

A physical manifestation of food management in extreme natural conditions: Gaushal, Manali, Himachal Pradesh

Garima Rajput, Manasvi Rane, Palak Babel

Affiliation: Windows to Vernacular

Email: rajputgarima04@gmail.com, manasvirane95@gmail.com, palak@windowstovernacular.com

Abstract

Since the dawn of settlements in the higher reaches of the Himalayas, the local communities are known for their resilient nature to adapt and thrive with nature's adversities. Through the plethora of possibilities, communities have fostered means to support life through centuries. An alpine setting and harsh winters result in innovation, development and evolution of practices to sustain through the harsh snowy winter months. The communities have evolved over the decades a distinctive self-supporting ecosystem, they have found means to meet their food requirements through the winter months when fresh produce is scarce. A response to the extreme weather conditions and limited access to the surroundings, these communities have developed unique farming crop patterns and animal husbandry; impacting the traditional building planning and space-making. Situated at an altitude of around 2040m/ 76693feet from the main sea level, Gaushal, Himachal Pradesh, India is one of the many villages in the region practicing winter prepping and stocking of food. Cut off from the main access road, however, the proximity to the city, the villagers have a unique and an efficient system that works on adaptive traditional wisdom, which has evolved into a yearly ritual; that reflects the mélange of ecological, cultural and social practices that help sustain the people.

Keywords: winter stocking, food storage, Himachal Pradesh, Kath - Kuni

Introduction

Human settlements across the globe have survived centuries living in harmony with the ecosystem around them. Understanding the nuances of the land, what it takes to thrive and survive; adjusting with the scarce resources and making it a way of life. The driving factors for settlements to stay is the availability of food and water. Over the centuries, settlements spread across all geographies, the most conducive to the hostile ones, from a nomadic sedentary way of living to a more settled or a semi-sedentary lifestyle (Chakraborty, 2017). Humans found ways to adapt and condition from hunting animals to rearing them and foraging farming and finding ways to overcome adversities and understand them better to evolve (Department Of Economic And Statistics Government of Himachal Pradesh, 2019)

The Himalayas posed a hostile and challenging terrain to thrive in, but humans have called it their home for centuries. The paper explores the evolutions and adaptations of the built fabric in one of such settlements in the Himalayas, viz-viz the adversities and challenges; through Manali and Naggar's regions focusing on Gaushal, Kullu district, Himachal Pradesh, India. The climate in the district of Kullu is cold during winter months and moderate temperatures during the summer months. The temperatures range from 4°C (39°F) to 26°C (79°F) over the year.

The average temperature during summer months is 10°C (50 °F) and 26 °C (79°F), and during the winter months, it is in between -15°C (5°F) and 12°C (54°F) (Department of Environment, n.d.).



Fig. 1: Snow covered forest and hills in the Kullu valley, Himachal Pradesh
Source: author

The research aims to map and understand the physical Manifestation of the adaptation and evolution of the built environment in the high altitude and low-temperature areas of Kullu district, Himachal Pradesh. A case study of the village Gaushal in Kullu district, Himachal Pradesh.

People and the journey

Till half a century ago the people in the region lived a transhumant lifestyle, seasonally moving up and down the Himalayas; moving to subalpine and alpine slopes of Lahaul and Spiti in the summer and low altitude pastures near Mandi in the winter. People in the region were predominately shepherds; rearing sheep, goats and cows and practicing subsistence farming. The hilly tracts were a challenging place to till; hence, the families sustained themselves with rearing animals, trading them, and wool. The shepherds would travel to the lower altitudes searching for greener pastures during the year's winter months. The male members and at times the kids joined the migratory journey up and down the slopes. A part of the family stayed back with the cattle to tend to the farms and maintain the house. Herds would consist of approx. one hundred fifty sheep and goats, alongside a few Himachali cows and bulls, mules and horses. The families lived in family homes made up of stone and timber in the village and temporary shelters while travelling with the herd. (Anand, 1970)



Fig. 2: A lady taking her herd grazing in the hills nearby, Gaushal, Himachal Pradesh

Source: author

Traditionally only a few crops were sown each year and were mainly rain-fed. Rice, wheat, maize, mustard, barley, millet, buckwheat, ragi, and kidney beans were a few of the sown crops and harvested through the various farming seasons. The people mainly practiced farming to sustain the family and provide fodder for animals; thus, small individual land parcel. For centuries the diet in the region consisted of minimally processed plant and animal-based food. The region sustained on the limited supply of resources and depended on their produce and traded a few things while travelling to Mandi¹ in the winters. Majority of the food items consumed consisted of whole grains, beans, greens, dairy products, and meat. Food is prepared by boiling, roasting, smoking, frying or fermentation over a traditional wooden stove within the house. People consume various kinds of fermented bread, pickles, soups, chutneys, and dried vegetables during winter months (Bhalla, 2007).



