Typology of House Elements

The typology of the house must consider, in addition to the arrangement of spaces (see Morphology), the elements of the house. It is as much through the treatment or form of house elements - roofs, walls, platforms, etc.- as through the arrangement of spaces, that the typology of the house can be defined.

Roofs

Roofs vary for two main reasons: the use of locally available materials, and the climate. Both influence the form of the roof.

In general, the pitch of the roofs decreases from the coast to the mountains. This is most marked in a section taken from the coastal area north of Rasht and passing inland through Fouman to the mountains. The reasons for this change is in each stage of this cross section two fold. Reed thatch is used in the coastal areas because it is the most abundant available material, using reeds from the marshes. The pitch of these roofs is very steep where the rainfall is high, to ensure that water will run quickly off the roof and not penetrate the thatch; they are shallower where the precipitation is less; hence the difference between reed thatch roofs in Gilan and in Mazandaran. The occurrence of low overhanging eaves is traditionally unique to thatched roofs and reflects the degree of exposure to bad weather, which is greater near the coast. Such overhangs usually protect a frail wall structure behind, such as plastered reed walls. Sheet metal roofs in these areas often imitate this form.

Moving inland, rice thatch replaces reed thatch in response to the respective availability of these materials. The pitch is shallower than on the coast and relates directly to the

decrease in rainfall. At the junction of plains and foothills, forests start replacing fields of rice, and hence wood shingles replace thatch. These shingles allow the roof pitch to be much shallower, and again, as the rainfall decreases into the mountains, the pitch can be lowered. One thus sees a progression from 35° to 25°. Although there are exceptions, such as Masouleh, the change from shingles to flat timber and mud roofs occurs at the point where there is insufficient rain to support forests, altering the materials which are available for roofing, and where the relative dryness of the climate makes flat roofs practical. So flat roofs are typical of the drier slopes and plateaus of the mountains.
Tile roofs which occur in areas where soil is suitable for tile production (Astara, Behshar and the towns of the Rasht/ Lahijan area), are an exception to the pattern outlined above, since they are suitable for use in areas of heavy rainfall without requiring a steep pitch.

Similarly, sheet metal roofs do not reflect local changes in climate, with the exception of those in the Turkomansahra area where the peculiar "H" ridge form of sheet metal roofs is, according to locals, to assist in the collection of rainwater.

Walls

Walls, in the same manner as roofs, vary according to the materials available locally and the climate.

Reed walls supported by a timber framework occur in the coastal areas, where reed is more available than other walling materials. This wall type is well suited to the warm humid conditions of the coast, where thermal insulation is less important than inland, where temperatures are more extreme.

A general observation is that walls increase in thickness with distance from the coast. Linked to this is a similar transition from framed wall construction near the sea changing to load bearing wall construction in the mountains. This change reflects changes in the availability of walling materials. Loadbearing walls are naturally thicker than framed walls, and so the change required by climatic conditions is facilitated by the change in the physical properties of the wall.

Moving from the thin reed walls on the coast inland, walls of timber lathing with a packed mud infill occur. These walls are thicker than the reed walls but are still supported by a timber framework. However, where timber is less available, packed earth ("chineh") walls are used, as in Sari and Fouman plains. The choice between these two types of walling is influenced by variations in local climatic conditions as well as the suitability of the materials.

Log walls, which are loadbearing, coincide with forested areas, and are therefore the major wall type in the foothills and forested mountains. Because of the good thermal properties of timber, these walls provide greater insulation against extremes of temperature than the thin walls found on the coast. The use of log walls is restricted to areas where timber is plentiful, and thick stone or mud loadbearing walls replace logs where the forests decrease inland. At this point thermal insulation is essential to counteract the cold winters and cool summer nights which occur in the mountains. Thick loadbearing walls are thus responsive to both the local climatic conditions and the availability of walling materials.

All the wall types mentioned above require rendering and maintenance. In areas where the soil is suitable fired brick

are produced and used for walling, as in Astara and Behshar. They have the advantage of being less subject to damage by rainfall and consequently require less maintenance. However, the cost restricts the rural use of fired brick even in areas where it is produced. Similarly concrete block has come into use throughout the coast and plains of the Caspian region for those who can afford it. Although it is less environmentally responsive, concrete block is locally believed to be long lasting and maintenance free.

Platforms

Houses are built on platforms to raise them above damp ground conditions and the risk of flooding. Platforms are therefore a predominant feature in the coastal and plain areas of the Caspian. Two basic forms of platform exist - those which are raised clear of the ground, which occur in areas where rivers are likely to flood (Sefid Rud delta), and those which are solid. Solid platforms are highest near the coast, and in general get lower towards the foothills, corresponding to the areas with drier and better drained ground.

Platforms are not a predominant feature of mountain dwellings, but visually the levelling of ground below the main structure of the building produces an effect similar to the platforms of the plains.

Orientation

Orientation of houses also alters from the coast to the mountains. To take maximum advantage of the sun's warmth in winter, houses in an ideal situation face south, with windows primarily on the south wall. However this ideal orientation is not always the most practical. On the coast houses tend to be oriented towards the south-east, turning the back of the house towards the prevailing north-westerly

storms. Moving inland onto the plains, a south facing orientation is more practical, since the houses are less exposed to bad weather. The situation is notably different in the foothills and mountains, where topography becomes a dictating factor. Houses primarily face downhill, with their backs turned toward the slope behind. This is not an ideal situation and where the site is sufficiently open towards the south, a south facing orientation is chosen.

