### CEREAL DRYING RACKS

KLAUS ZWERGER

# CEREAL DRYING RACKS

CULTURE AND TYPOLOGY OF WOOD BUILDINGS IN EUROPE AND EAST ASIA

With a Foreword by Hermann Kaufmann

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### Foreword

What are cereal drying racks? The photographs on the cover provide a first indication, and for those for whom this piques their curiosity, it marks the beginning of a rewarding journey. For that is what this book is: richly illustrated with an incomparable collection of photos and analytical drawings, collected over more than three decades, it transports us into another, by now almost bygone world. Although the topic may, at first sight, seem rather exotic, the variety of wonderful photos maintains one's curiosity and invites one to engage with the subject. Captivating not just for architects and cultural scholars, they very quickly entice one to read the description in the legend, and from there to dip into and then immerse oneself in the text.

The volume of text is impressive. It is quite amazing how much Klaus Zwerger has to say about this apparently so simple agricultural implement. The more one reads, the more one becomes aware that behind these racks, which once dotted entire stretches of land, there is a much larger theme, which the subtitle hints at: cereal drying racks developed into a *sine qua non* of arable farming and into an architecture without which the cultivation of cereal crops and the feeding of entire populations would have been inconceivable. Their economic importance has had a profound impact on the cultures of Europe and East Asia. With numerous background stories, the book embeds this object of agricultural architecture in the cultural and historical contexts of its use and traces its various manifestations from a simple tripod of three poles to a complex, multifunctional representative building.

The author has succeeded in classifying the cereal drying racks of the two so different cultures of the East and West in a single typological taxonomy. For almost every type of rack found in Europe, he has found a comparative example in East Asia, and in the process has elaborated a comprehensive study of the entire range of manifestations of this object. By their very nature, the structural and construction details of these agricultural buildings are open to plain view. This makes it wonderfully clear how and where differences between Western and Eastern forms occurred. The simplest forms of scaffolds are practically identical. But where carpenter's techniques come into play, the paths of development begin to diverge more significantly, both in terms of their construction as well as partially in their appearance.

On the surface, this book is a study of a historical form of architecture. Those who delve deeper, however, will find it reveals much more. It is an analytical investigation that, to use the words of the composer Gustav Mahler, conveys tradition not as the worship of ashes but as the preservation of fire. It describes cereal drying racks graphically and in exquisite detail, explaining their functionality, their economic use of resources and their adaptability to changing conditions. If these principles sound familiar, it is because they correspond – then as now – to the canons of contemporary timber construction. Zwerger's examination of an "architecture without architects" follows in the footsteps of my erstwhile teacher Ernst Hiesmayr who wrote in his book *Nur Holz* (Just Wood): "The purpose requires that one be ingenious with the simple. In each work, we see the considerations of place, of joining and forming. We see the economy of means that drives its realisation. An economy that tends towards an expression of pure realism endowed with an ethical dimension."

Hermann Kaufmann, July 2020



## Introduction

Immediately after the publication of a previous edition<sup>1</sup> of this book in German, Andō Kunihiro remarked that the book had been written too early, meaning that not enough time had passed since the disappearance of these structures for a book to be of interest. After all, some of them still existed. In the meantime, however, their number, as well as their distribution, are now about to approach zero across the globe. Several new structures have been erected in recent years in an effort to create an emotional, nostalgic connection to the landscape and to improve its attraction, but I did not want to burden the book with further examples merely for the sake of being up to date. The appearance as well as the use of the landscape has changed fundamentally since the days of the original constructions. While the ongoing transformation of the landscape is without doubt a worthy topic of cultural anthropological research, it is unrelated to the subject of this book.

Ten years after the first German version of this book, it may be time to revisit this topic. With this revised English-language edition, I would like to give an account of the once widespread distribution of cereal drying racks through this likewise wide-ranging documentation, study and analysis. My renewed examination of this topic has resulted, in particular, in significant changes to the third and seventh Chapters.

Chapter 3 now discusses associated aspects that had a direct influence on the emergence and development of cereal racks. Their growing size and complexity can be interpreted as an expression of their increasing importance in the economic process which directly affected the ruling classes' perception of these racks, and in turn naturally impacted their perception in the cultural sector as well. Due to their relevance to the economy and economic history as well as their socio-political significance, cereal drying racks contributed to shaping the respective cultures.

Chapter 7 has also been expanded with many new examples from China, where more recent publications have thankfully made it necessary to question or reassess earlier assumptions and statements made in the above-mentioned earlier German edition.

The first version of this book in German was the result of more than ten years of intensive collection, documentation and research work. Of the newly documented examples from the last ten years (especially those in Chapters pages 225–244 and 277– 295), most were unplanned discoveries made during research trips in the border region of Tibet and Sichuan. My travels had another purpose at the time. While I knew of these examples through existing literature, I had not had the opportunity to visit them before. They did not feature in the original German edition of this book because the available images - whether drawings or photographs - did not provide a sufficient basis for analysis. Within these images they appeared only as incidental objects in a wider scene - which is exactly how they were perceived. Cereal drying racks were so much part of everyday life that they were not deemed significant enough to warrant special focus; they were so universally utilitarian that few gave them any attention. People devoted time and energy to the design of their houses, but not to cereal drying racks. The same applies even to the more architecturally sophisticated cereal drying racks in the settlement area of the Dong minority, which are shown in several subchapters of Chapter 7.<sup>2</sup> While working on this book, I was pleased to hear news of a first detailed examination

<sup>&</sup>lt;< 4 This cereal drying rack from the Isel valley (A) allows one to see its entire construction from below.

of the subject in Chinese.<sup>3</sup> Otherwise, however, there is still very little contemporary literature on this topic in China.

I would like to briefly mention four books that support the impression that cereal drying racks were a phenomenon of everyday life and – apparently for this very reason – largely overlooked. In his very instructive book, Li Xiankui describes Sichuan architecture,<sup>4</sup> including images of wall-mounted cereal drying racks in Youting in the Dazu district.<sup>5</sup> Yet, neither the caption nor the text mentions them. In Beimiao in the former Daxian, now the Dazhou district, maize hangs in front of an "outbuilding of the Li family's farmstead".<sup>6</sup>

A third example shows a dwelling of the Tujia minority completely covered by corncobs hung up to dry on the façade.<sup>7</sup> The image serves well to reflect a widespread lack of regard for minority groups among the Chinese population, failing to even state the location of the dwelling.

Yang and Zhu's description of houses in Yunnan is from the same series.<sup>8</sup> Again, I have picked out those pictures that feature cereal drying racks and, once again, the accompanying text makes no mention of them: it refers to a house of the Yi minority in Luxi,<sup>9</sup> a juxtaposition of Han, Naxi and Yi courtyard houses,<sup>10</sup> Dai minority houses in the Xishuangbanna region,<sup>11</sup> a Naxi log house,<sup>12</sup> and finally two drawings of Tibetan houses in Zhongdian on the border with Sichuan that depict the locally prevalent hybrid construction method of earth walls and log construction.<sup>13</sup>

Muya presents a very striking house from the Sanyan area in the Gongjie region of Tibet near the Sichuan border.<sup>14</sup> The author describes an eight-storey house in which each storey steps back and forward markedly, as a "built expression of insecure life" in this area.<sup>15</sup> The architectonic appearance of the house is clearly characterised by ladder-like drying racks – of which no mention is made.

Li and Jin show a picture not unlike that in Fig. 347 of this book: a collection of single-row drying racks, each with five rows of rice sheaves hung above one another, stand arranged close together on a flat section of ground.<sup>16</sup> The accompanying text explains that in the Long'an region of Aba, agriculture and livestock breeding occurred side by side. Villages were situated on the edges of pastureland or cultivated land, with the houses nestled into the slopes to leave the flat areas free for communal activities. The picture shows – without any commentary – the erection of drying racks on communal ground as an example of one such public activity.