Fig. 3: Traditional methods of prepping food a. making chutney using a *silbatta* b. slow cooking on the Himalayan stove c. sun-drying

Source: author

¹ An important trade route passed through the Kullu valley between the Indian subcontinent and central Asia. A few of the important commodities of trade were borax, salt and wool. (Minhas, 1998)



Fig. 4: Orchards near the village, Gaushal, Himachal Pradesh
Source: author

In the past couple of decades, there has been a sharp decline in the transhuman lifestyle; reducing the livestock owned by a family and practicing a more sedentary² way of living. Shepherds have converted to farmers and horticulturists growing various vegetables and fruits; turning farms into orchards. (Thakur, 2013)

² An occupational shift is seen within the people of the region thus putting an end to the seasonal migration. People are now occupied in horticulture and tourism related industries.

Settlement and geography



Fig. 5: Settlements across the Kullu Valley
Source: author

Situated within the mighty Himalayas' along the rugged undulating terrain, the settlements are strategically located in the valleys. Ideally near a perennial source of water in the form of a stream, river or an underground source (Neetu Sharma, 2009); along the southern or eastern-facing slopes of the valley where one would receive maximum sunlight. Perched along the gradient the houses rise a couple of storey from the ground in closely packed clusters.



Fig. 6: Women fetching water from *baudi*³;
Source: author

³ Baudi is a deep stoned pit, which is dug where water percolates naturally from the earth surface (Neetu Sharma, 2009)

The region around Gaushal, Kullu district covered in temperate forests, covered in coniferous and broadleaf trees. The steep gradient and lack of flat surfaces, the natural contours are modified into stepped flatlands; although a labour-intensive practice, it is a widely-spread practice. Drained by the river Beas, the land is life-giving; thus, quality produce is grown. Unirrigated rainfed farms annually practice "*do fasli kheti*"⁴; following two cropping seasons through the year (*Kharif and Rabi*). An extensively seen practice of preserving fruits and vegetables through the winter by burying them underground. Similarly, root vegetables like potato, onions and garlic are left underground to harvest in the future.

Winters in the region receive high volumes of snow each year, burying the roads, foot trails, farms under a few feet of snow, making farming or the possible availability of fresh produce a herculean task. Considerably long winters and limited access to resources; sustenance depended on the stocking provisions, spatial management of the built form and the traditional systems and processes. The added threat of earthquakes in the Himalayas meant the houses had to tackle the sub-zero winters and an occasional tremor (Authority, n.d.). Such adversity saw adaptations and evolution in the region's lifestyle and significantly impacted the built environment at community and individual levels.



Fig. 7: Snow covered footbridge crossing from Gaushal to Bhaang, Himachal Pradesh
Source: author

A day or two of continuous heavy snowfall leaves the villages on the higher altitude under a white blanket. Spending a substantial amount of time indoors, eating and sleeping as things around are a bit inaccessible. A concretized access to the villages in the region is a relatively recent addition; the access previously was through meandering pathways, dirt tracks and wobbly bridges over the river Beas. A sudden downpour or a snowstorm would cut off the villages from the main highways, movement confined within the house's bounds. Hence it was essential to stock up the food, fodder and fuel rations for the incoming winter every year.

⁴ Gaushal follows two main cropping seasons in a year:

Kharif - cropping is done with the onset of monsoon and first showers and harvested by end of sept to November like wheat, barley, mustard, potato, etc.

Rabi - known as the winter crop and its harvested around spring time like rice, maize, soybean, jowar, ragi, cabbage, onion etc.

The built environment



Fig. 8: A typical Kath-Kuni house in the village with the courtyard

Source: author

Stacked stones and unyielding timber members soaring up and supporting the slate roofs in the region of study and the surrounding areas have evolved over centuries to meet its inhabitants' needs and respond to the context. A standard building principle is followed through the region, using the cator and cribbage method of construction directly responding to the context. The spatial configuration is a derivative of the cultural practices, occupation needs and lifestyle of the community. Aligned to the natural contours, the region's houses cram to subdue the winter's bone-chilling winds. The difference in elevation of the houses provides each house with ample sunlight throughout the day. The villages have communal water sources, *gharat*⁵, temples and a common ground to hold festivities and fairs.

Gaushal is a village nestled between the river Beas, with a varying flow along its eastern side and the Himalayan mountains along its western face. Sitting along the slopes of the valley facing the Beas' floods plains, often inundated with water and connected to the surrounding areas through wooden bridges.

