

Change of Shape, Size and Form Related to Traditional and New Materials in Atoni Buildings in Central Timor

A Comparison of the Region Near Nikiniki, Soe and Kefamenanu

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Abstract – This article is the second part of the analysis of the author's field research, which was conducted in Timor in May 2004 in Maubesi, and in June 2011 near Soe and Nikiniki and Kefamenanu. The paper focuses on the region of Central Timor, settled by the Atoni Meto people, who live in round houses built on the ground. The house form and materials utilised differ somewhat in the higher regions of Central Timor and the lower-lying Eastern parts of Central Timor. The aim of this article is to explore how such building materials are utilised and whether they are or can be integrated into local vernacular building traditions. New materials are often used to imitate the more traditional ones, often incorporating structural details from the older technology and traditional materials which are copied. In other cases, new materials lead to a change in the appearance and structure of vernacular buildings. New materials already influencing the building due to their different, new properties, and designs are devised to adapt to these changes, which in the end result in an altered building. It appears that the highland regions of Central Timor near Soe and Nikiniki use a more conservative house design while in the region around Kefamenanu modern materials are more present in vernacular architecture. The use of concrete and corrugated iron to build lopos (traditional granaries and community buildings) is striking and has produced a new version of the traditional lopo.

Keywords: Atoni, organic building materials, Timor, vernacular architecture.

I. INTRODUCTION

This article deals with the detailed analysis of the author's field research conducted in 2004 (See in Zámolyi, 2004) and 2011 in central Timor. The author has published a part of that research in 2021 (Zámolyi, 2021). This text can be considered the second part of that paper. Zámolyi (2021) detailed the introduction to the topic given and an overview of traditional and modern materials used in Indonesian vernacular architecture in general and in Timor among the Atoni in particular. The introduction to the topic and the research methodology which was used are essentially the same in both papers. Hence, only

a summary of both will be presented in this text; please refer to Zámolyi (2021) for more detailed information.

The Atoni Meto live in West Timor and Central Timor, which was historically divided into ten princedoms (Amarasi, Fatu Leu, Amfoan, Mollo, Amanuban, Amanatun, Miomafo, Insana, Beboki, and Kupang, see Cunningham (1967)). Today, within the Indonesian state, West Timor consists of four administrative units called “*kabupaten*”: Kupang, Timor Tengah Selatan (TTS, South Central Timor), Timor Tengah Utara (TTU, North Central Timor), and Belu. The former princedoms have integrated into the *Kabupaten* as smaller districts. Traditional structures do still exist (also the families of former *rajas*), but their importance is, of course, weaker than they used to be.

The author's field of study is focused on the areas near the towns of Soe and Nikiniki, which are situated relatively far from the coast, at a somewhat higher altitude (about 800m above sea level) (see Fig. 1). The area around Kefamenanu, which is more to the Northeast, is situated at a slightly lower altitude (about 400m) but still in a region dominated by hills and small mountains.

Timor has a monsoonal climate, which combines a strong and short wet season with a long dry period. In the wet season, heavy rains are usual, which can cause floods and soil erosion. The wet season lasts from December to April, the dry season from May to November (McWilliam, 2002: p. 25). The author carried out field research in the region in May 2004 and June 2011. This corresponded with the dry season.

There have not been extremely many studies in the field of architectural research about the Atoni. Probably the best known was written by Cunningham (Cunningham 1964), who worked in the Princedom of Amarasi. Then for a long time, not much was published. Domenig (2008) explored an essay on whether the four-post structure within dwelling houses of the Atoni highlands originates from the *lopo* (granary), and thus whether the dwelling house could be a converted granary. Even though his analysis is exact, he cannot reach a definitive conclusion on the subject. The question is relevant, as on many nearby islands (e.g., Sumbawa, see Hitchcock (1983) and in some places on Timor), the conversion of granaries into dwelling houses is an established fact. Recent studies are the one of Müller (Müller, 2013), whose research was conducted in roughly the same region as the author. Another study deals with houses in Kaenbaun village (domain of Miomafo, Northeast of Kefamenanu), with plans and analysis of the use of interior space (Kurniawan et al., 2013). In 2020 and 2021, studies were published about the settlements of Tamkessi (Lake, 2021) and Maslete (Sitindjak et al., 2020), where the author did field research.

The houses of the Atoni Meto near Nikiniki and Soe have round, domical roofs, no walls, and are built directly on the ground. On the contrary, houses around Kefamenanu are round but have a conical roof, a short roof ridge, and walls. Additionally, the Atoni built a granary and community building called *lopo*, with four large pillars and a round roof. The exact shape of the roof depends on the area where the *lopo* is found. In fact, like the houses, the roofs of *lopos* near Soe and Nikiniki are domical, whereas near Kefamenanu, they are conical.