There are, however, some notable exceptions to this pattern. Dong Shuyin's dissertation Wooden Granaries of South China: Building craft and its determining factor<sup>17</sup> represents a significant step towards recognising the effort and consideration that went into constructing cereal drying racks in China. Her analysis allows us to appreciate the enormous economic importance of these buildings.

Kreiner, Janata and Pauer have produced an excellent and fundamental work of research for Japan but it has unfortunately been largely unnoticed.<sup>18</sup> Their assertion that "compared with other work processes in Japanese wet-field rice growing [...] surprisingly little attention has been given to the process of drying both in folkloristic and ethnological research as well as from the point of view of technical and economic history" rings true to this day.<sup>19</sup> To my knowledge, very few works have been published to date on those objects of particlular interest to architectural historians and building researchers – namely house-sized, structurally complex specimens – in the East Asian region.<sup>20</sup>

At the very beginning of my work, I was fascinated by the monumentality of the countless cereal drying racks in Slovenia. I felt inspired to more in-depth research when, in the 1970s and later again in the early 1990s in Japan, I happened to see completely different cereal drying racks. Sometimes they were in regions far apart from one another, in two cases they were shaped like houses. By then I had many years' experience of the comparative study of European and East Asian timber construction technologies,<sup>21</sup> and it proved a stimulating challenge to examine the commonalities and differences in the arrangement and construction of these built structures in an academic study. The two architecturally interesting objects in Japan would not have made a very instructive,



1 The author explains his description with an instructive illustration of a cereal drying rack being filled. (source: Valvasor 1689, book 2, chapter 2, 105.)

or indeed interesting, comparative study. Yet, a more focused literature research provided clues to other areas where such cereal drying racks once existed. In many cases, it was an incidental description in the accounts of a travel writer that set me on the right path. These proved to be a valuable source, especially in China.

But even in Europe, there is on the whole very little in the way of specific literature on this subject. Such utilitarian, frequently only temporary structures were not attractive to broader scientific circles, nor were they accorded the same esteem as dwellings or barns. Many of the examples depicted and described in the literature no longer exist. "Some 300 years have passed since Johann Weichard Valvasor first described the cereal drying rack in Gorenjska in his work 'The Honour of the Duchy of Crain'; but interest in this domestic drying construction that graces the fields and pastures of our homeland still persists to this day."<sup>22</sup> (Fig. 1)

Cevc wrote these lines about 25 years ago. As far as ongoing interest is concerned, one or two may agree, but they are few in number. Nostalgic respect is all that prevents the demolition of the few remaining examples of the once highly important agricultural building structures, which in their original form have lost all meaning and whose preservation is no longer economically justifiable. No-one wants to tear them down, and so they simply gradually decay. Some particularly large or beautiful specimens are now used here and there as museum buildings or as venues for events, but in the rest of Europe, they have all but vanished entirely.

In East Asia, these structures are still partially in use, but here too they are on the way out. Only in very remote areas does time seem to have stood still. One hundred years ago, Handel-Mazzetti photographed a village in the Mudiqing valley in the border area between Yunnan and Sichuan (both CHI) (Fig. 2). While the scenery appeared largely the same only a few years ago (Fig. 3), careful comparison reveals that the number of cereal drying racks has gradually declined over the course of almost 100 years. Every now and then, there is a house with fired clay roof tiles, and the wooded slopes have



2 Xifancun in the Mudiqing valley (CHI). (photo: Handel-Mazzetti 1914/16, Weltmuseum Wien, Photo archive VF 13793)

been progressively cleared. After that, however, things changed rapidly. Within the space of three years, developments accelerated, and the valley was flooded to create a reservoir to ensure the factories of a nearby county town were less prone to power fluctuations.

The central tenet of this book is that the cereal drying racks' various forms and shapes, which have evolved over the years, are to be regarded as works of architecture. In this context, I take the meaning of architecture to be "the art and technique of designing and building, as distinguished from the skills associated with construction". By way of further clarification, "the characteristics that distinguish a work of architecture from other built structures are (1) the suitability of the work for use by human beings in general and the adaptability of it to particular human activities, (2) the stability and permanence of the work's construction, and (3) the communication of experience and ideas through its form."<sup>23</sup>

The term "cereal drying rack" is so unusual that it requires further explanation. While the function and purpose of cereal drying racks is discussed in the following chapter, it is precisely because these utilitarian structures were once so omnipresent that they have never been regarded as a subject worthy of scholarly study. As such, many of my



3 Sanjiacun in the Mudiqing valley (CHI).

findings were the product of sometimes rather roundabout exploration. In Japan I was confronted right from the outset with the statement that my subject of research had more to do with agricultural history than with architecture. However, in my preceding research I had made a fascinating discovery. As my collection of examples gradually expanded, a system of typological classification began to crystallise, and at the same time a second layer began to take shape, gradually at first, then more and more distinctly: these structures serve to illustrate the basic construction principles of historical timber building – not all of them, but many, and more so in Europe than in East Asia. Despite my disappointment over the admittedly not unexpected lack of interest, I heeded the advice of my Japanese colleagues. And they were not wrong: through a more or less intensive examination of historical East Asian agriculture I learned of the economic importance of constructions for cereal crop farming and in turn of cereal drying racks.

Historical contexts can only be properly understood as a combination of manifold conditions. In Chapter 3 I attempt to identify and explain the interdependencies of these many interwoven influences. My original intention was to differentiate these according to building typology, cultural-historical significance and economic-historical roots. I have departed from this structure in this edition, as the distinction between "economic-historical roots" and "cultural-historical significance" would have drawn artificial boundaries in this net of interwoven relationships.

The material cultural assets presented in this book are not merely compositions of ideas put into reality or the inherent representation of the development of these ideas. We need to look deeper. Over the past decades, there has been a fundamental shift in the concept of material culture. We no longer subscribe to the frequently tacit assumption of the Western conception of man that sees man as detached from material things.<sup>24</sup> The intellect is neither more important nor superior. To escape this dichotomy of the material and non-material, Hahn suggests "that we should always seek to understand the material things used in a society through the context of their use. Everyday life is not defined by material things alone, but likewise not solely by actions and knowledge."<sup>25</sup> Rather, it is their synthesis that "enables us to gain an understanding of everyday life".<sup>26</sup> Culture and material things are inconceivable without each other.<sup>27</sup> An anthropological view of constructed form fails to convince when its concentration on the house as a symbol recalls the culture that produced it. "The building [...] seen as an artefact and [...] studied from within the boundaries of cultural knowledge"<sup>28</sup> does as little justice to the object as it does to those who built it, or to those who used it.

In this book we dissect cereal drying racks in exacting detail down to their individual construction elements. Examining each in isolation is a didactic attempt to enable us to compare objects from very different cultures in an understandable way, at least to make them comparable to a certain extent. Why don't we speak directly of comparability, especially as we have gone to such effort to create an ordering scheme that would seem to facilitate it? One reason is that the interplay of material objects, knowledge and actions differs in each society, in fact to such an extent that we are obliged to seek a specific explanation for each individual case.<sup>29</sup> If this is the case, this calls into question the very notion of comparability. For this reason, we have chosen here to speak of juxtaposition, and we hope that the reader will understand our intentions. Everything we see, we interpret and evaluate according to our respective cultural background and personal horizon of experience. How we classify observations and draw conclusions from texts is thus always coloured by subjectivity, however much we strive for objectivity.

Another reason is that the contemporary approach to research does not merely examine the objects of research, "their forms and materials [...] as isolated aspects", but rather "makes the perception of things and their meanings the focus of study".<sup>30</sup> Using the example of cereal drying racks, this study aims to show that material cultural assets help shape and inform cultural meanings and social order.<sup>31</sup> The meaning we ascribe to cereal drying racks is not something that exists in its own right but that is derived from the way we regard them,<sup>32</sup> from their use in the seasonal pattern of every-day agricultural life as well as from the way they are co-opted into artistic thematisation. Daniel Miller sums it up succinctly: "To study material culture is to consider the implications of the materiality of form for the cultural process."