FOUMAN AREA NE to SW SECTION

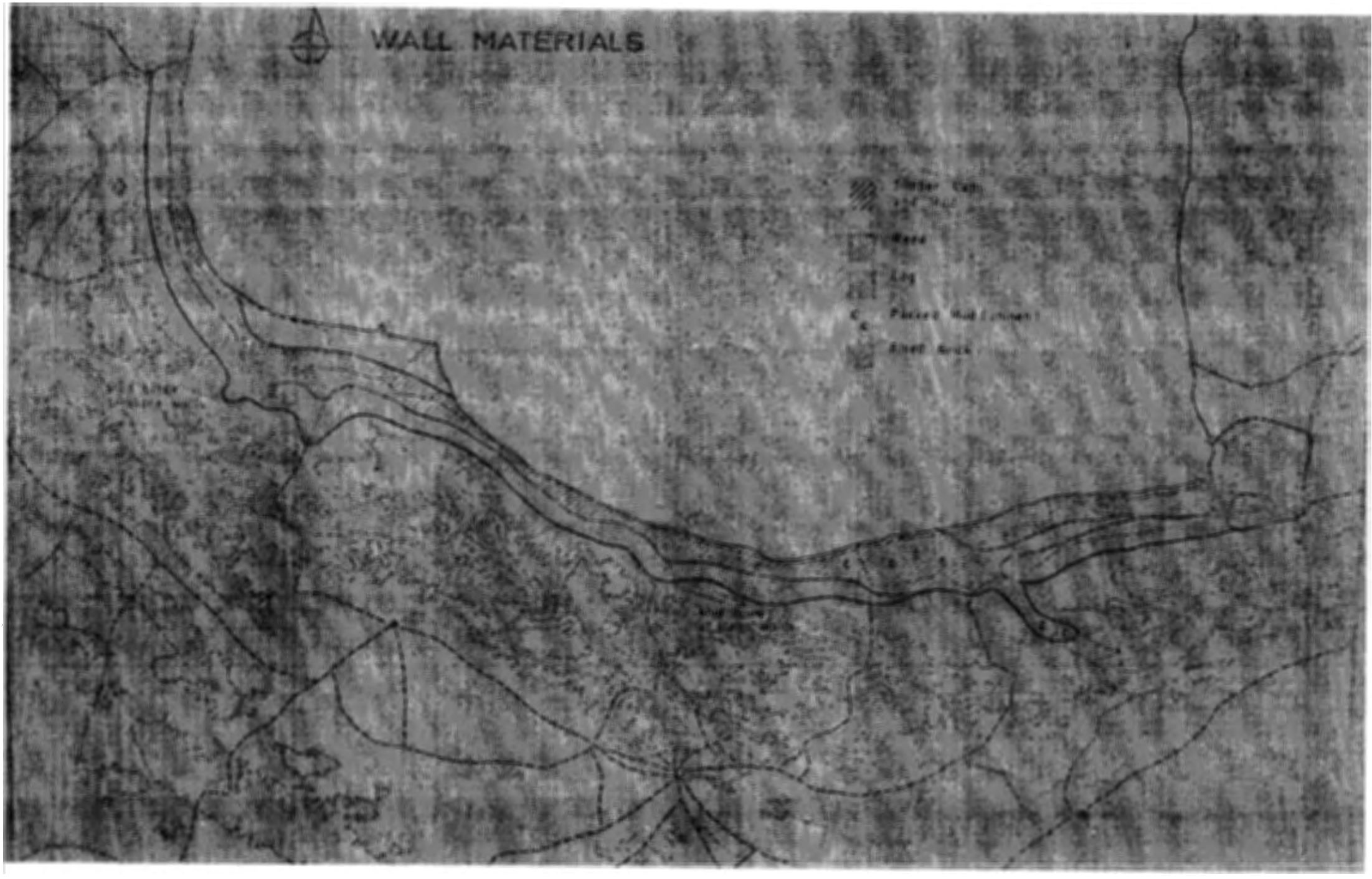
	COAST	PLAIN	FOOTHILL	MOUNTAIN
Sectional form	Single Storey Low rooms High Roof Height of rooms limited by Materials used	Mezzanine Medium height rooms Medium high roof	Two Storey High rooms Low roof	Mixed single & 2. storey Low rooms Flat roof
Plan form	Front aivan Aivan provides sheltered outdoor space for summer	Front aivan & east side Mezzanine with Talar Talar provides cool summer living space	Front aivan, commonly enclosed Upper floor talar & room Talar provides cool summer living space.	Central aivan. Front aivan
Roof	Hipped 55° Overhang 3 sides Reed thatch Overhang provides protection from prevailing N.W storms	Hipped 45°–50° Overhang N+W sides Rice thatch Pitch lower as rain decreases inland.	Hipped 30°–40° Small Overhang Shingle Pitch low to keep shingles in position	Flat Mud on timber Low rainfall and shortage of timber
Walls	Frame: timber & reed panels Temperature not extreme, insulation not important Uses local materials	Frame: lathing and packed mud Loadbearing: mud Choice depends on local availability and tradition. Thermal insulation desirable	Loadbearing: Log Simple effective use of local material Provides some thermal insulation	Loadbearing: Stone or mud brick horizontal tie Provide good thermal insulation Problems with weak mortars for stone
Platform	High, solid Above risk of Flooding	Medium, solid Less risk of flooding Platforms lower near hills	None, except levelling —	None except levelling —
Openings	Medium	Medium	Small [winter use] Medium [Summer use]	Small / Medium
Orientation	S.E Back to prevailing N.W. storms.	S Allow winter sun penetration	S and topography Face winter sun when possible. Slope deciding factor	S Land topography Face winter sun where possible
Use of space	Summer aivan Winter rooms Little specialisation	Seasonal & diurnal change. Summer talar. Winter rooms. Spring & autumn aivan	Summer upper floor Winter lower floor Integrated animal shelter	Main living indoors Little seasonal change Summer sleep on roof.