Almost all Atoni buildings in Central Timor are round. Zámolyi (2017) stated that Atoni buildings in Central Timor have a peculiar structural solution within their roofs: a strong ring made of lianas holds together the rafters, which are lashed to it. Three such rings are used in one roof: one at the bottom of the roof, one in the middle and one near the top.

Different roof designs in the compared regions use different structural elements (sticks or wooden poles of different sizes). The use of new materials like concrete and corrugated iron brings more geometrical design, and organic forms are given up.

While highland and lowland *lopos* can be almost similar in size, houses tend to be extensive in the lowlands. Note: while in *lopos* near Kefamenanu, many modern materials are used (concrete, corrugated iron), the houses in the same region always keep their roof made of organic thatch and concrete is used sparingly. Size differences among *lopos* and vernacular houses in the lowlands can be considerable (there are pretty small buildings and quite large buildings of the same type). In the highlands, only size variations occur among *lopos*; vernacular dwelling houses are all of the very similar sizes and can be considered relatively small.

The study aimed to provide an overview about structural solutions used among atoni buildings and find answers to the question of how the use of new materials transforms existing vernacular building forms.

II. METHODOLOGY

The research was conducted as a part of a more extensive survey within Indonesia made by the author during the years (Sulawesi, Alor, Adonara, Lembata, Sumbawa have been places of field research among others, for results of these see also Doubrava & Zámolyi, 2007; Zámolyi, 2013). The subject of study were structural aspects of vernacular architecture and elements of the building process. In Timor, several villages were visited, and most houses were photographed (outside, inside, details) to provide a large base of images for later comparison. A few buildings were selected for the architectural survey, which was done by tape measure and handheld densitometer and sketches drawing on the spot. The selection was made on the site after visiting a specific village. The criteria for selection were either a building being very typical or very unique or unusual to document unconventional details and structural solutions. Hybrid types of building mixing more traditional and more modern materials and designs were specially investigated.

Fieldwork was conducted in May 2004 in Maubesi, and in June 2011 near Soe and Nikiniki (villages None, Supul and Boti) and Kefamenanu (among others the villages of Fafenesu, Maslete, and Tamkessi). Overall time spent in the area was in 2004 four days, in 2011 approximately ten days.

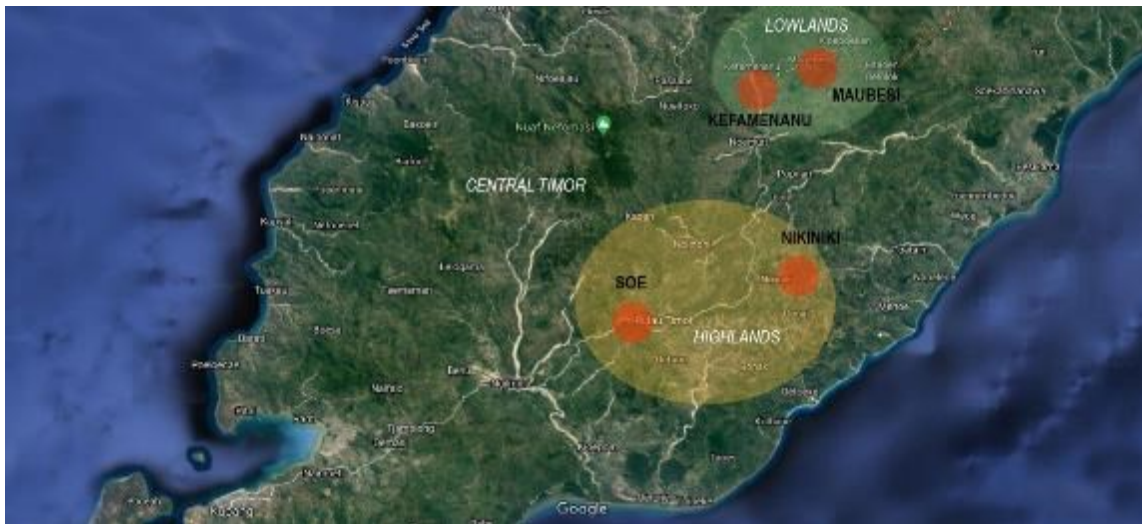


Fig. 1. Map of Central Timor with main Fieldwork areas, and also the higher areas ("highlands") and the comparably lower areas ("lowland") marked
Source: Zámolyi (2021: p.98)

Additionally, interviews about the building process, name, and function of building parts, decoration of the building, and rituals were performed during the building being done. Although quite a lot of information was obtained with the help of the interviews, the statements could not always be fully counter-checked or set in a broader context. This is because the time spent with the villagers was always short, and sometimes the translation of the guide was slow or vague. Only an absolute minimum of the interview-data is used in this article, and most structural aspects are discussed, which could be documented directly at the built object. Please refer to the first part of this text in Zámolyi (2021) for further information on field research methodology.