As compositions, cereal drying racks show how work processes can be made more effective with the help of technical aids. The developments that we imagine have contributed to their form were, like most developments, seldom linear.<sup>34</sup> "Culture is not a univariate phenomenon, nor is its functioning to be understood or measured in terms of a single variable – the spatial-temporal transmission of ideas. On the contrary, culture is multivariate, and its operation is to be understood in terms of many causally relevant variables which may function independently or in varying combinations."<sup>35</sup> However, I have only rudimentarily or in a rather fragmentary way followed Binford's principle of isolating the causal factors that inform the development of cereal drying racks and relating them to each other.<sup>36</sup>. My primary interest lies in the architecture and the typology of the cereal drying rack. Moreover, I am particularly concerned with the attempt to compare and contrast the typological classification of examples from the West and the East. Technical analyses of the construction can reveal constructive intentions in as

far as they are necessary to understand the typological representation. At the same time, if one wants to accurately trace the form, and perhaps more importantly the meaning that influences the form, one cannot simply ignore other causal factors. Since this is not a work in cultural anthropology, I have taken the liberty to weave in the occasional cultural-historical and economic-historical fact that I consider helpful for understanding the structures' forms.

Supposing that cereal drying racks as agricultural artifacts are the product of different contributing factors, I venture onto uncertain ground. Pfaffenberger knows what we are talking about: "The supposed functions of artifacts [...] do not provide a clear portrait of a human culture's needs, and what is more, one cannot unambiguously infer from them precisely which challenges a human population has faced."<sup>37</sup>

In my juxtaposition of Western and Eastern manifestations I, like many researchers before me, arrived at two interesting conclusions. One is that the same problems gave rise to often very similar problem-solving strategies, and in turn to almost identical structural designs. At the same time, the detailed resolution of the construction problem drew on the respective individual building traditions. I examine this along with the consequences of the visible comparability of constructions in Europe and East Asia in more detail in Chapter 5.

I have deliberately avoided using the term architecture in the title in order to be able to include very simple cereal drying racks into the given structure of juxtaposing typologically examples from the West and East. The construction of cereal drying racks, continually adapted and perfected over the centuries, is a perfect example that explains some of the basic principles of timber skeleton construction. For functional reasons, the walls could not be filled in. Sheaves of grain were hung over the horizontal rungs so that they were exposed to the wind. A fully hung cereal drying rack would therefore have closed walls and resist the wind much like the sails of a ship. The necessary bracing to resist the wind load, which always came from one side, remained visible, as did the construction itself. Accordingly, one often has an unrestricted view of the roof construction (Fig. 4, p. 8). Few other constructions afford the possibility to study a timber building tradition in all its different manifestations so clearly, and to compare and contrast its development across Western and Eastern cultures.

Building methods that do not originate on the drawing board vehemently resist all attempts at typological classification; over centuries they have adapted to ever changing conditions, transferred by settlers and modified to meet new conditions using the resources available at the new location.

There are nevertheless two reasons to try all the same. The first is a predominantly pragmatic one: in order to organise such a complex topic, Chapters 6 and 7 are divided into numerous subchapters that present a typological structure. The second is the methodological decision to juxtapose examples from two different cultures for the purposes of comparison. Both these chapters make repeated reference to Chapter 3 to explain and substantiate the reciprocal relationship between the structures' use based on their economic environment and how they were eventually built. As a result, it was the desire to conduct a cultural comparison that led me to adopt a building typological approach.

Chapter 8 concludes the investigation. The fact that the roofing and the conditions in the West and the East are largely the same, provides a welcome opportunity to once again examine the Western and Eastern specimens together. This commonality in terms of their weather protection is, however, offset in Chapter 9, which discusses principal differences and their respective origins.

The very comprehensive scale of this study includes examples from a broad spectrum of places, regions or provinces that, in some cases, will not be familiar to all readers. To give at least a rough idea of where they lie, the corresponding country is given in abbreviated form as follows:

A	Austria
СН	Switzerland
CHI	China
CRO	Croatia
D	Germany
EST	Estonia
FR	France
IT	Italy
JP	Japan
LAO	Laos
RO	Romania
RUS	Russia
SWE	Sweden
SLO	Slovenia
ES	Spain
THA	Thailand
UA	Ukraine
VN	Vietnam

This first English edition gives me the opportunity to briefly respond to a criticism in the context of a review of the earlier German edition.<sup>38</sup> As Kühebacher's review was very detailed and favourable, I feel all the more obliged to explain my choice of place names, which he questioned at the time. Egon Kühebacher, a South Tyrolean linguist, historian and German philologist, has written extensively, among other things, on topics related to names and folklore. As such, he is a truly expert reviewer who "finds it strange [...] that a work written in German by a German [sic!] scholar does not use indigenous South Tyrolean place names".<sup>39</sup> I elected to use the current Italian names of South Tyrolean villages, just as I have named the villages that belonged to Carniola in the Middle Ages by their present-day Slovenian names. Kühebacher sums up: "In a scholarly work, the historically evolved language and cultural landscapes should be categorically more important than more recent national attribution."40 I would like to answer this with a question: how long does it take for national attribution to no longer be recent? With all due respect and sympathy for the injustice suffered by those affected, I made my choice after careful consideration. If I were to adopt the author's principle, it would entail changing numerous place names mentioned in this book and many I would need to give in two or even three languages. This is not the place to discuss whether or when is the "right" time to accept political realities. I believe we have more than enough to do with injustices that are currently being committed and that we can demonstrate how serious we are about outlawing political acts of violence by remonstrating against those committed in the many trouble spots around the world today.

Chapter 4 begins with two sketched maps (Figs. 63 and 64) that aim to provide a general overview of those regions in Europe and East Asia that are mentioned in this study, either in the text or the pictures. Nevertheless, it is simply not possible to include all the place names mentioned in the text within the scope of these maps.

The title names the two cultural regions within the study. There is no special significance to their order; it simply follows that of the original German version, where it was in alphabetical order ("Europa" and "Ostasien"). In theory these need to be reversed for the English version, however I have refrained from doing so in order to avoid switching much of Chapters 6 and 7, which would have entailed unforeseeable consequences for other relevant sections in the book.

In several cases in this study, structures are described as "primitive", a term no longer suitable in a social anthropological context. Although imprecise and unreliable, it is still quite customary in an architectural environment, due in part to canonical works such as Raimund Abraham's Elementare Architektur.<sup>41</sup> Alternative expressions never quite transport the same meaning as clearly.

I also adhere to the use of the word "bay", as it remained unchanged in many regions of Europe as well as in publications.<sup>42</sup> Cereal drying racks are generally comprised of vertical posts or columns that carry horizontal poles: the bay represents the space between two columns in the longitudinal direction. For example, a structure with four columns arranged in a row connected by horizontal rails is referred to as a three-bay rack. In the case of multi-row cereal drying racks, the term bay is applied synonymously to describe the distance between two adjacent transverse connectors: that is the space between two planes that are parallel to the gable and perpendicular to the longitudinal direction.

This terminology has been maintained for the East Asian examples, although it conflicts to a certain extent with the meaning used in many instances in China:43 if a temple's floor plan is demarcated by four columns in the longitudinal direction and three columns in the transverse direction, the columns describe six (three by two) sections. In relevant Chinese literature, each of these rectangles is defined as a bay or jian<sup>44</sup> (Fig. 5). According to the terminology of our study, however, the temple has only three bays, because the bay is understood here as a structural interval rather than as a demarcated area. This terminological clarification is necessary because in some contexts in Europe, the term was also used to denote a surface unit.45

Otherwise, all [notes] or [...] indications of omissions in square brackets are by the author.