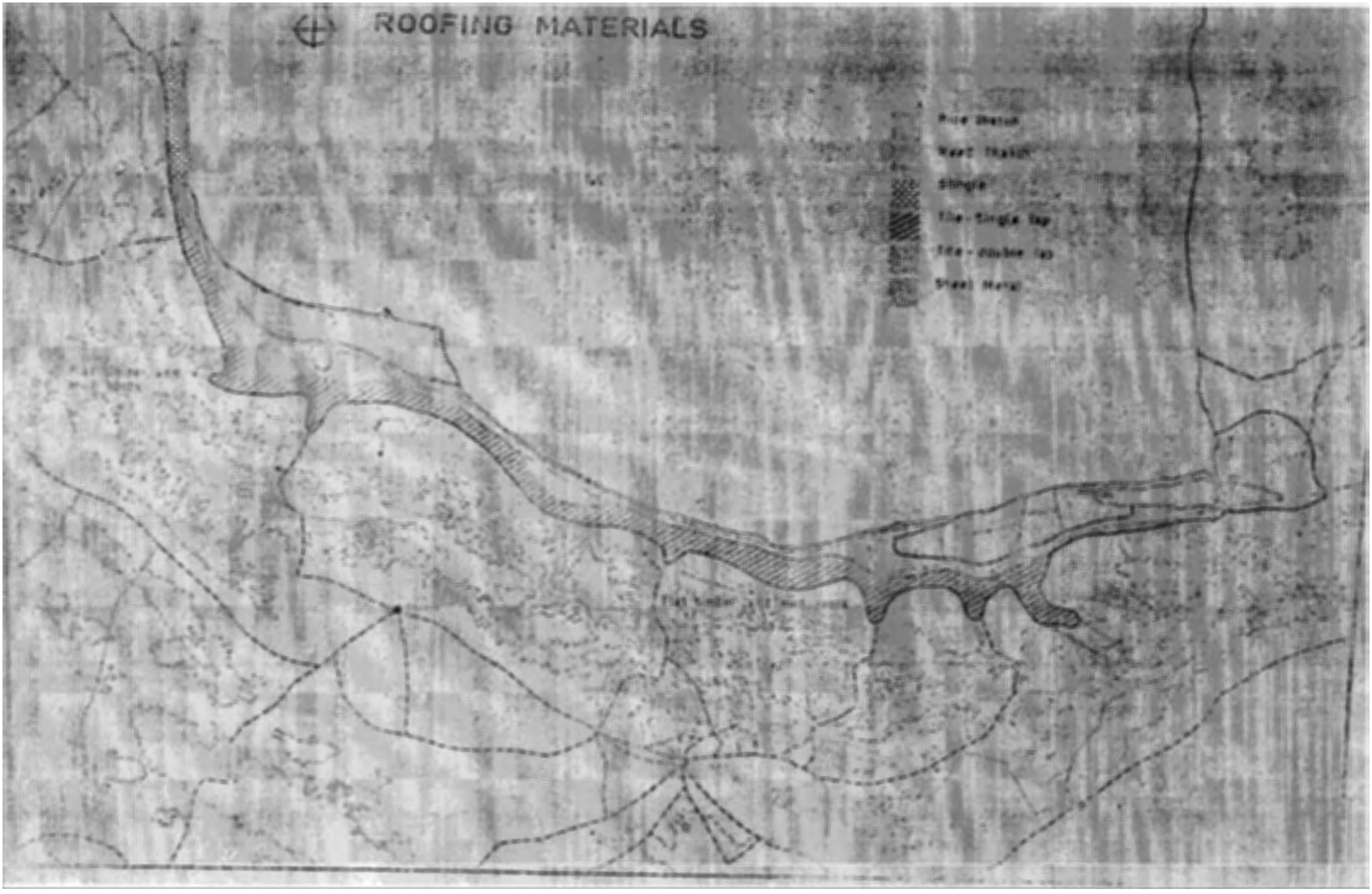
MAZANDARAN NORTH to SOUTH SECTION

	SARI PLAIN	SARI FOOTHILLS	MOUNTAINS WET SLOPES	MOUNTAINS DRY SLOPES
Sectional form	Single storey, low rooms low roof Some two storey, upper floor unwalled.	Single & 2 storey Low rooms, low roof. Economics influence choice between 1 or 2 storeys	Single & 2 storey Low rooms Low roof	Single ~ few two storey Low rooms Flat roof
Plan form	Linear rooms Front aivan House develops linearly	Linear rooms Front aivan	Most 'L' shape or central aivan considerable variety ~ economics of owner and site condition	Front aivan, also 'L' shape
Roof	Hipped 35° Reed thatch, being replaced by sheet metal Rain less than in Gilan, hence thatch pitch lower.	Hipped 35° Shingle. some thatch and sheet metal	Hipped 35° Shingle	Flat. Timber & mud ring beams used Low rain & less timber flat roofs suitable.
Walls	Framed. Reed panels plastered Newer: packed mud or fired brick	Load bearing: packed mud Close to plain some frame with lath & mud thermal insulation required for winter →	Load bearing Log ~ older Stone ~ newer Horizontal timber reinforcement used	Load bearing Stone or mud.
Platform	Medium, solid Above level of local flooding.	Medium, solid Mainly for levelling site	Low, solid Site levelling	None except levelling
Openings	Large / medium Windows North and South side allow crossflow ventilation.	Medium	Small / Medium	Large / Medium
Orientation	S	S & topography	topography	S
Use of space	Little seasonal change 2 storey buildings have upper floor for summer sleep.	Little seasonal change	Indoor summer use, Migrate to plains in winter	Indoor all year. Summer sleep on roof.

GILAN & MAZANDARAN WEST to EAST SECTION

	ASTARA	SEFID RUD DELTA	BEHSHAHR	TURKOMANSARA
Sectional form	Single Storey Low rooms Low roof Harsh climate	Single Storey with Low rooms High roof	Old: Single Storey with high rooms. Newer: 2 Storey with low rooms Low roof	Single Storey Low rooms Low roof.
Plan form	L shaped, small Protected aivan	2 rooms with aivan on 2 sides & walkway all round Rooms built on raised platform	Front aivan House stands at north end of walled courtyard. Semi urban form	L shaped / Central aivan Style relatively new previously nomadic
Roof	Hipped 35° Tile, single lap Rainfall high but Tile suitable for low pitch	Hipped 55° Thatch, Reed (Rke) Overhang N+W side Prevailing storms from N.W.	Hipped 30° Tile, double lap Tile requires low pitch	Hipped 25° Sheet metal H form ridge Collection of rain from roof for drinking important
Walls	Framed: lath & mud or Loadbearing: fired brick Choice depends on availability and economics	Loadbearing: log or Frame: lath & mud Frame replacing log wall	Loadbearing: brick Bricks produced in local kilns	Loadbearing: [illegible] Mud mortar used with fired brick... Weak
Platform	Low, solid Above surface water from rain	High, raised on wood blocks with clear space below, Raised above risk of flooding	Low solid platform Platform higher on older buildings where basement is used	Minimal, solid Houses usually on raised ground
Openings	Medium	Medium	Medium	Medium / Large
Orientation	S	S, S.E	S	S
Use of space	Little seasonal change mainly indoor living	Summer use aivan Winter rooms Hot humid in summer so air movement beneficial.	Outside cooking in summer Rooms multi use	Little seasonal change Aivan used when weather permits


WALL MATERIALS


ROOFING MATERIALS

Settlement Pattern

The concept of a village as a clearly defined, compact cluster of dwellings, which is common in the central plateau and the interior of Iran, does not correspond with the settlement patterns of most villages in the Caspian region. Here the settlements seem loosely knit because the dwelling units are dispersed amongst trees and vegetation at some distance from each other. Excluding a few exceptions to this pattern, the scattered relationship of the small clusters of dwellings makes the visual definition of a village as a unit a tenuous one. However, on a closer examination the links between different dwellings within a village become apparent. In most plains and foothill villages of this region, the house cannot be considered as the only unit of built shelter; it is interlinked with the private garden plots and the ancillary buildings within these plots. In these villages the main house is located within the relatively large, tree-lined gardens that also contain animal shelters, stores for agricultural produce, shaded outdoor washing and cooking spaces and in some cases a secondary house that is used seasonally (e.g. the nemar in the Sari area). The gardens, which also provide vegetables and fruits, mainly for home consumption, act as the main unit defining the structure of the settlement. It is the garden plots that are connected to each other in groups and the clusters of private plots are linked by a spine such as a footpath, road or a watercourse.

The most notable changes in settlement pattern within the Caspian region correspond mainly with changes in altitude or from the coast inland towards the mountains. There are also relative differences between settlements in the western Caspian (Gilan) and those in the east (Mazandaran). The altitudinal change is more marked in Gilan than in Mazandaran

where the transition is much more gradual. The differences of degrees of change in the western and eastern parts correspond also to changes in the levels of annual precipitation and temperature.

Plains Settlements

The largely rice growing plains and coastal strips of the Caspian are characterised by settlements surrounded by trees at the limits of the clustered expanse of rice fields. The plots of paddy fields divided during the land reform, have remained grouped together, possibly for ease of irrigation. The settlements at the edge of the fields are composed of small (one to four) or larger (six to ten) clusters of garden plots connected together along a road or footpath. The plains settlements in Mazandaran are more compactly clustered than those in Gilan. This could be due to the larger feudal estates in Mazandaran (average number of peasants per estate in Gilan is six; in Mazandaran is thirteen*).