III. THE ATONI BUILDINGS – FIELD RESEARCH RESULTS RESULTS AND ANALYSIS

This text will focus on structural differences between structures near Soe, Nikiniki, and Kefamenanu. An attempt will be made to explain these differences by examining the materials used.

A. Dwelling Houses and Lopo Buildings

The dome-like huts near Soe and Nikiniki are usually 4 m in diameter, rarely more significant: this seems to be the size limit imposed by their structure (see Fig. 2). The dome is also small enough to be heated up conveniently at night (and additionally, spherical space can be heated most economically of all geometric bodies, as it has the smallest surface-to-volume ratio). However, it must be said that the smoke tends to be caught indoors, which is certainly not healthy (see Fig. 3). It keeps vermin away, and

the soot preserves the wood and the thatch. The size of the *lopos* is often larger. In their case, the builders have found different structural solutions as in the case of the houses (see Fig. 4).



Fig. 2. Atoni Round House in Boti Village, Central Timor in 2011. The house is comparably small, is built directly on the ground, and has no walls. Its structure is made up of rafters planted into the earth and bent to the shape of the domical roof. Inside there are four posts that support an attic.

Source: Author (2022)



Fig. 3. The attic holds the harvest and is usually blackened by soot and the fireplace's smoke. Inside of an Atoni roundhouse near Nikiniki, Central Timor, 2011

Source: Author (2022)



Fig. 4. Inside of an Atoni roundhouse near Nikiniki, Central Timor, 2011. There are four posts which support an attic
Source: Author (2022)

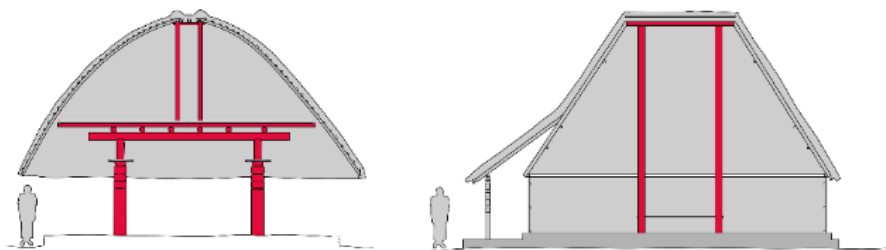


Fig. 5. The schematic drawing shows the four-post Lopo-structure (left) and the house structure with only two middle posts (right)—houses surveyed in Maubesi, eastwards of Kefamenanu.
Source: Author (2022)