5 Sketch of the meaning of the term bay in a) China, b) Greek, Roman, medieval and Islamic architecture. along with what this means in the context of c) a multi-row cereal drying rack, and d) single-row cereal drving rack

NOTES TO INTRODUCTION

- 1 See Acknowledgements, p. 349
- 2 See Zwerger 2013, 257–283.
- 3 Xin 2017. The author examines the elaboration of cereal racks as discussed here in Chapter pages 295-314. In her typological classification of numerous examples from the southern settlement area of the Dong minority along the Duliu River, she tries to draw parallels between the buildings of the Dong and those of the Han
- 4 Li X. 2010.
- 5 Ibid., 143.
- 6 Ibid., 145.
- 7 Ibid., 335.
- 8 Yang, Zhu 2009.
- 9 Ibid., 42.
- 10 Ibid., 43.
- 11 Ibid., 64
- 12 Ibid., 86. 13 Ibid., 94, 95
- 14 Muya 2009, 194
- 15 See the corresponding examples in Chapter pages 277-295.
- 16 Li D., Jin 2012, 35.
- 17 Approved in November 2019 at Vienna University of Technology
- 18 Kreiner et al. 1982.
- 19 Ibid., 95.

- 20 Ando et al. 2010, 22–27; Zwerger 2005, 127–149; Zwerger 2007, 471-512.
- 21 See Zwerger (2012) 2015; third, revised and expanded edition.
- 22 Cevc, Čop 1993, 11.
- 23 Both quotes from: Encyclopaedia Britannica, Keyword: Architecture. (www.britannica.com/topic/architecture). Getty's Art and Architecture Thesaurus Online, on the other hand, defines architecture as what "was designed by an architect" which would immediately exclude the use of the term architecture in this context. No cereal rack has been designed by a (trained and certified) architect (see http://vocab.getty. edu/page/aat/300263552).
- 24 Kopytoff 1986, 84; Miller and Tilley 1996, 11.
- 25 Hahn 2014, 9.
- 26 Ibid.
- 27 Miller 1994.
- 28 Asquith 2006, 130.
- 29 Brown 2004; Feest 1999,
- 30 Hahn 2014, 14.
- 31 Miller 1987; Miller 1996
- 32 Hahn 2014, 11.
- 33 Miller 2002, 399.
- 34 See Pfaffenberger 1992, 491-516.
- 35 Binford 1965, 205.
- 36 Ibid.

- 37 Pfaffenberger 1992, 496.
- 38 Kühebacher 2012, 52–55.
- 39 Ibid., 54
- 40 Ibid., 55.
- 41 Abraham, Dapra 1963.
- Since these structures are rarely constructed to exact measurements, specific terms such as intercolumnar or axis spacing would be misleading.
- 43 I qualify this with "in many instances" to indicate that the terminology is not unequivocally defined but a matter of discourse. There are two interpretations of the term jian (yoke/bay): one introduced by Fu Xinian, and one very similar to our interpretation. This is further complicated by the fact that there is no consensus on whether the term denotes a planar (two-dimensional) or spatial (three-dimensional) unit.
- 44 A comparable spatial definition of the term "bay" can be seen in church construction where a unit of vaulting in the nave, enclosed by four columns and demarcated by ribs, is known as a "bay"
- 45 The English term yoke or acre denoted the area that could be worked by a certain number of oxen per day. The unit of land measurement, which has Roman origins, was less than half as large as a yoke in Austria. The size of a yoke in southern Germany, Switzerland and Hungary was in between



# rying Rack – and Typology

Dictionary) the cereal drying rack is de-" as "a sheltering building on a field for immsches Wörterbuch, we find two releon a field for sheaves of corn, in Carinthia d köss [...], in Pusterthal köse, a structure e German-speaking enclave of Gottschee the Rhenish, Franconian, Bavarian kaste this recurs in the Nordic terms kast, kästr, he Swedish kas, alternatively kös f. (gen. od, hay, etc. and in turn *kasa*, meaning to Carinthia and Tyrol is harpfe and harpfen of corn made of upright tree trunks with to understand how to actually build such definition was struck from the following us no real indication of what these strucescription of a "sheltering building on a

t it can be to describe even a very simple

sist of two rows of pillars either side of a lumns on each side between which horith that the structure looks something akin

bach [Ljubljana/SLO], there is a small but e sees here a lot of so-called *Harfen* [racks], es in the records of the Carniola Economic es, three to eight fathoms high [1 fathom wo, often also four transparent sections. rn, hay or clover that have been hung out bt serve the latter purpose, then they are e kind not seen in other countries where s them only here and there in Carinthia."<sup>5</sup> itself but, as with a puzzle, various details de an overall picture.

ec as "a freestanding, permanent, vertical, itly made of wood and covered by a roof."<sup>6</sup> ereal drying rack although this is not quite badly defined than the term cereal drying posefully avoided introducing countless regions in which cereal drying racks exist. r to a greater or lesser extent in meaning,

v derelict through disuse. Zali Log (SLO)



7 Once a cherished symbol of a rich harvest, now not even worth using as firewood. Spodnje Danje (SLO)

and sometimes they have entirely different names but refer to the same thing. In Austria, for example, *Harpfe* is more common in Tyrol, whereas *Köse* is used more in Carinthia.<sup>7</sup> Such terminological differences only distract from the purpose of this work, and as such I have not pursed this further here. (Some researchers have studied the etymology of the terms for cereal drying rack in different languages. Alongside Bruno Schier,<sup>8</sup> Tone Cevc<sup>9</sup> and Konrad Huber,<sup>10</sup> of particular note is Anton Melik.<sup>11</sup>)

It is worth briefly examining the attributes Juvanec uses in the above definition. By using the adjective "freestanding", he limits the description to the kinds of structures listed in Chapters pages 132–186 and 224–276 and thus excludes most notably the groups of cereal drying racks that are attached to buildings. The word "permanent", as opposed to temporary, excludes some precursors and primitive forms, but also a large group of East Asian cereal drying racks that are erected annually at harvest time. Juvanec's restriction makes sense regarding the Slovenian types. However, I take issue with his assertion that the cereal drying racks in China and Japan are merely "similar objects" because "the definition I gave at the outset does not apply to them."<sup>12</sup> As we shall see later, there are types of cereal drying racks in both China and Japan that are compatible with Juvanec's definition.<sup>13</sup>

The attribute "predominantly made of wood" refers to the specific local situation. Elsewhere in Slovenia and in the immediately bordering Italian and Austrian regions there are also cereal drying racks with masonry pillars (Fig. 6, p. 18). "Vertical" refers to the upright supporting elements of the structure (Fig. 7) while "open" describes the sections used for drying crop. Plus, the reference to roofing is yet again more restrictive relative to the classification in this study. Finally, Juvanec defines the function of the cereal drying rack simply as drying and storage; see further details in Chapter 2.

Linhart offers a remarkable term definition in his Versuch einer Geschichte von Krain (Towards a history of Carniola). Discussing "arable farming" he writes in paragraph 18: "The Carniolan people now hang them [the wheat sheaves] on racks. These are high wooden railing-like structures, which take the form of wide transparent walls that resemble a harp strung with strings and are called *Koselz*. In Siberia, where they are also used, they are called *Hoseri*.<sup>[14</sup>] Without doubt, the musical instrument *Gosli*, *Husli* [an old Russian plucked instrument], which was common in Slavic regions as well, gave rise to both names due to their similarity with the strings.

Mr. D. Anton (e.)[<sup>15</sup>] suggests this kind of use, which one also sees in different forms by other Slavic groups, can be traced back to their old nomadic way of life where they had neither barns nor threshing floors."<sup>16</sup>

Japan has a similar variety of designations. What some see as conceptual specialisation is for others incomprehensible gibberish. Shimizu Takahisa, in his descriptive explanation in *Nōgyō zue*, differentiates between two types of *haza* as synonyms for cereal drying racks. *Jihaza* are drying frames, which incorporate living trees referred to as *tachiobasa* in the prefecture of Niigata.