⁵ Gharat - local name for a flour grinding mill that is traditionally found in the Himalayas, where running water is used to power the mill. Previously every village in the hills had a couple of *gharats* running in the village. Currently only one remains in the village of Gaushal.

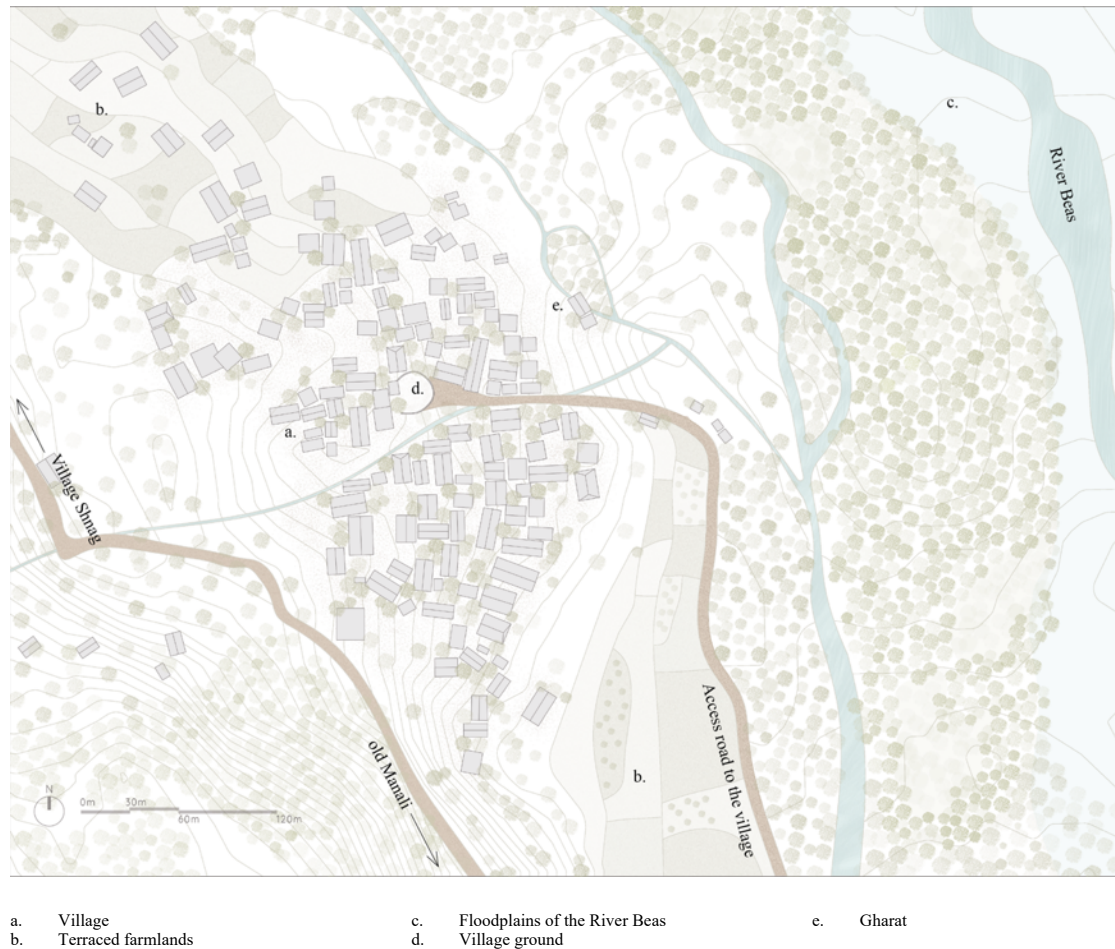


Fig. 9: Village Gaushal built context, Himachal Pradesh

Source: author

House planning

The houses in the region are multi-storey structures interspersed between a series of courtyards and fields and closely spaced with one another, at times a couple of inches away from the other while sharing a common courtyard; housing animals and humans under one roof. The intricately carved wooden cantilevered balconies around the house and the sloping slate roof provide an identity to the soaring high buildings in the region.

The spatial configuration of the house supports its function and the user. A practice seen across many settlements in the higher reaches of the Himalayas, the animals occupy the house's lowermost storeys⁶ while the humans occupy the upper ones. Over the years, the spaces within the home have been developed to make it a self-sustaining well-oiled machine that can support itself even when it is covered in a couple of feet of snow every winter. Housing several elements that are built-in and integrated to sustain life.

⁶ Animals occupy lower storeys of houses in houses in Ladakh, Tawang, Arunachal Pradesh, parts of Uttarakhand and Himachal Pradesh.