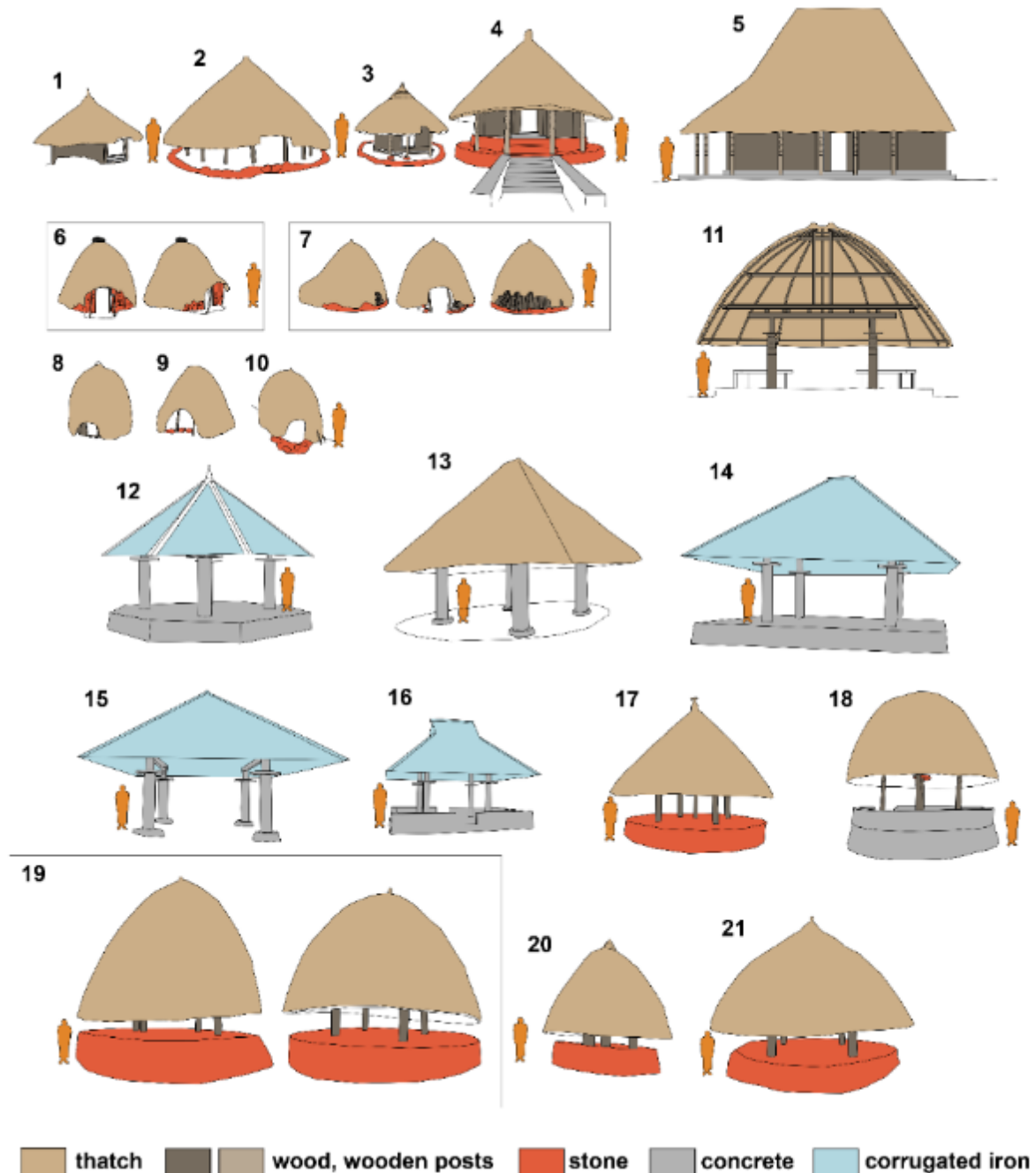


Fig. 6. Comparison of Forms, approximate sizes, and Materials used in vernacular Atoni architecture. The drawings are approximately scaled to a similar size to show variations, which at least near Kefamenanu can be considerable. While highland and lowland *lopos* can be almost identical in size, houses tend to be more prominent in the lowlands. Note: while in *Lopos* near Kefamenanu, many modern materials are used (concrete, corrugated iron), the houses in the same region always keep their roof made of organic thatch and concrete is used sparingly.

Houses in the region of Kefamenanu: 1-Tamkesi, 2-Maslete, 3-Fafenesu, 4-Along the road eastwards of Kefamenanu, 5-Maubesi. **Houses in the highlands near Soe and Nikiniki:** 6-Soe, 7-Boti, 8-Kampung Supul near Nikiniki, 9-Nikiniki, 10- Kampung Supul near Nikiniki.

Lopos in the Region of Kefamenanu: 11-Maubesi, 12-Bijeli, 13-16- Along the road eastwards of Kefamenanu.

Lopos in the highlands near Soe and Nikiniki 17-Boti, 18-Near Nikiniki, 19- Kampung Supul near Nikiniki, 20-21 None village near Soe

Source: Author (2022)

For the houses, small-diameter sticks are used to build up a roof frame, the upper part of which is bent, as the sticks taper, and their thin ends can be easily shaped into a round form (see Fig. 5).

Furthermore, when working with such small-diameter parts, it is a static and structural necessity to form a dome-like roof: the vertical rafters are the same diameter as the horizontal battens. Thus, a basket-like structure is created, held in shape by the three stronger ring-cables of lianas. However, as the roof is cupola-formed, it functions like a membrane, in which pressure forces build up in all directions. Such a structure can be comparatively thin (the sticks have relatively small diameters), as loads are distributed evenly, and only pressure forces occur (see Fig. 6). The weakest point of such a structure is the apex, which is supported by a single pole in most cases.

In the case of the *lopos*, a different approach is used to achieve a very similar but overall larger form. Stronger sticks are used for the rafters in the lower part of the dome, where the curvature is only slight. At the top end, where the curvature is very pronounced, sticks of much smaller diameter are lashed to each of them to create the desired domical roof shape. Thus, to enlarge the domical structure while at the same time keeping its shape, an architectural-structural "trick" has to be used. As the system is used for smaller-diameter huts, a particular measure does not work for the larger *lopo* roofs.