The other group are the *tsukurihaza*, consisting of vertical pillars and horizontal poles erected on the harvested fields.<sup>17</sup> In the prefecture of Aichi the farmers knew two types of *tsukurihaza*, the *gasshōgata* and the *hashigogata*.<sup>18</sup> Apart from the fact that these two groups represent only part of the spectrum of cereal drying racks in use, most farmers throughout Japan are unfamiliar with the term *hasa* or *haza*. I have hinted at the variety of terms used in a separate study on specific types of cereal drying racks in Japan<sup>19</sup> but this should really be examined by experts from the region.

### DIFFERENTIATION FROM OTHER DRYING STANDS

Drying is a form of preservation. Even when the function of drying stands is limited to merely drying, they are still used to dry a large variety of "goods" – starting with the alternative use of cereal drying racks when they are not needed for their actual purpose (Fig. 8). In Sichuan in the southwest or in Zhejiang in the east (CHI), huge quantities of metre-long noodles are still hung on poles in front of the shops where they are produced (Fig. 9). Likewise, young leafy branches were dried as fodder.<sup>20</sup>

The Evenks, an indigenous people made up of numerous groups and clans from Siberia, Mongolia and China, hung elk and deer meat up to dry. Fish was dried everywhere from Northwest America<sup>21</sup> to South America,<sup>22</sup> Siberia<sup>23</sup> and Scandinavia,<sup>24</sup> and in Japan dried fish is a popular snack still found in every supermarket. Tofu, horseradish and much more is dried to this day for preservation.<sup>25</sup> But not only food; laundry was also hung out to dry on racks identical to those used for drying cereal crops (Fig. 10).<sup>26</sup>



8 Spun hemp fibres hung out to dry after bleaching on a cereal drying rack not needed for its original purpose at that time. Lijiazui (CHI)



**9** Freshly produced metre-long strands of rice noodles drying on bars in front of the shop. Laogong (CHI)



10 A quarter of the castle courtyard at Schloss Liebenau (A) is used for drying washing. The washing lines, like the rungs for drying grain, are strung between large tripod-like supports. (source: Vischer 1681, 347)

In order to preserve corncobs, they must dry for a particularly long time after harvesting. In Burgenland and southeastern Styria (A) the common name for a corncob storage barn was a *Tschardake*,<sup>27</sup> a loan word from Croatian-Turkish, in use since maize cultivation was introduced to southeastern Austria, along with the term *Türkenhäusl* in the Inn valley (A).<sup>28</sup> These are small drying barns and storehouses. The name *Woazharfe*, which is used in the Styrian districts of Feldbach, Voitsberg and Leibnitz (all A), indicates the linguistic affinity to our topic, as *Woaz* refers to *Weizen*, wheat.<sup>29</sup> Cereal drying racks were also used temporarily to store grain for a certain period of time, for example until threshing (Fig. 11). In Europe one can still find such isolated examples between



11 A Tschardake of this size is a rarity. Schachendorf (A)



12 It is not easy to relinquish things anchored in collective memory through centuries of use. Both the drying structure and the scarecrow look like forgotten exhibits from a museum storeroom. Apetlon (A)



13 Unlike the more recent huts made of wood, older maize stores were made of wickerwork. Mara (RO)

Portugal and the eastern border of Europe: the cage-like crates, at least 2 m high and 50 cm wide, are bounded by vertical slats spaced slightly apart but close enough to prevent the corncobs slipping between them (Fig. 12). At the top, they are covered by a pitched or hipped roof. An earlier form made of wickerwork illustrates the secondary function of well-aerated drying even more clearly (Fig. 13).

Though widespread, this was not the only method of corncob drying. Maize was also hung up to dry on cereal drying racks of various kinds: in Japan on single-row structures,<sup>30</sup> in Tibetan populated areas of China on wall-mounted ones and on poles strung around the perimeter of the pergolas (Fig. 14); whereas in Slovenia and Tyrol (A) in wall-mounted cereal drying racks at the gable ends; and finally in parts of Burgenland on poles strung along the pergolas beneath the eaves. Some authors even see the *Tschardaken* in Styria and in Burgenland as the culmination of the development of a twin-row cereal drying rack topped by a carpentered trussed roof.<sup>31</sup>

This book makes no distinction between racks used to dry rye or barley, or those used to dry grass – distinctions that were in detail investigated, for example, by Jirlow.<sup>32</sup> Such exacting specification may well have been relevant at one time or another for the comprehensive construction of such structures as the different grain types have different-length stalks.

Grass, which in many cases was hung out to dry on the same racks once the cereal crops had been taken down, has a very different consistency to grain. From today's perspective, this differentiation is irrelevant. As a researcher you are grateful for any cereal drying rack you find that still exists, even if now used for drying grass. Having said this, the intention in this book is to focus on drying frameworks that in some way have gone on to be developed into house-like, more complex architectural constructions.

Even though I occasionally speculate on possible developmental stages in this study, I have not tried to establish or trace a development theory of the cereal drying rack, no matter how obvious – and most tempting – it would be to anticipate and then



14 Reaching up to unattainable heights, the dwellings of Tibetan farmers in De'erba in Sichuan (CHI) were forbidding and impervious. The only openings in the wall are behind the balcony-like drying racks on the uppermost storeys.



**15** A cereal drying rack from the 18th century still stands in Hočevje (SLO). Its primary structure is made entirely of oak.

trace an evolutionary path from the most primitive to the most complex forms. However, when trying to find really early testimonies of cereal racks, you would soon be confronted with two kinds of obstacles: on the one hand, wooden structures are very susceptible to weathering, especially when exposed. Using any date inscriptions as evidence should be viewed with caution as timber elements were frequently repurposed from other dismantled structures (Fig. 15).

On the other hand, many older racks have now disappeared. Once a farmer's crop yields rose, he would replace older, smaller cereal drying racks with new, larger, more elaborate ones. If yields decreased, the racks may have been reduced in size, or simply left to decay. The older the building or structure, the more in need of repair it became. As demand declined for their original purpose, only perfunctory repair work was conducted, if at all. Accordingly, there is very little reliable physical evidence on which to base and verify scholarly hypotheses on their time of origin. Only few early drawings show, at best, that there were single-row or multi-row cereal drying racks in one or the other location, as well as where they existed frequently. But these plans merely show an outline, not their construction.

Earlier, we mentioned the incredible range of different things that were dried. The drying of tobacco is a special case. In Japan<sup>33</sup> and elsewhere, it led to the development of some extremely interesting architecture (Fig. 16). In China, however, some quite different kinds of drying houses were made of earth. The occurrence and distribution of wooden structures – in which we are interested here – is very varied. The simplest



16 Tobacco barn in Wilhering (A).

drying racks were very similar everywhere and practically indistinguishable from other racks for specifically drying crops (Fig. 17). They occurred in too many locations so that, as with the examples mentioned earlier, it makes little sense to list them all.

### DIFFERENTIATION FROM BUILDINGS FOR STORAGE

The cereal rack is "a kind of barn for various still semi-ripe and semi-dry crops".<sup>34</sup> This description stands in stark contrast to the statement that "it is actually intended only for drying alternating sheaves of crops and not for storing the grain."<sup>35</sup> To illustrate the difference, let us look at a storage building that did not serve the purpose of drying – the *Vierrutenberg*<sup>36</sup> or "helm" in English.<sup>37</sup> The fact that the stacked material in the *Rutenberg* could also dry out more thoroughly makes it comparable to hay barns on alpine pastures: both were conceived primarily for weatherproof storage (Fig. 18).

In fact, in the Baltic countries, the *Vierrutenberg* was used exclusively for the storage of hay. To protect it against soil moisture, the construction was fitted with a grate at its base.<sup>38</sup> Moreover, descriptions of such structures in Graubünden (CH)<sup>39</sup> and Styria (A) are more or less identical,<sup>40</sup> and further descriptions are documented for other larger regions such as Austria<sup>41</sup> and Central Europe, the Carpathian countries as far as northern Italy<sup>42</sup> including the Ligurian Apennines.<sup>43</sup> The available literature shows quite clearly that this construction has interested many researchers.<sup>44</sup> We even have a model of this



17 A rack for drying tobacco leaves stands between the depiction of washing a horse and saddle, and the emerging silhouette of Fuji san in the background. (source: Hokusai, Fugaku hyakkei 1834)



18 Several examples of a Vierrutenberg in Pičan (CRO).



**19** Model of a "storage device with a height-adjustable straw roof". (Technisches Museum Wien (A), Inv. No.: 21.575)

structure thanks to the Austrian Archduke Johann's (1782–1859) interest in nature, technology and agriculture (Fig. 19).