Foothill Settlements

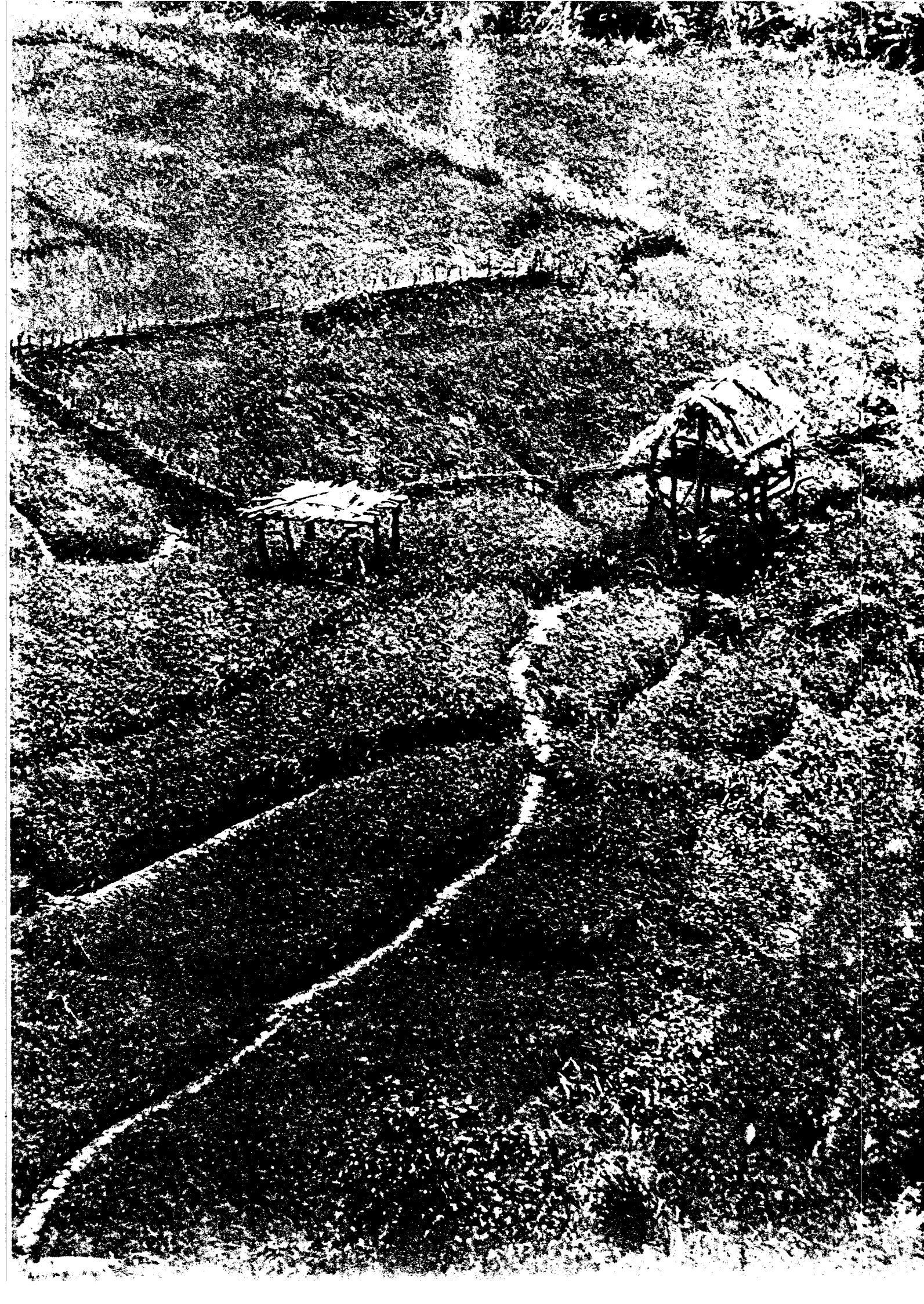
The agricultural fields in the foothills remain linked together wherever possible and the settlements are on the edge of the agricultural land. The houses are within private garden plots as in the plains villages. An exception to these are the semi-urban settlements where the houses have small walled yards (e.g. Rostam Kola). In Gilan the house plots tend to be linked in a linear fashion along roads or at the edge of the hills, whereas in Mazandaran the settlements are more clustered.

Mountain Settlements

The clusters of houses become increasingly compact as one moves higher into the mountains and smaller house yards replace the garden plots. In the drier parts of the central

* A.Lambton, op.cit., p.219.

Alborz settlements begin to conform with the compact pattern of villages in the interior of the country. Flat roofs predominate as the annual level of precipitation lowers considerably and timber becomes less abundant. Here the houses with their walled yards, which are attached together, define the circulation and hence the settlement pattern of the villa



Ancillary Buildings

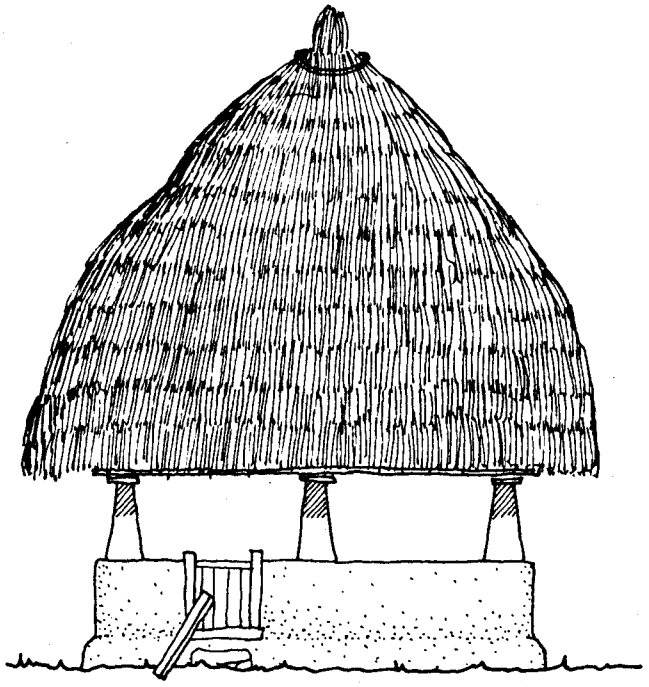
The garden plot encompassing indoor and outdoor living and activity areas, and ancillary animal and storage buildings, is the common form in most of the Caspian Region.

The rice barn is a common structure throughout the rice growing area. They differ greatly from the west to the east of the region. While the rice barn on stilts is the most dominant form, a structure built on the ground (telambar) is found around Fouman. Differences occur because of climatic as well as economic conditions. The telamabar, or ground-built store, is employed mainly by small farmers who are unable to store large surpluses. This kind of store is not effective for long term storage because of problems of rising damp, although rice can be stored for periods of three months to two years in these buildings. The grain is partially protected by spreading a layer of hay or sweet grass on the ground first, to keep away rodents. Small farmers do not usually require more sophisticated storage structures because they normally sell their harvest immediately after harvesting.

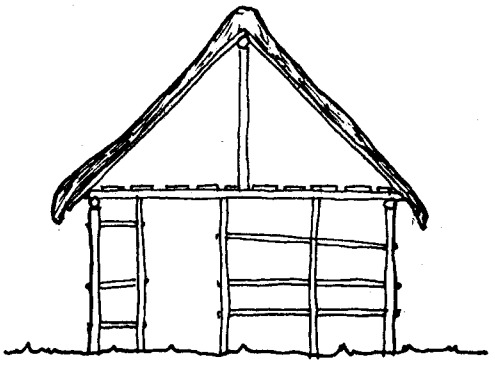
Larger farmers are able to store their surpluses in order to sell them when market prices for rice rise (normally in the spring). They use rice stores built on stilts which are able to keep rice undamaged for periods of three years or more. Rodent guards are incorporated into the design of the stilts (see detail drawing). Rice is stacked in such a way as to allow air circulation through the central channel. Thus continuous aeration ensures proper drying.

Though rice stores are normally found within the house-garden plot, in eastern Gilan and Mazandaran they are built in the cultivated areas.

* General Reference: C.Bromberger in Ethnologie et Traditions Populaires de l'Iran, pp.17-19.