Fig. 10: Traditionally houses in the region were built using stone, timber and slate
Source: author

The traditional homes have two main habitable spaces that double as a kitchen and living space spread across two levels. The use and function of the space serve change depending on the seasons. The access for the upper levels is through a series of ladders and trapdoors. Affixed in the external wall during construction in the form of a square-shaped box made up of wood, slate or stone, plastered in mud (*madhaam*). An orifice along the external wall for the bees to move in and out and a moveable lid to access the hive on the inside. Multiple boxes around the house were an excellent honey source, as sugar was not locally available in the region and provided easy access through the winter months.



Fig. 11: a. Orifice of the *madhaam* along the front facade of the house b. Inside the opening of the *madhaam*
Source: author

The house's load-bearing walls support the wooden floor resting on a network of wooden beams and joists. Lining the walls and floor is a mud and cow dung-based render. Hidden under the finished floor are buds of ginger, stored safely for the next season.

Against all adversities, a good crop needs to be stored correctly, an estimated 60-70 % of food grains produced in the country is stored at a home level in traditional storage structures. (Promila Kanwar, 2006). Multiple storage options intersperse within the house for different grain types.

***Kholi* | Courtyard**

An open space in the house's bounds is one of the most vibrant and social spaces of the settlement. Built-up along the natural contours and levelled using stone masonry and boulders; often surrounded by a low bundh wall. The courtyard serves as a space for multiple functions like family gatherings, sunbathing in winters and various other activities throughout the year; and thus, is of utmost importance in the efficient working of the household.

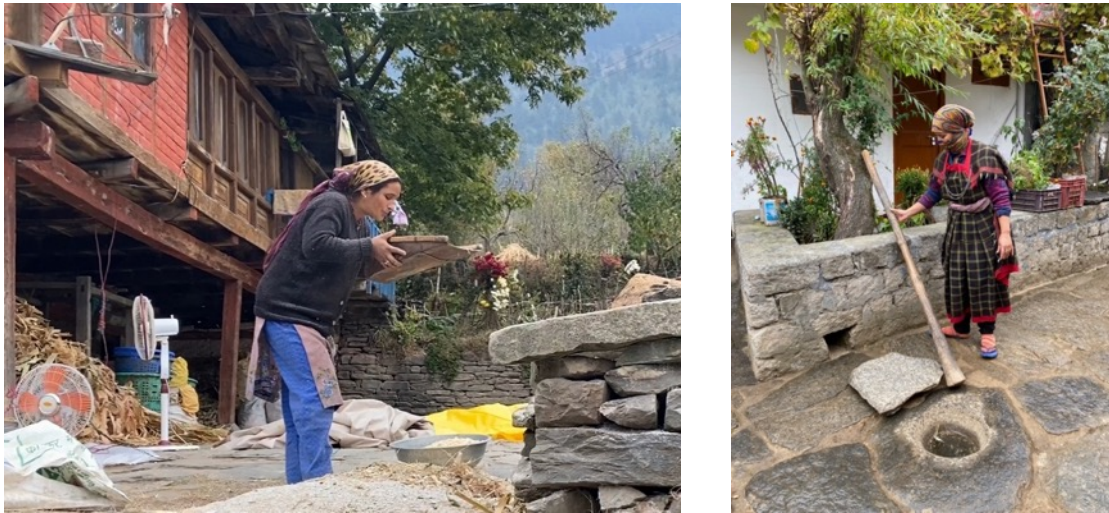


Fig. 12: a. Winnowing of the crop in the *Kholi* b. *Usal* embedded in the floor of the *kholi*

Source: author

The use of the space is optimal for post-harvest related activities of the household. Threshing of various crops; drying of grains, fruits and vegetables; and pounding of seeds for extraction of oils using the *ukhal* that is an integral part of every courtyard. The courtyard also serves as space for feeding the cattle or milking the cows.



Fig. 13: Prepping of maize in the *kholi* for the incoming winter season

Source: author

The courtyard is where the kids play during the sunny days, especially in the winter months. The women of the house sit and spool wool or use the looms, generally situated on the overhanging verandah in the upper levels, however overlooking the courtyards. Traditional *pattus* and other fabrics are made either for personal use or commercial purposes. Firewood is collected and neatly stacked under the roofs of overhands in the courtyards.