In his encyclopaedia, Vaclav Frolec describes the *Vierrutenberg*, for the first time depicted in the 14th-century Wenceslas Bible, as an open barn with a tent roof, i.e. explicitly as a place of storage.<sup>45</sup> Another drawing from Poland has been handed down from the 16th century.<sup>46</sup> However, in the Czech Republic and Slovakia the roofing is not necessarily defined as a tent roof,<sup>47</sup> while the Hutsuls living in the Carpathians, in the border area between Romania, Poland and Ukraine, made equal use of both monopitch and tent roofs.<sup>48</sup> In addition, Romstorfer presented examples of pitched or saddle roofs, and explained how the round or square piles of hay placed on a grate with a movable roof developed out of the hayloft and hayrick,<sup>49</sup> by placing four vertical posts around the stack of hay onto which a height-adjustable roof was fixed: the simple haystack became a *Vierrutenberg*!

Very simple variants were used in Latvia.<sup>50</sup> More elaborate variants, also described by Romstorfer, replaced the grate with a single-storey masonry building which was usually plastered (Fig. 20).<sup>51</sup> This type incorporated influences from the Ukrainian Carpathian region.<sup>52</sup>



20 Vierrutenberg atop a log-construction storehouse in Strîmtura (RO).

#### NOTES TO 1 THE CEREAL DRYING RACK - TERMINOLOGY AND TYPOLOGY

- 1 Lexer 1862, 134.
- 2 Grimm 1873, vol. V, column 1841-42.
- Grimm 1877, vol. IV, column 476. 3
- 4 Wopfner 1927b, 352-53.
- 5 Herrmann 1781-83, vol. 2, 8.
- 6 Juvanec 2000, 4.
- See, for example, Wopfner 1927b, 322–353.
- 8 Schier 1966, 333-35.
- 9 Cevc, Čop 1993. 10 Huber 1944, 86–99.
- 11 Melik 1931, 93-98.
- 12 Juvanec 2000, 4.
- 13 Nowadays assertions about details of structures in China and Japan are all too often simply repeated without verification. Taking his cue from Juvanec, Kaltenbach writes: "While the simpler types can also be found in other Alpine countries, the more elaborate constructions can only be found in Slovenian culture." (Kaltenbach 2004, 6).
- 14 The most extensive study on the occurrence and transmission of these two terms is probably by Jože Stabéj. In his very meticulous piece of research, he also refers to Hacquet's erroneous use of the term Hoseri, which was originally correctly given as Stosheri by Pallas (see Chapter 4) (Stabéj 1954, 35–7).
- 15 (e.) refers to a footnote: "Im a. B. I. Th. S. 140." but there is nothing there. There is, however, in: Hacquet 1776, 256.
- 16 Linhart 1796, 334. See the not dissimilar explanation of the word in Kühebacher 2008–2009, 29
- 17 Tsuchiya (1717) 1983, 254.
- 18 Nakamura T. 1969, 93.
- 19 Zwerger 2005, 128-29.
- 20 Umebara 1881, 22-23.

- 21 Wegener 1937, 421.
- 21 British Columbia Archives, call no.: I-18408, F-05394, H-05513, H-07161, I-30818, I-11418, I-18388, I-29251; Duff 1952, 62-67; Duff 1997, 75,
- 22 Hirt 1882-87, No. 137, fig. e.
- Bouterwek 1937, 94.
  Kjellberg 1930, 247; Čapek 1990, 126.
- 25 Goto, Nimura, Ono 2013.
- 26 Forrer 1991, fig.75; Hubatschek 1998, 60; Hubatschek 1999: 71.
- 27 Museum für Völkerkunde (Museum of Ethnology) 1954, 67; Tomasi 1980: 64
- 28 Haberlandt 1965: 23. In Tyrol and East Tyrol maize is called Türken.
- 29 Ibid.
- 30 Weston 1921, 51st.
- 31 Huber 1944, 62; Bancalari 1898, 486.
- 32 Jirlow 1937, 156-68: A very detailed article in the Austrian Folklore Atlas deals with drying racks for grass: Kretschmer, Nestroy 1974: 1-15.
- 33 Kurosaka, Andō 2002, 167–174.
- 34 Kollreider 1959, 236.
- 35 Pseiner 1822, 161.
- 36 Heresbach mentions the "montes" as "tectum pensile" (Heresbach (1570) 1970, 22a).
- 37 Haio Zimmermann has twice investigated and described this temporary storage structure. In one section, he refers to a possible etymological connection with the German-language root bergen, meaning to safely shelter (Zimmermann 1991, 74-75). In his second essay he writes: "The ample documentary evidence that this building was called a 'helm' in Scandinavia and the scarce but certain evidence in England [...]

- allows this use of the name. Etymologically, 'helm' in Anglo-Saxon means a 'cover', 'protection' or a 'helmet'." (Zimmermann 1992, 40).
- 38 Bielenstein 1907, 104.
- 39 Simonett 1968, 11.
- 40 Die österreichisch-ungarische Monarchie in Wort und Bild (The Austro-Hungarian Monarchy in Words and Pictures) 1890.356.
- Österreichischer Ingenieur- und Architektenverein (Austrian 41 Association of Engineers and Architects) 1906, 164.
- 42 Buschan 1926, 393.
- 43 Molino 1997, 68-69.
- 44 On the history and distribution of the Rutenberg, see the impressive analyses in Zimmermann 1991, 71-104, and Zimmermann 1992, 34-43. The second article gives the English name of the structure as "helm".
- 45 Frolec, Vařeka 1983, 135.
- 46 Krassowski 1961, 11, fig. 18.
- 47 Mencl 1980, 32, fig. 59.
- 48 Kaindl 1896, 149, fig. 203 and 204; 158.
- 49 Romstorfer 1915, 74-76.
- 50 Ligers 1942, 136–37 and fig. 168.
- 51 Mencl 1980, 338, fig. 792.
- 52 Ibid., 336-39.



# 2 Functions of the Cereal Drying Rack

The respective Japanese literature, which will be discussed in more detail in the following chapter, is full of examples of genre scenes of rice production. The illustrations describe the cyclical activity of the farmers – from planting to drying to loading the crop in transport containers.<sup>1</sup> Some books include further and more detailed illustrations: in *Nōka hitudoku* ("Textbook for Farmers") Ōkura and Yamazaki present various simple drying racks and partly detail their construction.<sup>2</sup> The pictures show rice sheaves hung over horizontal poles. One needs no specific Japanese language skills to deduce that information from the comic-like sequence of pictures. The fact that they are hung out to dry can be seen in the subsequent illustrations.

Hence, the very first purpose of a cereal rack is for drying the crop. There were three basic methods of drying in East Asia. The first was to spread the cut grain stalks on the field – naturally only in good weather, otherwise the stalks beneath dried poorly or not at all. Nonetheless the plants tend to absorb moisture during the night. Another common custom was to place the stalks bound into sheaves with the ears pointing either up or down. Finally, the third option was drying by hanging the sheaves in specially manufactured scaffolds.<sup>3</sup>

Already the *Gengzhi tu*<sup>4</sup> depictions indicate different forms of rice drying in China, the use of a cereal rack being just one of them. Wet rice was handled differently to dry-grown rice, and sticky rice<sup>5</sup> differently to ordinary rice. Shitara differentiates between several methods of wet rice drying in Japan. *Hase-gake* describes drying on cereal racks, *kui-gake* the stacking of rice sheaves around a wooden post sunk into the ground (Fig. 21), *aze-tate* the hanging of the divided rice sheaves over the narrow footpaths between the wet rice fields. At harvest time the water was drained from the rice fields, and the footpaths between them protruded high enough to dry the rice.