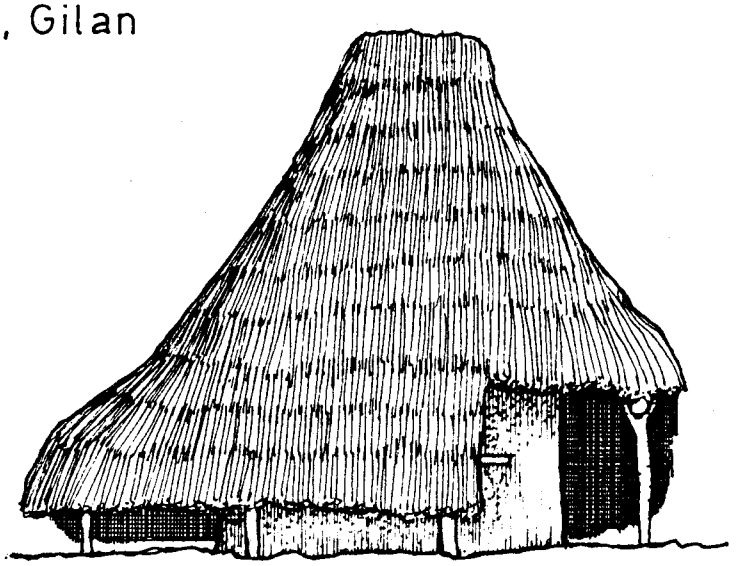
Rice Store - Asalem Area

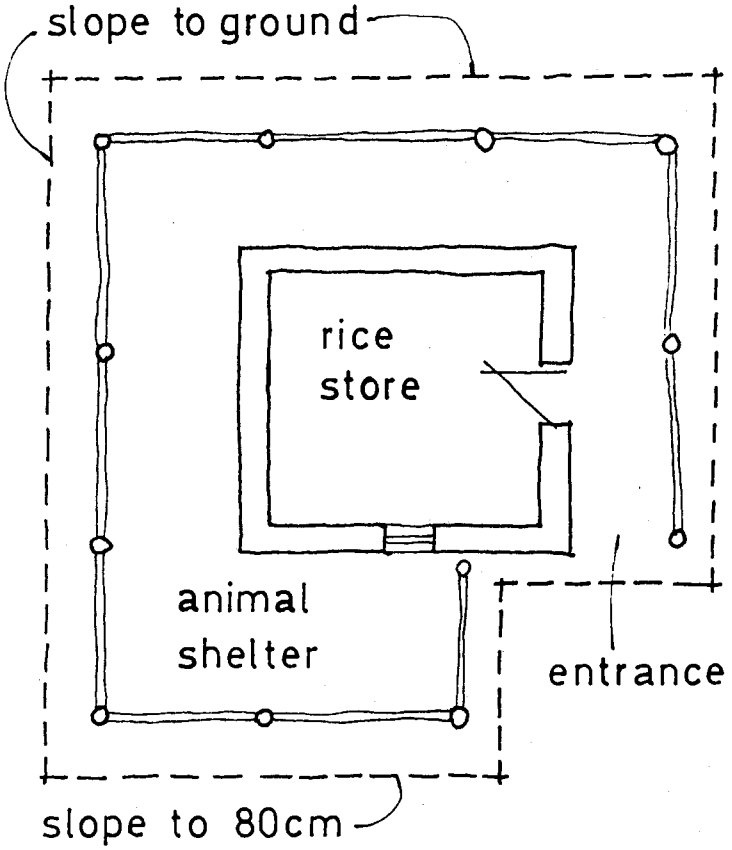


Rice Store - Fouman Area

Animal Shelter - Rice Store

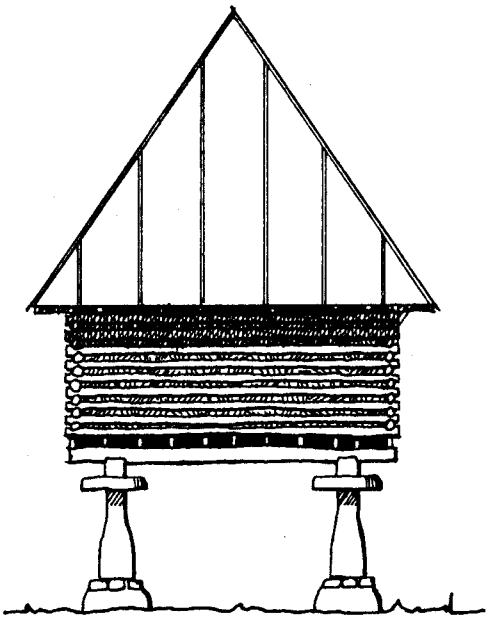
Dogoor , Gilan

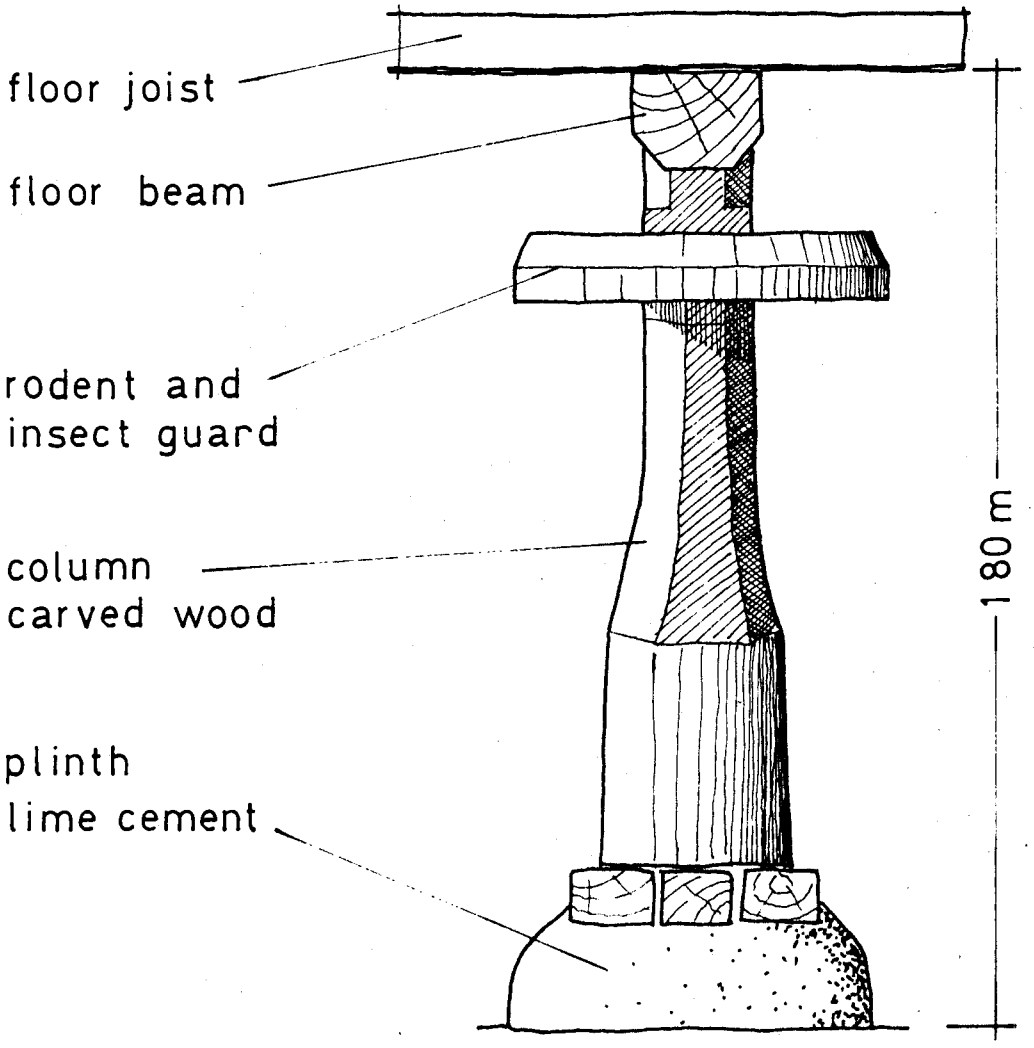




Rice Store

Toolehsara
Mazandaran





Column Detail

Rice stores typical of the Asalem area.