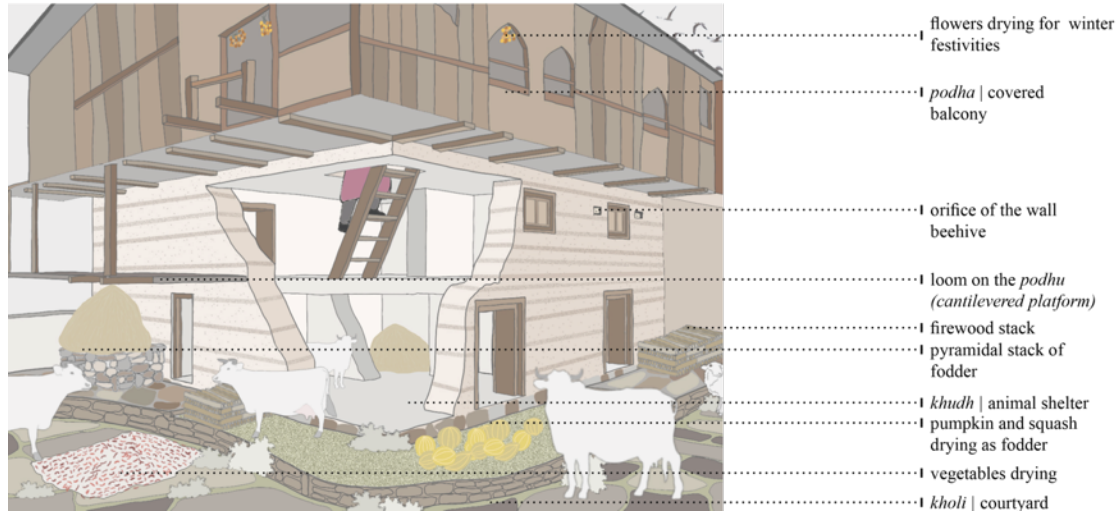


Fig. 14: Graphic of the house showing the activity in and around the house

Source: author

Plinth and its surrounding areas

Accessed through the courtyard the house's base is a stone masonry foundation with a stone plinth raised a couple of feet from the ground, sheltered by the overhangs of the roof and upper-level balcony. The extended plinth around the house acts as an elevated stone platform that works as a shelter for the produce and household items against water and snow. When it is difficult to access the forest areas due to the snow during winters, this space is used to stock the firewood for daily consumption⁷. The area doubles up as a storage place for dried grass, straw and leaves as fodder for the animals. Some of the houses have an elevated wooden shelf along its outer edge where the remains of the maize and barley crop or grasses s fodder and firewood would be stored. The arrangement and stacking of the grass and wood strategically to ensure the pile's stability⁸.

⁷ Firewood collection starts every summer, sourced from trimmings of trees, fallen trees and branches during a heavy downpour or storm and is stored in the designated spaces over time.

⁸ Using the principle of equitable weight distribution, the bundles/ *pulah* of grass is stacked with a circular base, which tapers towards the top. The bundles form a circular pyramid.



Fig. 15: Variation in firewood stacking in and around the house
Source: author



Fig. 16: Fodder stacking on the ground and the first level of the house
Source: author

***Khudh* | Animal's living space**

The house's ground floor is generally earth-bermed against the land's contours and provides significantly less light and ventilation. These spaces become ideal for keeping the cattle and sheep of the family. Through the day the livestock is out grazing. During the winters, cows move into the courtyard in the day and *khudh* through the night. The stone walls and floors of the *khudh* are left exposed. In the winter months, the dung is stacked or lined on the floor and is used as manure in the fields.



Fig. 17: Entrance to the khud from the *kholi*
Source: author



Fig. 18: Unfinished walls of the *khudh*
Source: author

***Bihi* | Room on the first floor**

Traditionally the low heightened floor over the ground was a space for animals and fodder storage. The past couple of decades has seen a steady decline in livestock owned by a family. Devoid of openings, the dark space is now a habitable space that subdivides using walls to make it a more livable space.



Fig. 19: Low height space within the *bihi*
Source: author

The newer houses are devoid of the mezzanine level, and the living spaces are directly above the ground floor. The balconies around the room on the first floor create a semi-open verandah on the ground floor. The space's use is to store fodder, firewood and dry vegetables, fruits and spices, and other farming tools and items.



Fig. 20: Drying and storage of vegetables, spices and firewood in the verandah
Source: author

Podhu | Cantilevered platform

The *podhu* is a cantilevered wooden platform on the first level for the house's looms (*khadhi*). The platform traditionally is also a place to soak in the sun (*dhup sekhne ke liye*). Currently, the use of the platform is for fodder storage.



Fig. 21: Variants of the *podhu* in the region
Source: author

Andhar | Living room | winter kitchen

The upper floors are spaces used both as a living or the kitchen. The room has an open stone hearth in the centre. *Andhar* like other spaces of the houses doubles up as living space to entertain with the kitchen stove keeping the space and its users warm, especially in the winter months. *Andhar* has an open plan with niches (*teeri*) in the wall for storage of smaller utensils.