The simplest method was to place the cut rice stalks directly on the dried wet rice field or on straw mats. Drying on a wooden post was customary in the lowlands, while cereal racks were mainly used in mountainous areas. Compared to other methods their main advantage was their greater effectiveness; their main disadvantage the far greater material effort required. The simplest method was therefore the most commonly used. Drying rice on cereal racks was nevertheless of economic relevance on a larger scale. Not only did the rice dry perfectly, but after threshing, the remaining straw was of the highest quality (Fig. 22).<sup>6</sup> In pre-industrial society, its versatility was almost limitless.

It should be obvious that drying on upright ladder-like scaffolds is the most labourintensive but also most effective method, as spreading the drying volume across the largest possible vertical surface exposes the crop to maximum air circulation. The air absorbs moisture from the crop's surface and transports it away. Thereby the vertical stacking arrangement allows for protecting all the lower sheaves of drying corn under the uppermost layer.

Naturally, a roof was more effective, even when "the crop is not protected from driving rain and hail coming from one side."<sup>7</sup> Both forms of covering – the upward horizontal layer of corn sheaves as well as a proper roof – would also protect the harvested crop from excessive heat and sunlight, though here too an actual roof was more effective.<sup>8</sup> For "the sun is beneficial for the cultivation of the crop because it warms the earth and



22 Historical depiction showing straw stems bound to trees for storage. (Hiroshige Andō: Rice Field near Kinoshita River from the series: 12 views of Mt. Fuji, 1854–1858; generously provided by Aoki Hisako)



21 To this day, hanging grain sheaves on a stake is the most common drying method in Japan. Sanpoku machi-Nakahara.

promotes growth; a ripe crop has no further need of the sun to dry and for its long-term preservation, or rather no need for direct sunlight, only its heat to further dry the air."<sup>9</sup>

Strong sunlight makes two- and multi-row cereal drying racks under one roof more productive. The air under the roof heats up, becoming warmer than the air beneath it. Air circulation occurs not only over large areas, but also at a micro-scale through differences in temperature. For instance, the molecular weight of water vapour is 18g/mol, that of dry air almost 29g/mol, meaning that humid air is lighter than dry air. As the temperature rises, the ability of the air to absorb moisture increases. The freshly harvested crops hung up to dry release moisture into the air which then rises, automatically generating air movement that in turn stimulates the influx of drier air.

The foremost function of the cereal drying rack becomes clear wherever drying on the ground or other simple drying means were predominant – particularly in East Asia where you find large cereal racks only in those areas where climatic conditions made them necessary, e.g. in Rongjiang in the southeast of Guizhou Province (CHI) where some 1200 mm of rain fall per year. According to an old saying, there are no three consecutive sunny days in that region. Therefore, cereal racks were the answer in areas where humid climates with a lot of rain prolonged the ripening process and made drying very difficult if not unfeasible.<sup>10</sup> The shorter the time nature provided for cultivation and harvesting, the more dependent farmers were on cereal drying racks.<sup>11</sup>

The use of cereal drying racks was not solely a response to adverse weather conditions. Sometimes the topography of a settlement area left no other alternative. In Ticino (CH) for instance, the slopes to the left and right of the mountain valleys are not very suitable for growing cereal crops due to altitude, low temperature and coarse, less



23 The author describes his observations as: "Skreen and Poles on which Buck-wheat is stacked in Carniola." and "Barn on the sides of which Indian corn is hung in Carniola." (source: Cadell 1820, plate II.)

fertile soils. Consequently the farmers had to construct terraces for cultivation. To make the most of the soil under these inhospitable conditions, they even reaped two harvests: in autumn or at the beginning of winter they sowed wheat, in very high altitudes rye, and in March or April millet or buckwheat on the same field. In June, before the ripening period, the wheat was cut not far below the ears so as not to damage the already growing millet, and by the beginning of October, the second crop was ripe for harvesting.<sup>12</sup> Without cereal racks such intensive land use would not have been possible.

An Englishman travelling through southern Europe noticed at the beginning of the 19th century that different crops were dried on single-row cereal racks than in larger house-like ones (Fig. 23)<sup>13</sup> – an observation likewise supported by statements about other regions. In Valais (CH), for example, grain was dried on wall-mounted ladders, whereas freestanding, single-row cereal drying racks were used to dry beans.<sup>14</sup> But that was not always the case: in the 18th century, farmers in the Valais and neighbouring valleys also hung grain on single-row cereal racks (Fig. 24).<sup>15</sup> And the Estonians hung peas and lentils on their drying racks whereas grain was kiln-dried.<sup>16</sup>

Another aspect of drying that should also be mentioned in this context is that visual qualities also play a role alongside taste: rice that has not had enough time to dry



24 Filling cereal drying racks in Tschamut (CH). (photo by P. K. Hager in: Pieth, Hager 1913)



25 The "grain" drying rack could be used to dry anything that needed drying. Šmartje (SLO)

sufficiently can turn brown.<sup>17</sup> Pure white rice grains are consequently as much a quality criterion in East Asia as taste.<sup>18</sup> As hanging sheaves of rice dry most uniformly, dried rice is of better quality.<sup>19</sup>

The size and shape of the cereal drying racks reflected the amount of crop that needed to be dried and the financial situation of the farmer.<sup>20</sup> They gave an indication of the yield of a harvest,<sup>21</sup> in the first instance for the farmers themselves.<sup>22</sup> While the size of the sheaves was not standardised, cutting them thousands of times each year during harvesting made it ultimately calculable. The same applied to the cereal racks: they varied in number but not in height or the spacing of the supports. This distance between supports is often called a bay but several authors use the term window: a quasi-standardisation which allowed for determining quite accurately how much crop had been cultivated and the amount of tithes due, even from a distance. It also made cheating quite difficult.<sup>23</sup>

There are, however, indications in the literature that such assessments of dues did not necessarily have to correspond to the facts. "Binding [the cut ears of grain into bundles of sheaves] makes the later loading, storage and threshing of the crop easier. The individual bundles are made no heavier than 15 kilograms to avoid complicating their handling due to their weight. If the crop is not very dry and the harvest time is wet, the weight of the sheaf must be reduced to between 4 and 6 kilograms to make drying easier. The best way to bind winter cereal crops is in 8 to 10 kilo, summer cereal crops in 7 to 8 kilo and legumes in 5 to 6 kilo bundles."<sup>24</sup> The sheaf size also varied regionally and determined the spacing of the horizontal hanging rungs in the drying rack. Last but not least, the labour factor could have a not insignificant impact on the amount of occupied cereal drying racks. If hired labourers were paid according to the number of sheaves, this naturally resulted in an increase of the number of sheaves harvested. Hence a cursory glance at the hung cereal drying racks might not notice such subtle yet economically consequential differences.<sup>25</sup>

In the region around Ampezzo (IT) the number of cereal drying racks gave an indication of the number of families. As a rule, each family had its own drying rack in front of their house. Two cereal drying racks, or a twin-row of racks, would indicate that two families lived in the house.<sup>26</sup> However, further examples from Lesach valley (A) mentioned in Chapter pages 150–154 show that this was not always generally applicable.

Although other crops were also dried on cereal drying racks, they were probably developed for drying cereal crops that served as staple foods for the population: in Europe that was predominantly barley, rye, oats and wheat, but also varieties less well-known today such as buckwheat. In Tibet it was wheat, barley and peas for the common people; whereas rice was reserved for the upper classes.<sup>27</sup> Barley was the most important cereal crop for the Tibetans and was cultivated at altitudes of up to 4400 m, occasionally even higher.<sup>28</sup>

The situation was comparable throughout China where farmers paid their dues in millet, wheat and barley. During the Han period (202 B.C. – 220 A.D.) rice was a luxury commodity in northern China<sup>29</sup> due to the specific climatic conditions there. Millet and wheat, on the other hand, were able to flourish without problem in harsher northern climes.<sup>30</sup> And so, the success story of rice began in the south. I will discuss the situation in Japan in detail in the next chapter.