Rice stores found in Kuchesfahan and Shahsavar districts. Note stilts incorporating rodent and insect barriers.

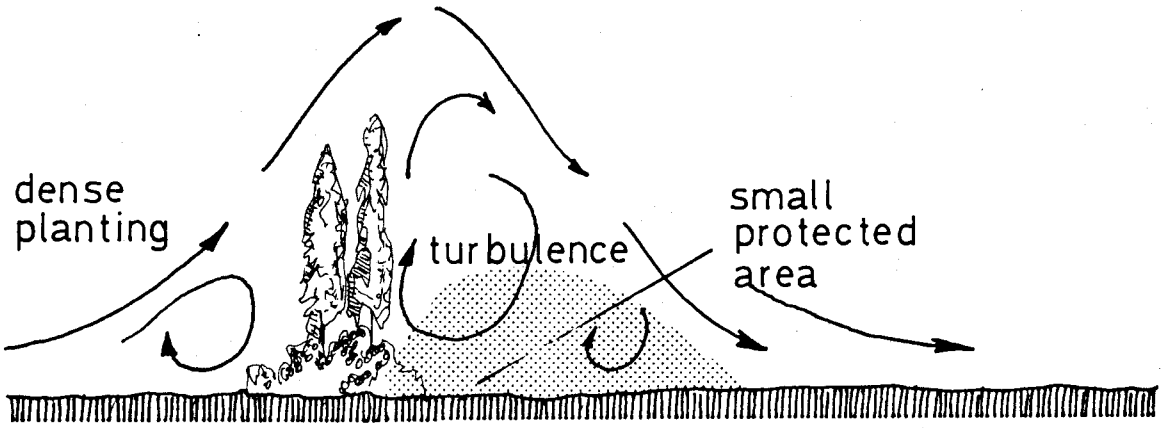
Climate and the Built Environment

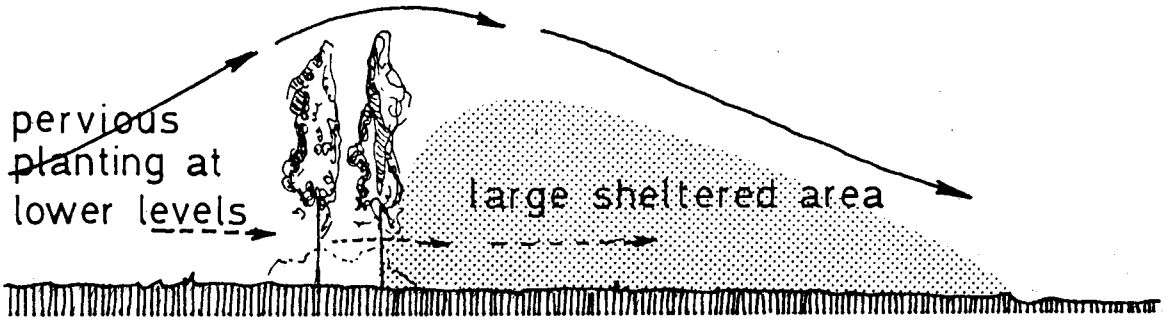
Major climatic influences can be controlled by careful design of the built environment. Indigenous building of the Caspian shows a variety of interesting responses where climatic forces have, by simple means, been modified and used to maximize comfort conditions within or around shelters.

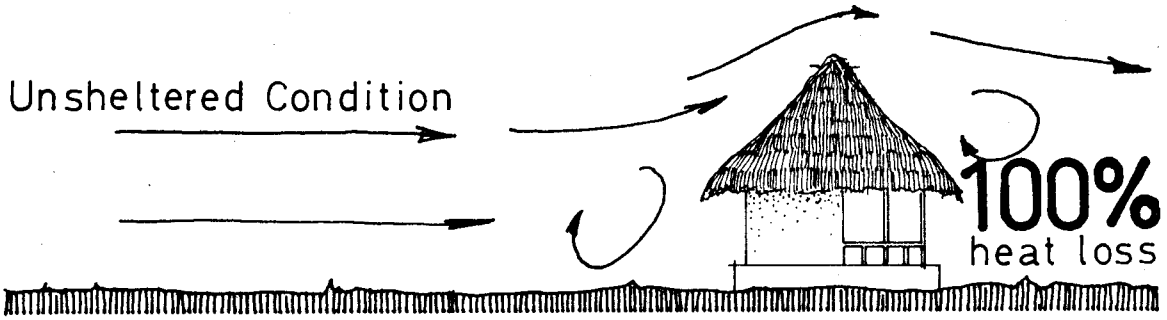
Wind forces can be modulated by the use of natural elements such as trees or bushes. Wind breaks are advantageous in areas where strong winds may cause structural damage to building, or in cold seasons draw heat away from built shelters. It can be seen from the example that a single line of planting on the windward side of a building can cut heat losses and therefore energy consumed in heating by 20%. Continuous planting such as a garden planted immediately to the windward side of a building, can cut down heat loss by a further 10% to save 30% on heat energy. This principal is demonstrated clearly in many settlements in the Caspian where individual houses are set in protective garden plots. Particular shelter belts can be designed to control air movement. A dense planting belt is less effective than a semi-pervious one which allows a proportion of the wind to pass through. Such a shelter belt will exclude damaging strong winds but allow mild breezes through, which are favourable for cooling in hot seasons. Planted belts and wind breaks not only help shelter buildings but can be useful in protecting agricultural fields from wind damage.

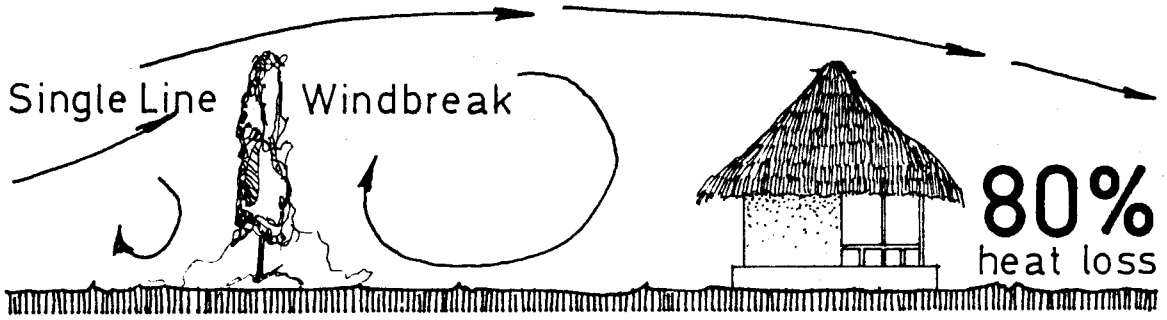
Roofs in the Rasht-Fouman area are designed with particular consideration given to the problems of rain and wind. According to local people, in this area the potentially most damaging winds occur in the winter and come from a north and west direction. These winds are strong and cold and are accompanied by heavy rains. It is for this reason that the north and west sides of the buildings need to be well sheltered. Roofs