In contrast, the houses near Kefamenanu use large-diameter rafters, at least double or triple the size (in cross-section) of the small sticks used in the highlands. They cannot be laid upon each other at one central point and thus need a more significant substructure to support them: the short roof ridge. It is technically very inconvenient to have a roof ridge supported by only one pile. Two piles are supporting the roof (although there are examples from other places in the world where a short roof ridge in a round building is supported by one central pile only¹). Since the rafters are relatively strong, they cannot be bent like weak sticks – the roof has to be conical but can have larger spans than the domed roof. Although small houses can also be found near Kefamenanu, the general trend is toward larger buildings. The houses can reach diameters of up to around 8 m, approximately double the size of houses near Soe and Nikiniki. There is no indication of houses without walls – it seems that the houses in the area around Kefamenanu have always had walls. At least, they had them at some point for a very long time since no buildings (even poorer or low-prestige buildings) have been found so far without walls and with a conical roof. Of course, a wall-less house with a roof of straight rafters (taking the roof pitch of the existing houses as the basis for this consideration) would be somewhat inconvenient. Whereas in the case of the houses near Soe and Nikiniki, the lower parts of the domical roof are almost vertical. Thus, the space below them can be used very easily. The space below a roof with straight rafters would have a very narrow triangle at the periphery, which would be very inconvenient in terms of usable space. This, of course, does not mean that a wall-less version of the Atoni house with a conical roof could not have existed. The Fiji islands are known to have rectangular houses without walls, which seem to have had a similar pitch. Although a significant geographical distance separates these two examples, they show the structural possibilities. On the very exposed shores of the Fiji Islands (hurricanes comparably often hit them), this type of house was considered storm-proof. The absence of walls was contributing to the greater strength of the structure (as the form is more aerodynamic). It is low and exposes less surface to the winds, see Zámolyi 2015. However, the central Timor area seems not to be highly exposed to winds. Thus, it is reasonable to assume that walls have existed there for a long time already. Especially, a porch or veranda area with an extra row of pillars is usually added in front of the houses, which is substantially connected to existing walls.

¹ See e.g. The “Rausina” building type of Western Viti Levu, Fiji Islands (see Zámolyi 2004 and 2015).



Fig. 7. New Lopo Made in a Traditional Design in Nikiniki, 2011.
Source: Author (2022)

Thus, we can see that choosing a specific material can alter a design in several crucial points, although, in essence, it is the same building type. The two different materials were chosen to make the building better adapted to local conditions (Soe and Nikiniki = smaller houses that are more efficient to heat, Kefamenanu = large and spacious ones). The choice of material could have been influenced by the availability of resources or by unclear multicultural reasons. It is worth mentioning that small, dome-like huts can resist strong winds better than large buildings. Still, then again, modern rectangular wooden houses (with comparatively small diameter timber frames) are built near Soe and Nikiniki and Kefamenanu, and it does not seem to cause problems. Thus, the reasons why a specific roof shape is chosen are not easy to determine, but the limits imposed by the materials used are certainly a factor.



Fig. 8. Old *Lopo* (Atoni Community House and Granary) With Domical Roof Near Nikiniki, Central Timor, 2011.
Source: Author (2022)

Of course, if the goal is to build large dome-shaped roofs, this is also technically possible – however, more effort and input in terms of work and technology are required. We have seen that this approach has been followed in the case of some of the larger highland *lopos*. The round roof is created of large and small diameter rafters lashed together at the appropriate places. Furthermore, it is also technically possible to create extensive domed roofs using simple tools and similar technology, mainly lashings. This is demonstrated by the Fale-Tele, the large meeting house of the Polynesian Samoa Islands (see Lehner et al., 2007: p.126). It seems that the highland Atoni did not need such large representative buildings, as the *lopo* is the largest building with public (assembly) functions. It is interesting to note that, near Kefamenanu, dwelling houses incorporate prestigious architectural elements such as carved doors, carved porch piles, statues of birds on top of their ridges, or the whole house is built on an elevated platform. Near Soe and Nikiniki, the houses have none of these elements. Nor is any other measure taken to lend these houses any additional prestige. On the other hand, in both areas, the *lopos* (as community house and granary) are adorned with carved pillars, carved or painted beams or diamond-shaped decorations made out of folded palm leaves attached to the inner, lower part of the *lopo* roof. *Lopos* are also often placed on stone or concrete platforms. The only attempted use of new material for houses near Soe and Nikiniki is introducing a wall area made of stone and some measures taken to protect the apex of the roof (see Fig. 7).