Some of the houses have another room used adjacent to the *andhar* for sleeping and or storage. This space stores item of daily use like firewood, dried grains, flowers and vegetables. Big individual wooden boxes/ *sandook*⁹ store the different grains and clothes. The hearth is burning through the winters' day, ideal for slow cooking the food and providing warmth from the bone-chilling temperatures. The heat of hearth activates the bacteria in a mixture of buttermilk and whole wheat flour to ferment and prep the starter for a traditional dish called the *siddu*. Replacing the traditional stone hearth, with the Himalayan stove with a piped chimney, helps the smoke find its way out directly rather than moving around the room.



Fig. 22: Wooden grain storage: *sandook*

⁹ A number of *sandooks* are spaced through the house to store grains for daily consumption and emergencies. A house at least 10 *sandhooks* traditionally. Now a days the *sandooks* are used to store clothes.

Source: author

In the corner of the room embedded under the mud render on the floor (*droog*), is storage constructed with wooden planks with its insides plastered in a mud-based render that runs to the lower floor level, covered in wooden planks, the *droog* store's *dhaan* or red rice. Access to the storage is through steps carved in a wooden log. For the other grains, the use of hollowed-out logs of wood with a cover (*dedhori*) and wooden *sandook* is extensive. The *sandook* is made with timber of high oil content with a lesser probability of an insect attack; wood helps the grain last longer. Extensive use of earthenware and metalware for measuring and storage of oil and *ghee*. People store the pickle in earthen pots to ensure longer shelf life. Sewn bags of sheep and goat skin (*koonth*) store the ground flour and transport the grains to the *gharat* for grinding.

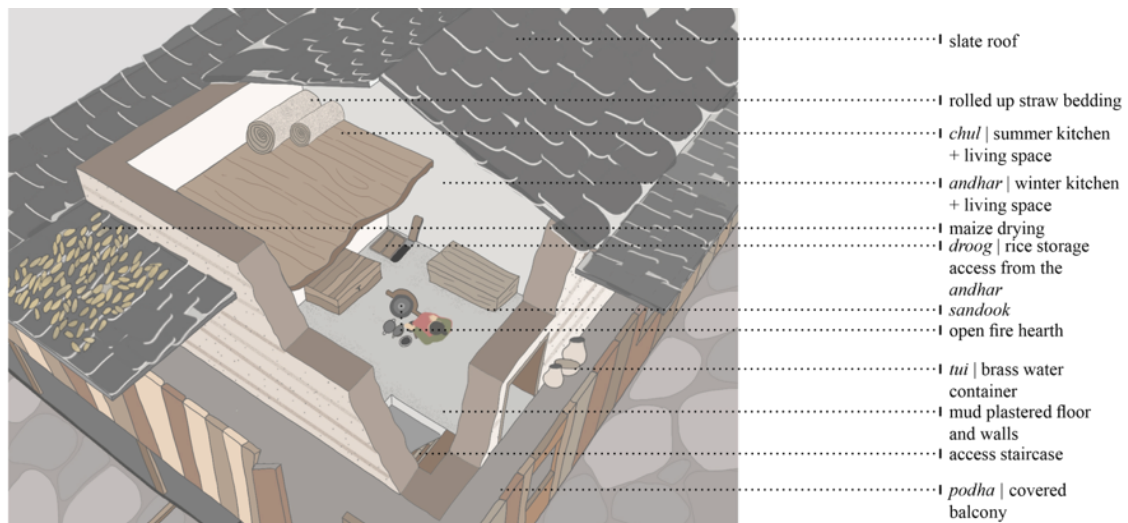


Fig. 23: Graphic of the *andhar*
Source: author

Podha | Semi-open balcony

With intricately carved wooden panels and columned balcony, the *podha* encircles the living level partially or wholly. It is covered in the front portion of the house and closed in the back area. The *podha* is a place designed as an extension of the interior spaces. Flowers are dried on hooks alongside the balcony¹⁰. People bask in the winter sun on the *podha* while cleaning the grains. The wooden floor provided a space for the *tui* (brass pots holding water) as it was a non-plastered surface that would not get messy with water spills. The hooks on the *podha* is a space to hang the *kilta* filled with lamb meat to air dry during the onset of the winter¹¹.

¹⁰ Flowers are an important part of the religious and ceremonial practices in the region. In the winters fresh flowers are scarce, thus dried flowers partake in the festivities.

¹¹ The meat is tied along the walls of the *kilta* and the top is covered with a *pattu* or cloth. The holes in *kilta* allow for the air to pass through and dry the meat to preserved for the winter. On an average a family of four would dry meat in two *kiltas* for the winter. The dried meat is an essential source of protein in the winter months.