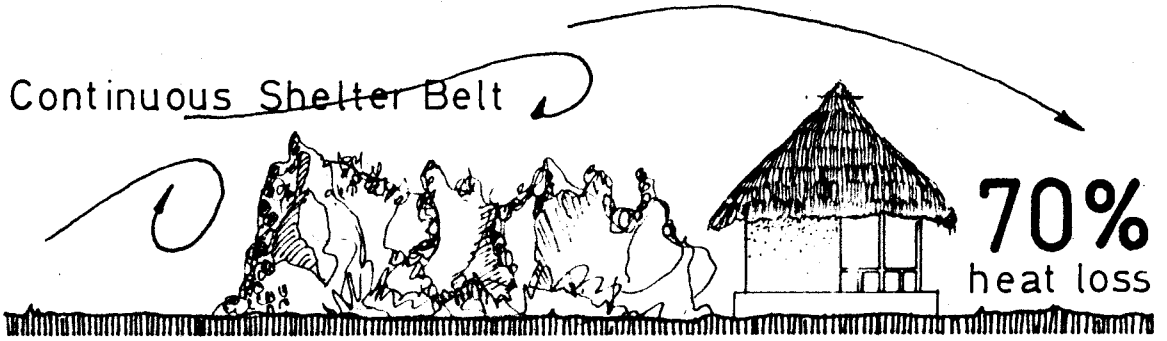
Micro-Climate Control with Planted Shelter Belts