Fig. 9. Sometimes People Experiment With Building Walls. However, the technology seems alien to them, as this poorly built and crumbling stone wall shows. The apex of the roof is strengthened by a rubber car tyre against rain, wind, and storm. Atoni round house near Oinlasi, Central Timor, 2011.
Source: Author (2022)

In some areas near Nikiniki, seldom, but still, attempts are made to erect house walls out of stones (see Fig. 9). Generally, such walls are low (not over 1m in height) and poorly built, as the stones often come loose. It is a recent concept, as only very few houses have such walls, and the quality of the masonry is poor, with unworked, irregular stones stacked quite haphazardly in mortar. Frequently, stones drop out, or the walls develop large cracks. This shows that people are not yet familiar with this building technology. In all other respects, the structure of the building remains the same.

Another instance of new materials used is the protection of the apex of the roof by tin cans, plastic buckets, or car wheels. This measure aims to strengthen the most vulnerable part of the roof, keep rainwater away, and lessen the impact of wind or storm.

Both the stone walls and the strengthening of the roof apex are not measures that try to enhance the prestige of the building but rather aim – at least in the case of the roof – to physically strengthen a weak point. The introduction of stone walls could be for a similar reason, as the thatch in the lowest sections of the roof is quickest to rot, and rain splashing off the ground can damage it. Solutions for such areas which have rotted away are replaced by flattened bamboo, boards, or a row of sticks squeezed between the rafters, and the laths have often been observed. Thus we can say that near Soe and Nikiniki, ordinary dwelling houses seem not to be adorned in any way. No prestigious architectural elements are used. Only the *lopo*, the granary, and the community building have decorated, carved, or otherwise

particular features. It is interesting to note that all modern, new, or unusual materials are made to conserve or strengthen the roof thatch. Even more interesting is that walls or elements with wall-like features are introduced almost automatically to strengthen the roof's lowermost part.

B. The Lopo Roof

Near Kefamenanu, there is a *lopo* in front of almost every house. In the highlands around Soe and Nikiniki they are much rarer – only a few per settlement, although they are usually decorated, and their roofs are larger than those of the houses. Also, they are typically placed on a small stone platform and in a more elevated position than the dwelling house itself. They are used not only as granaries: the open space below the roof is used as a workspace, for gatherings and for feasts (see Fig. 10).



Fig. 10. An Atoni *Lopo* (Community Building and Granary) Under Construction Near Tamkessi Village, Central Timor, 2011

Source: Author (2022)

After its roof, the second most interesting feature of the *lopo* is its load-bearing inner structure: four monumental pillars carrying two large beams connected by several secondary beams. Directly on top of these beams is a floor made of boards, sticks, flattened bamboo, or twigs laid onto closely-spaced smaller tertiary beams. In the Soe and Nikiniki area *lopos*, a single post supporting the apex roof is placed on top of the floor. In the Kefamenanu area *lopos*, two posts support a short roof ridge, and the base of these posts is housed in a smaller piece of wood which distributes the loads and stops the post from piercing the floor structure.

Interestingly, it seems that in the highlands near Soe and Nikiniki, this four-pile inner structure of the *lopo* was adapted and placed within the dwelling houses, only in a much smaller format. Near Kefamenanu, this did not happen frequently. Both solutions can be seen here: houses with a roof ridge supported only by two large piles. They are dug into the ground or, in a modern variation, held in place by concrete fundaments and houses with a four-pile frame with an attic floor on top and two smaller posts on this floor to support the roof ridge. The piles of the *lopo*-like attic within such houses have no rat guards, as the cooking fire drives all vermin away.

By contrast, the houses in the highlands near Soe and Nikiniki all have a four-pile inner structure. For this region, only one historical record (Müller, 1857: p.239) mentions the existence of buildings with a single central pole. The author saw no such buildings during his field research, so if they still exist at all, they must be rare.

The *lopo*'s central support post usually has one or two sets of crosswise-arranged pairs of horizontal beams, which help shape and stiffen the dome. Four beams (2 on each side; 2 at 90° to the

first pair) run from one end roof to the other. In some *lopos* there are even two such crosses at different heights. The size of the *lopo* roof makes this measure necessary.

Fascinatingly, in the lowlands, the number of roundhouses that have a four-pile inner structure is considerably lower than in the highlands. In the sample of houses visited by the author, there were definitively more dwelling houses without the four-pile structure.