Fig. 24: A view of the *podha*
Source: author

Chul | Summer kitchen and living space

The attic space in between the roof and the *andhar* floor is used as the kitchen and an area to sleep in during the summer months as the temperatures are lower than the rest of the house. The winter months it seconds as a storage space. The attic reduces the *andhar's* volume, thus helping maintain the temperatures during the winter months. The flat slate tiles and the roof profile serve the purpose of protecting the house against rain and snow and a surface to dry maize, fruits and vegetables for the winter.

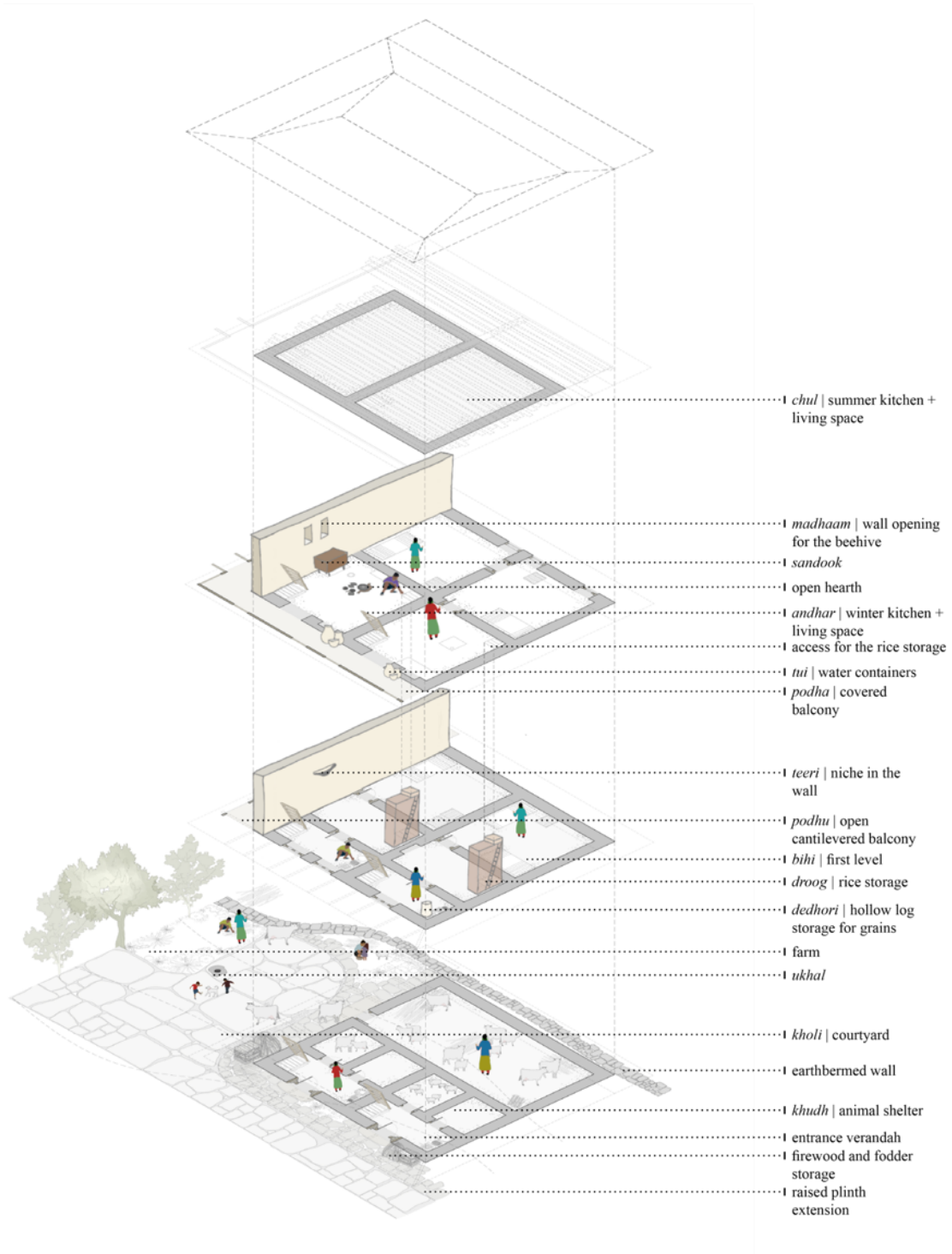


Fig. 25: Floor plans of a typical house in Gaushal, Himachal Pradesh
Source: author