The fact that such drying racks were probably developed for drying cereal crops does not mean they were not used to dry all manner of other suitable crops. The fact that different crops ripen at different times contributed to the importance of cereal drying racks. When one crop had dried, the next could be hung out to dry.<sup>31</sup> If there was enough space, several crops could be dried at the same time (Fig.25). Multi-row cereal drying racks often bore different crops on the inner racks than the outer ones.<sup>32</sup>

Often mentioned in conjunction with cereal drying racks was the problem that they presented an attractive proposition for vermin with which the farmers were unwilling to share the fruits of their months-long labour. Yet, this is an unconvincing argument against using cereal drying racks,<sup>33</sup> as a picture from a Japanese agricultural book once again shows. Pests and vermin also fed on uncut rice and on rice laid out to dry on high ground (Fig. 26).<sup>34</sup> Most frequently mentioned was the damage caused by birds and mice.<sup>35</sup> Father Placidus estimated crop losses caused by birds to be so high that he felt like poisoning the birds.<sup>36</sup> This sounds all the more remarkable given the precautions



26 A genre depiction from Sō 1804, vol. 4, 26.

that were apparently taken "to protect the ears of corn from the birds".<sup>37</sup> The use of "stuffed bird-eating vultures with wings outstretched as if flying"<sup>38</sup> as a deterrent could be further improved by tying live hawks or sparrowhawks to both ends. "To feed them costs no more than what 16 sparrows at most consume".<sup>39</sup> A further proposal was the use of protective netting (Fig. 27).<sup>40</sup> The Dicziunari Rumantsch Grischun also describes in great detail how the ears of grain had to be hung on the cereal drying rack in order to protect the grain as best possible. It wasn't just to minimise the damage done by birds. If the lowest sheaves were hung too low, they risked being eaten by goats; were they not packed densely enough, the wind could blow them off, especially where the ends of the poles extended beyond the supports. Still, if they were too densely packed, the corn grains might begin to mould or, in the case of barley, to germinate. But even when the drying had gone according to plan, "sometimes when we took down the sheaves from the racks, we found more mice than sheaves".<sup>41</sup> Some, at least, found an outlet for their frustration at the losses in hypothetical arithmetic games: think how much greater the yield would have been had "the sparrows devoted their attention to other nourishment more in keeping with their usual diet, for example in rooting out maggots?"42

Japanese mice were no less hungry than European mice. "The damage caused by mice was very great back then, far greater than we can imagine today. Mice had the greatest impact on the crop yield."<sup>43</sup> As such, the situation in Japan was most probably very similar to that in Europe. Rats, on the other hand, were regarded rather ambivalently in ancient Japan. White rats were seen by some as emissaries of a fortune-bringing god. There is some logic to this in this context in that they signalled a good harvest. At the same time, it was believed that a rat-infested building would soon burn down. One way or another, the inhabitants often had little alternative but to accept their presence. Anecdotal accounts of life in inhabited grain stores describe how food was put out for the rats in the evenings to avoid being troubled by them during the night.<sup>44</sup>

In this study, we suggest the cereal drying rack is different to other drying stands and to structures built purely for storage. This is because their secondary function is the temporary storage of harvested crop. In extreme mountainous locations, the duration of the growing season was so short that the single-row, freestanding cereal drying rack had to supplement or replace the ripening process. The weather did not permit the crop to remain out in the field for any longer.<sup>45</sup> Indirectly, this meant that such crops could not have been grown in the highest regions without the aid of cereal drying racks.



27 Nets intended to keep birds away from the drying sheaves. Totsukawa mura-Tonoi (JP)



**29** The larger the covered space beneath the cereal drying rack, the more variably it could be used. Hotavlje (SLO)

In the Ticino Valle Leventina (CH), cereal drying racks were used "to ripen the rye",<sup>46</sup> which was cultivated in the neighbouring Valle Malvaglia "right up to the screes".<sup>47</sup>

"Although this landscape [the Valle Leventina] is only bounded to the east and west by high mountains and receives sunlight from noon onwards, the climate here is still so cold that no fruit trees there bear fruit; [...] all the same arable land and garden land is cultivated. Corn is planted in the former but can only fully ripen in long and warm summers. [...] To fully dry the corn crops, open drying fences or scaffolds are used, known locally as *Rescana*, an apparatus that consists of vertically erected posts or stakes in the open field through which various horizontal poles are passed, over which small sheaves of corn are hung in layers one above the other much like a thatched roof such that the uppermost layers protect the layers beneath from rain while exposing the whole to the air and sun so that it may fully dry. When rainy weather is forecast, a makeshift straw roof is placed over the uppermost layer to help keep out the rain. [...] One sees no barns or storehouses: instead the aforementioned apparatuses replace the need for them for the local inhabitants."<sup>48</sup> (Fig. 28).

Drying methods in Japan also clearly reflected the climatic conditions: in Okinawa, cut grain remained on the field only until the day's work was done. Where cereal drying racks were used, the grain could remain in the rack for months before threshing.<sup>49</sup>

The Taisho period (1912–1926) brought, among many other innovations, a transition from large landowners to small- and medium-sized landowners or landowning farmers.<sup>50</sup> With this came an increased need for many smaller-scale means of storage, which in many cases were fulfilled by cereal drying racks. I will return to this in more detail in Chapters pages 269–276, and 277–314.

Bringing in the crop also has to do with making it safe. One reason for the adoption and spread of cereal drying racks was therefore probably the sense of having safely harvested one's crop. "What hangs on the rack is safe and sound."<sup>51</sup> After drying, many cereal racks continued to serve as storage until the time came for threshing.<sup>52</sup> Hanging on the rack, the grain was not subject to influences that could reduce the quality of the crop during storage, most notably moisture from precipitation and the soil. Its storage function also afforded the workers a certain degree of flexibility. Irrespective of time and weather, workers were free to sow and cultivate a new crop on the harvested field.<sup>33</sup>

I would like to mention another function of the cereal rack that few users gave serious consideration. It emerged only regionally and comparatively rarely in specific



**28** Drawing showing how the field can be cleared to make way for replanting with a second crop. (source: Schinz 1783–1784, plate II.)



**30** Maize straw was an ideal form of protection against cold winters for the cereal rack itself and everything contained or stored within it. Kompolje (SLO)



32 The versatility of house-shaped cereal drying racks has ensured their survival to the present day, preventing them from being demolished. Dobrava (SLO)

situations. The constellation of two rows of cereal drying racks under a common roof created a covered space between the racks large enough for vehicles or larger farming equipment to be stored shielded from the weather.<sup>54</sup> Depending on the size of the cereal rack, one could, of course, store or park other things beneath it (Fig. 29). And in many areas where maize was cultivated, the harvested maize plants were also dried on the cereal racks (Fig. 30).<sup>55</sup> The maize was used as a substitute for winter fodder and when inserted deliberately and carefully into the racks, the maize stalks acted as excellent weather protection for everything within the rack. Its thick walls protected the contents like a thatched roof. I will return to the significance of this association in more detail in Chapter pages 269–274.

In the prefecture of Ehime, on the west coast of Shikoku (JP), fishermen erected stone walls in front of their houses up to the height of the eaves as protection against typhoons. The fishermen on the north coast of the Ishikawa peninsula (JP) in turn erected woven wattle fences to shield against high winds and storms that were so high one could no longer see the houses behind them (see Fig. 328). Not so far away, on the island of Sado, fishermen used cereal drying racks for the same purpose: in winter they wove green saplings into the rack to create better cover to shield against the wind.<sup>56</sup> Although the narrow coastal strip they lived on provided optimal conditions for fishing, the environment became extremely inhospitable in winter. In the north of Japan, as well as not far from Ishikawa in Toyama and Nagano, cereal drying racks served a very similar