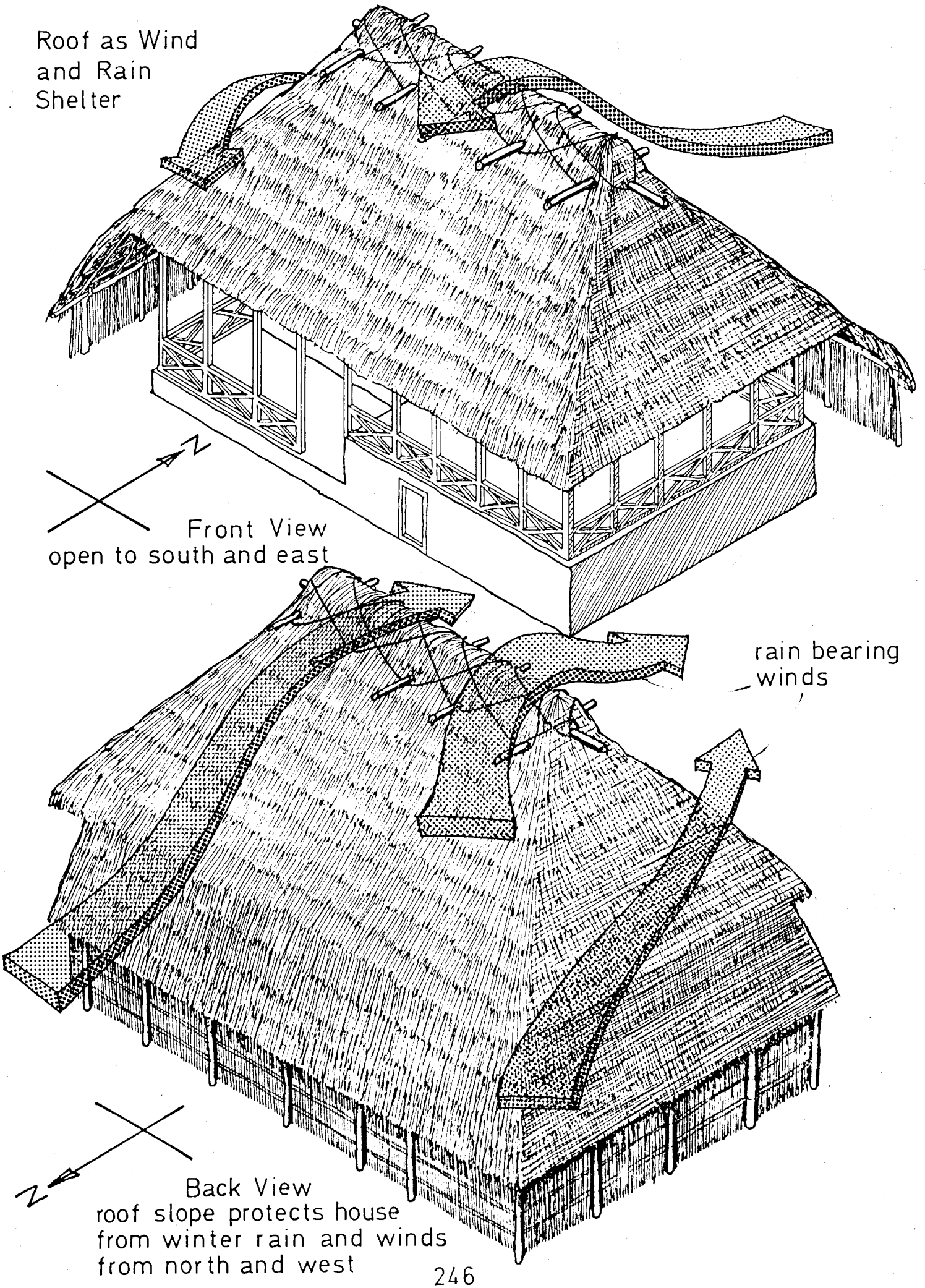








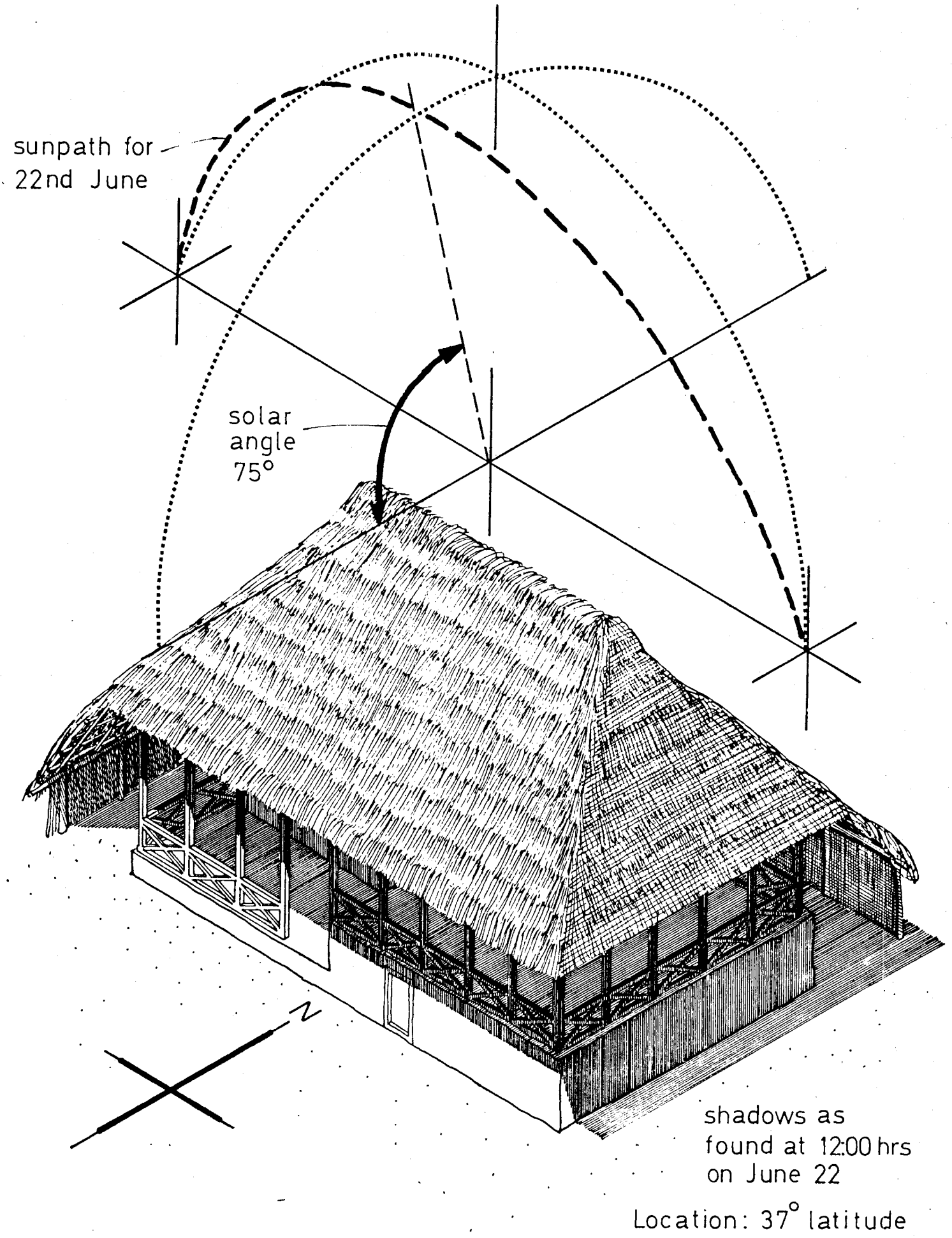


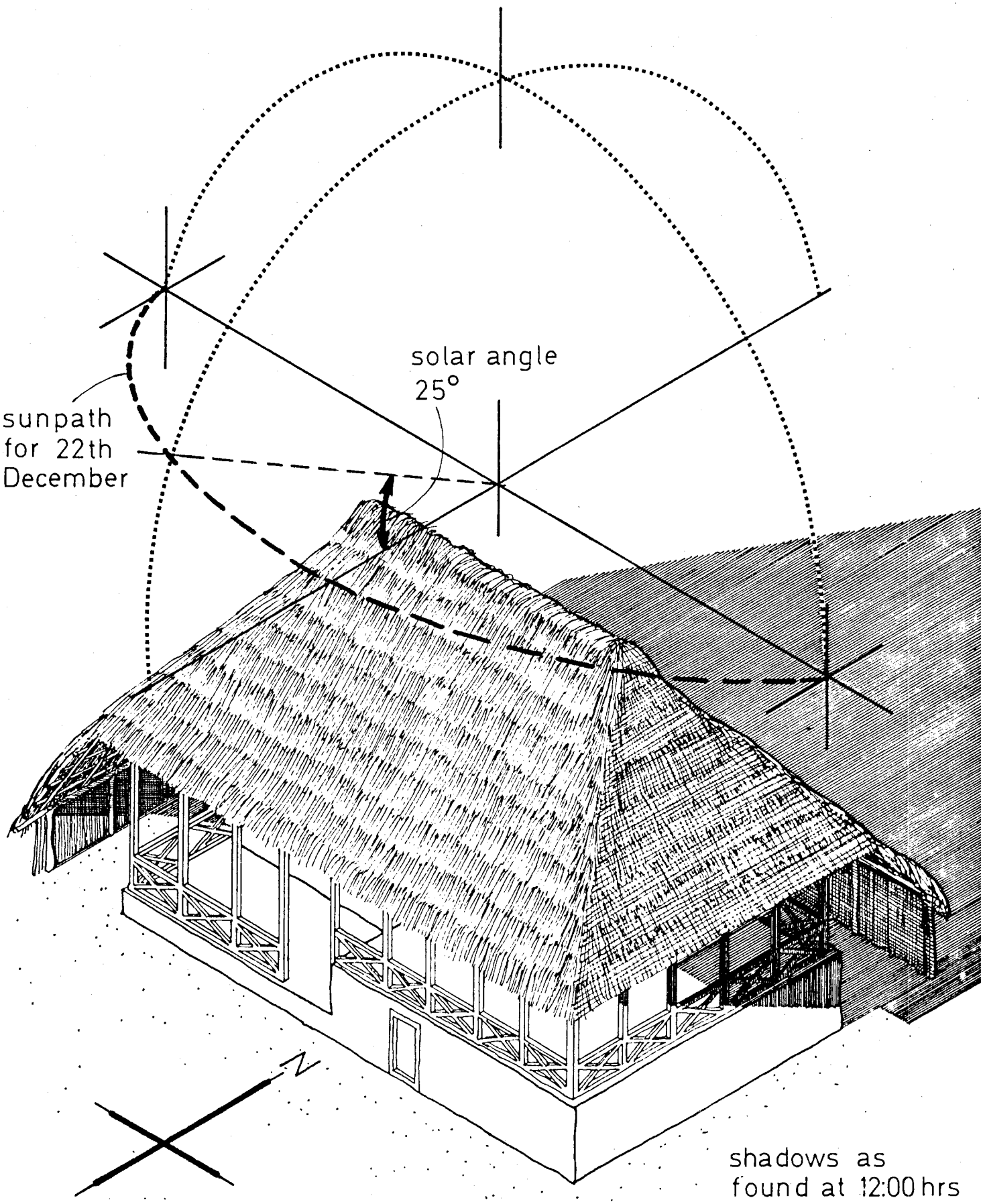

Roof as Wind
and Rain
Shelter
N
Front View
open to south and east
rain bearing
winds
N
Back View
roof slope protects house
from winter rain and winds
from north and west

are designed in this area so that the eaves on the critical sides incorporate an extra extension which reaches almost to the ground. The gap remaining between the eaves and ground is filled on these two sides with a reed or mud wall. This particular roof construction acts as a screen or double wall to protect the building from rain damage and also provides extra heat insulation. The passage thus created on two sides of the building serves as valuable space for storage, cooking, or animal shelter. The profile of the resulting house deflects the wind so that the open unprotected south and east faces and the front forecourt are in the wind shadow. Activities can be carried out in this sheltered space with little interference.

While strong, cold or rain bearing winds are especially unfavourable in winter, moderate air movement in the hot humid summer season is necessary for thermal comfort reasons. During this time of the year it is important to allow the cooling breeze to move freely through the settlement. The scattered nature of the settlement plan, which is common to many rural areas of the Caspian, is favourable in this respect. Houses tend to be situated within their own garden plots with wide spacing between built structures. In this way buildings do not shadow each other from the effects of moderate air movement.

Seasonal changes in solar radiation are an important consideration in house design. The accompanying charts demonstrate this clearly. In the summer the sun follows an almost overhead path from dawn to dusk. The summer solar angle is very steep and reaches a maximum of 75° on June 22nd. Because of the high sun angle, solar radiation can not penetrate deeply into open roofed living spaces such as porches, aivans, or talars; these spaces remain shaded during the hottest time of day. Equally, overhanging roof eaves are able to shade walls and prevent them from being heated up by solar


sunpath for
22nd June
solar
angle
75°
N
shadows as
found at 12:00 hrs
on June 22
Location: 37° latitude


solar angle
25°
sunpath
for 22th
December
N
shadows as
found at 12:00 hrs
on December 22
Location: 37° latitude

radiation. Even when eaves are insufficient to shade walls the oblique angle of the sun in summer has little heating effect on vertical surfaces, and because of wall or sill thickness has little chance of penetrating windows to heat interiors. In the winter, on the other hand, the sun path is low in the sky, reaching a minimum of 25° on December 22nd. The near horizontal rays of sun are able to penetrate deeply into covered spaces. During cold months these outdoor roofed spaces are warmed by the sun. Solar radiation can therefore penetrate below eaves and strike vertical surfaces such as walls at an almost perpendicular angle, thus warming the walls whose heat energy is passed on to interiors. In the same way, sunlight can readily penetrate south facing windows to help warm interior spaces of houses in the winter.