Table 1 Dimensions of storage spaces within the house

	Content	Architectural space for storage production	Dimensions of the storage	The volume of the storage	Notes
	Food storage				
A	Dhaan Red rice	Wooden chamber storage: Structurally integrated within the floor systems, storing rice in a wooden chamber that's runs the total length of a storey	7' x 2' x 4' (l x b x h)	56 cu feet = 1585 kg 15.85 Quintal	Storage is enough for at least 3 years of supply of grains. Locally grown red rice has a shelf life of a couple of years. A mud-based render on the wooden box with a mud-based rendered deters the entry of rodents and pest.
B	Kodra Finger Millet	Sandhook – a wooden boxes raised on pegs and moveable.	6' x 1'6" x 1'6"	13.5 cu feet = 380 kg 3.8 Quintal	Stored for an extended period, as the grains do not spoil easily
C	Rajma kidney beans pulses	A mud-plastered hollowed trunk of the tree with a lid	2' dia x 2'-6" ht	7.85 cu feet = 222 kg = 2.2 Quintal	The trunk is plastered with a mud-based mud from the outside and inside to deter rodents and pests' entry.
D	Makki maize	Sandhook – a moveable wooden boxes on pegs.			Maize is stored for a limited duration only, as the grain does not last long.
E	Ghehun Wheat	Sandhook – a moveable wooden boxes on pegs.			
G	Honey production	Niches built in the walls of the house-made up of slate or wood. Bees were reared in the niches to produce honey for the house.	1' x 1' x 2'	10 kgs per year	Average 2 niches per house
H	Firewood	Space under the <i>podha</i> or <i>podhu</i> of the house an extended shelf on the ground floor of the house	5' x 6' x 12'	360 cu feet 10200 kg	Storage for: 145 days
	Animal Fodder				
I	Fodder for cows	Space under the <i>podha</i> or <i>podhu</i> of the house an extended shelf on the ground floor of the house	6' x 7' x 6'	252 cu feet = 7000 kg	
J	Fodder for sheep and goats	Space under the <i>podha</i> or <i>podhu</i> of the house an extended shelf on the ground floor of the house	12' x 7' x 6'	504 cu feet = 14000 kg	

The information is based on anecdotes of different household usage in the village of Gaushal, Kullu district. For centuries, as a response to the natural context, the locals in the region shaped the built and their households. It has been a key to their successful habitation over the years. The last few decades have witnessed the newer generation adopting, rather hastily, various contemporary elements, which one refers to as development. However, the traditional wisdom and methodologies, that have stood the test of times govern the thought process, if not the physical manifestation. Some of the locals have found the middle ground to develop a balance between contemporary and the traditional; however, only time would showcase its effects.

In a larger perspective, climate and the natural context are slowly changing over time. Thus, even in the 21st century, during the winter season, when the snow cuts the village off from the rest of the land, outside movement is restricted, days go by cooking, sleeping, or prepping the yarn. Hearths or the Himalayan stoves run through the day in all kinds of houses. People in the region prefer adhering to specific traditions and customs concerning the diet and their environment. It is then, when the wisdom of the built, the knowledge of the practice of winter prepping and stocking, becomes an essential aspect of the lifestyle and livelihood.

The increase in the availability of resources, both foreign and native, throughout the year and improvements in road accessibility to various markets led to the sharp decline in stocking practice for the winter. Despite the decline in number and kind of practices, a few of these practices have found their way to the 21st century. The altered fabric built in the 21st century reflects the accommodation of age-old wisdom of stocking in its spatial organization.



Fig. 26: Provisions of firewood storage in a 21st-century house
Source: author

Glossary

Andhar – winter kitchen and living space

Bihi – low height room on the first level

Chul – summer kitchen and living space

Dedhori – a hollow wooden log covered in mud plaster used for storage of pulses

Dhaan – a locally grown variant of red rice

Gharat – a flour grinding mill that is powered by channelized water

Kholi – courtyard

Kilta – a hand-woven bamboo basket traditionally used to carry the produce, grass, fallen leaves and firewood from one place to another. In recent times it has been replaced by a basket made of plastic.

Khudh – space on the ground for the animals

Maraam – an opening in the wall for rearing bees

Matka – an earthen pot

Pattu – a woven woollen fabric used as body covering by women in the region

Podha – a covered wooden balcony

Podhu – a cantilevered platform on the first level

pulah – a bundle of dried grass/ leaves.

Sandook – a wooden box for grain storage

Siddu – a traditionally fermented steam-cooked oval or disc-shaped dish using whole wheat flour stuffed with a spicy paste of opium seeds, walnuts etc.

Silbatta – a handheld mortar and pestle

Teeri – a niche in the wall used for small utensils

Tui – brass water container

Ukhal and Musal – mortar and pestle

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