C. Modernization – The Lowland Atoni Lopo Developed

It appears that the modernization rate is higher in the lowlands near Kefamenanu than in the highlands around Soe and Nikiniki. It is unclear whether this is due to attitude, money, differences in infrastructure, or material availability. Further research on the subject would be necessary. As mentioned, modern houses made of concrete and bricks with corrugated iron roofs can be seen throughout the Atoni area (see Fig 11). In the highlands near Soe and Nikiniki, modern houses are often built in front of the original vernacular building. However, the situation is different in the area near Kefamenanu: far fewer traditional roundhouses are left, and the modern buildings often fully replace them. Where there are still old roundhouses (see Fig. 8), the tendency is to build the contemporary version alongside the vernacular buildings (although this would need to be verified on a larger sample of buildings, which would have gone beyond the scope of this field research), both equally visible from the street. The *lopo* is usually placed in front of these buildings and this is the most easily visible from afar.



Fig. 11. There is an Atoni *lopo* covered in corrugated iron sheets in Fafenesu village near Kefamenanu, Central Timor. Usually, all *lopos* are built spherical, but because it is easier to apply corrugated iron sheets to a more simple form, the roof has been re-designed to have a pyramidal (conical) form based on a polygonal ground plan.

2011,

Source: Author (2022)



Fig. 12. An Old Atoni *Lopo* (See Carved Wooden Piles) Newly Covered in Corrugated Iron Sheets in Fafenesu Village Near Kefamenanu, Central Timor, 2011.
Source: Author (2022)



Fig. 13. An Atoni *lopo* was made with modern materials: The roof is made with corrugated iron sheets, the posts and main beams were cast in concrete. Bijeli village near Kefamenanu, Central Timor, 2011
Source: Author (2022)



Fig. 14. An Atoni *lopo* was made with modern materials: The roof is made with corrugated iron sheets, the posts and main beams were cast in concrete. Near Kefamenanu, Central Timor, 2011
Source: Author (2022)

The modernisation of house types is rare in the highlands, and in *lopos* it is incredibly conservative. The situation is entirely different in the lowlands near Kefamenanu, with modernized roundhouses and *lopo* types. The *lopos* seem to receive more attention or are subject to experimentation than the house type. While the roundhouses are almost always thatched and have wooden walls and structures, in this area, the *lopo* often has a corrugated iron roof and main pillars made of concrete (see Fig. 12). Usually, the extremely modern *lopos* are connected to modern houses built out of concrete and concrete masonry blocks and fitted with corrugated iron roofs. These houses are always rectangular and usually have a hipped roof (see Fig. 13).

Thus, although the wooden structure of the round house type has not been replaced, the four main pillars of the *lopo* are often built out of concrete (often even the rat guards are cast in concrete). In most cases, the beams and the roof structure are made of wood, the main beams being fastened with the protruding ends of the rebar irons to the concrete pillars. In one case, the author saw a house whose entire frame was made of concrete: the main posts and the two main beams and thus formed a pair of moment frames.

In essence, this modernisation process doesn't change much. The concrete pillars still have the same function and appearance as the wooden ones (see Fig. 14). They are dug into the earth (even if they now have a larger and broader anchoring with the help of an additional concrete foundation) and the main beams are flexibly fastened to them. The only case where the behaviour of the building could also change is the last example, where the main beams were also cast in concrete, as this produces heavy and more rigid frames than comparable wooden frames or concrete pillar-wooden beam frames. The concrete beams setup is very stable, but it could cause problems in case of earthquakes if not sufficiently reinforced with iron, or the concrete is of inferior quality. Otherwise, it is a formal imitation of a wooden structure but is also a good solution in concrete. There is only one significant change. The wooden piles of *lopos* are usually ornamented with carved motifs; concrete pillars are not, of course, because it would be too challenging to produce a decorated formwork.

Interestingly, no efforts were made to apply painted motifs as a substitute. Thus, while the structure remains the same, the *lopo* loses its decorative (and maybe also symbolic and prestigious) adornments and becomes plainer. However, it must be noted that not all wooden *lopos* are carved; there are also some with simple wooden piles. An interesting experiment attempting to produce peculiar posts was noticed in one case (Fig. 14), where the piles were cast with a formwork made of corrugated iron. The wavy surface of the corrugated iron produced a pattern somewhat reminiscent of the cannellures of classical Greek columns – an astonishing sight! Whether the measure was intended to be an act of decoration or corrugated iron is just easy to use as formwork, and the surface, a by-product, was not clear. Still, the technology seemed to deserve mention in any case.

The roof shape of the *lopo* is altered by the modern materials. The organic round form cannot be reproduced easily with iron sheets, thus the roofs are made in different shapes: a pyramid on a square or polygonal ground plan or a roof with a short roof ridge on a rectangular or polygonal ground plan. Of course, the short roof ridge is almost always present in the lowlands, but sometimes forms without a ridge are encountered as well. Wooden beams and rafters within the roof are not naturally round

anymore, and nowadays, readily-available timber with square or rectangular cross-sections is used. Nowadays, connections are nailed rather than lashed.

It is much easier to create a hipped/pyramidal roof on a square ground plan than on a polygonal ground plan – thus there is a strong tendency to rationalize the square. The modern, industrial material dictates a simple, solid, and angular form. The ideas sprang up not only in the minds of Indonesian people recently but also in European minds a hundred or so years ago when confronted with the properties of such new materials. Without a doubt, in this particular case, the material dictates the form, and the new form is more straightforward than the old – the built environment is transformed – though whether for better or for worse is, of course, not for us to decide.

D. Lowland Atoni House – Conservative Modernization

The Atoni roundhouse of the lowlands has changed, too (see Fig. 15). Although usually still thatched with organic material, walls are typically made of wooden boards nailed together to form panels. These panels are then inserted between the wall piles. Thus, here too, a polygonal ground plan is formed. Sometimes square laths are used for the rafters, but it is still more usual to have round rafters. Often, the foundations of the piles are strengthened with concrete, and the house is placed on a platform made of concrete, stone masonry, or concrete covered with ceramic tiles. These platforms often have several layers or steps, which emphasise the importance of the house, as it is placed on a heightened substructure of modern and prestigious material. Having a small veranda with decoratively carved piles at the front of the house is a ubiquitous element. Also, the door is often inscribed with unique motifs. However, modern materials were not used in the wall and roof zones, apart from the best wood for door boards and their frames. A corrugated iron roof never replaces the thatched roof. We can state that while the dwelling house in the Kefamenanu area is undoubtedly treated as a prestigious building in architectural terms, it is handled in a far more conservative way than the *lopo*. This finding is consistent with the attitude in the highlands around Soe and Nikiniki, where the *lopo* type seems to be grander (and also to have undergone somewhat more modernization) than the house. The highlands are much more conservative, and modern materials are hardly ever applied to the houses and only in a very restricted way to the *lopo*.



Fig. 15. Small Atoni roundhouse with walls and conical roof in Fafenesu village near Kefamenanu, Central Timor. The house has ritual significance but is not occupied. Its owners live in a house of modern design next door. 2011

Source: Author (2022)

IV. CONCLUSION

Although it is customary in Indonesia for one vernacular style to be connected to one people (ethnic group), this article has shown that the house design of the Atoni Meto varies somewhat according to the geographical location of the houses. While the main characteristics, like round ground plan, stay still (at least, in the area of the author's field study), other features like the presence or absence of a wall zone and the shape of the roof change. Whereas houses near the towns of Nikiniki and Soe are smaller, have a domical roof shape, and do not have walls, houses around Kefamenanu are usually somewhat more extensive, have a conical roof, and a distinct wall zone. Interaction between the dwelling house and a community building and granary called *lopo* could be detected in a way that many houses (especially around Nikiniki and Soe, to a lesser extent around Kefamenanu) incorporated a four-post structure typical for the *lopo* into their building design. This goes so far that some hints and hypotheses argue that the houses are converted *lopos*.

While modernization around Nikiniki and Soe has been more conservative, in the area around Kefamenanu, there has been more marked experimentation with new materials. Additionally, the role of the *lopo* is different in the area around Kefamenanu and the area around Soe and Nikiniki. Around Kefamenanu, many households possess *lopos* and place them near the road in plain sight. In contrast, in Nikiniki and Soe, there are fewer *lopos*, one per clan, and they are usually built in less visible locations. In the latter area, traditional vernacular houses are often hidden behind the new, modern house (*rumah sehat*) promoted by the government. Around Kefamenanu, traditional vernacular houses are usually placed beside the modern one and built onto a platform of concrete or stone to emphasize their prestige and importance.

Where applied, new materials such as concrete and corrugated iron change the layout of buildings, making their appearance and ground plan less organic and more regular. The use of modern materials with the above-mentioned effects can be observed primarily in the case of *lopos* in the area around Kefamenanu. It seems that often new solutions using new materials are sought and sometimes found. These unique solutions exhibit differences compared to the traditional layout and appearance. The process is ongoing and will probably yield new solutions in the future, probably for the dwelling house, which has remained very much unaltered. At this stage, it is difficult to foresee what position within a "renewed" or changed vernacular architecture will be occupied by natural materials such as wood and organic thatch. This research area would benefit from further studies with a particular focus on "traditional" vernacular solutions, as well as emerging hybrid buildings or buildings utilising modern materials.

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