Alpine Milk:
Dairy Farming as a Pre-modern Strategy of Land Use

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ABSTRACT

From an agronomic standpoint, today's Alpine milk production as well as mountain farming in general seems to be inefficient. Due to an European overproduction of food, the massive input of labour by the mountain farmer is no longer profitable. As producers of environment and standard-bearers of landscapes, however, farmers are sorely missed in the Alps today. By the 1980s geographers were pointing out that ecological problems in the Alps can be the result of the under-use of nature. Cultural landscapes, which today are admired according to aesthetic or environmental protection considerations, disappear with the farmers. Against this background, the paper introduces the premodern Alpine dairy farming as a case study which illustrates the changing relations between natural resources, economic interests and cultural values that form the interplay between land use, agricultural production methods and the meaning of food. The story of the Alpine milk illustrates that in premodern times food production reflected much more the connection between local land resources and farmer's skills, tools and practices – a link that has ceased to exist in the mindset of industrialised societies.

KEYWORDS

Agriculture and environment, Alpine mountain farming, premodern dairy production

1. INTRODUCTION: ALPINE ENVIRONMENT AND AGRICULTURE

The link between the landscape and nutrition has ceased to exist in the mindset of modern industrialised societies. There are only a few products left, such as

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selected wines, where geographical origin plays a role. Most foodstuffs have seen a drastic reduction in the amount of land necessary for their production. The separation of animal and plant production has fostered animal production, independent of the area, and even some vegetables and herbs can now grow on an artificial culture medium. Regionally and locally variable crop farming has been replaced by agribusiness which is characterised by a highly advanced division of labour and which involves the production, processing, transportation, storage and marketing of foodstuffs.

Today agriculture can orientate its production much more to the demand efforts than to landscapes and soil. This remove from the soil enabled agricultural specialisation and the concentration on single products that are further processed and marketed in very different ways. The markets are largely open, and thanks to conservation technologies and transportation systems even highly sensitive products like fresh milk can be transported hundreds and more miles. As a consequence a regional, site-adjusted agricultural promotion policy has become rather nonsensical.

In stark contrast to this, most European Union members have their own regional agricultural promotion programmes. Until the end of the 1970s, they were justified mainly for social and economic policy reasons. In the past two decades, however, environmental policy has increasingly taken their place as the main justification.[1] Due to overproduction, product-based subsidies are being continuously reduced and incentives are being provided so that farmers will give up, or at least reduce, agricultural production (e.g. through set-aside programmes). At particular locations, however, farm-based direct payments are increasingly being granted.

The Alpine mountain regions are one of those locations where farming is highly subsidised in order to protect the flora and fauna and to preserve regionally typical landscapes. At first due to the purposes of the tourism industry, care of man-made landscapes has become an important buzzword and the farmers are discovered as indispensable gardeners. Even as early as 1975 a journalist came up with a perfect description of the problem, saying: 'First the cows went, and then the tourists – who's left to milk!'[2] As for the manufacture of food, mountain farming is hopelessly unprofitable. The massive input of labour by the mountain farmer, who is at a disadvantage in using mechanical implements, is not in the least bit profitable from an agronomic perspective. As 'environmental producers'[3] and standard-bearers of the man-made landscape, though, farmers are sorely missed in the Alps these days.[4]

So far, the influence of agriculture on the environment has mostly been described in terms of over-use as results of technological change. Applications of chemical fertilisers, pesticides, fungicides or herbicides, concentration of animals and monoculture, these and other technologies of industrialised farming raised broad public concern.[5] In the Alps, however, geographers were among the first to point out that ecological problems are the result of not only techno-

logically determined over-use but instead of the under-use of nature. According to the contents of several Swiss reports to the UNESCO programme *Men and Biosphere*[6], weed infestation, abandoned roads and crumbling buildings had caused the landscape to be structurally simplified and impoverished. Places for flora and fauna to live, which were only created by agrarian land use in the first place, disappeared with farmers. Swiss social scientist and economic geographer Paul Messerli therefore concluded that the best method of maintaining the land and protecting vegetation was through continuous, site-adapted agricultural land use.[7]

Such well-meaning suggestions, however, cannot deny the fact that farmers never shaped their landscape according to aesthetic or environmental protection considerations. The Alpine landscape actually developed as a 'measure of what was possible' (Paul Messerli), which earlier generations developed in order to meet their living needs. From an historical perspective, this means that Alpine farmers and their animals not only affected their environment by their first appearance, but also continued to influence the perceptions of each new generation of people. As Dale Porter put it in his study on the *Embankment of the Thames*, the purposes for which agricultural field patterns originally were designed, and the contexts in which they functioned, can change or even disappear: 'As objects, however, they tend to persist more or less in their original form'. [8]

From this perspective, environmental history has to take into account that landscape is both cause and result of agricultural development, and it has to distinguish between the land created by agricultural work and the popular imagery of an area that tends to freeze the existing landscape as natural scenery. This distinction also has consequences for the assessment of technology. It is not always technology that changes the environmental attitudes and practices of land use. Rather than the simple cause of environmental problems, technology itself can be the outcome of environmental conditions. In the words of Dale Porter, production methods and technology are much more mediators 'between cultural values, social groups, and institutions on the one hand, and the natural environment on the other.'[9]

The same can be said for the products of agricultural work. Pre-modern dairy products should not primarily be perceived as the aim and outcome of agricultural production; the meaning of milk goes far beyond the idea that farmers support a region's or nation's demand for food. Rather the story of Alpine milk gives an impression of the ways food production was developed as a means of knowing and struggling with the natural environment. Whereas today the locality of products may be seen as externally imposed imagery, celebrating the virtues of a landscape, pre-industrial butter and cheese making reflected much more the connection between local land resources, farmer's skills, tools and practices. Richard White's plea to take man's shaping of nature through work into greater account in environmental history for me seems to be evident.[10]

2. METHODOLOGICAL ASPECTS

In this sense, I shall introduce the history of the Alpine dairy farming as a case study which illustrates the changing relations between natural resources, economic interests and cultural values that form the production methods people choose. Although I discuss the interplay between land use and agricultural production methods, this paper is not intended to be a landscape history and, less than that, a piece of historical geography. My main focus is the history of milk production as an interconnection of regional living conditions, skills and practices. Drawing upon literature and source material mainly from Switzerland, and occasionally from South Germany and Austria[11], the first part of this paper will describe in an ideal-typical model how dairying was integrated in mountainous farming practices. By looking explicitly at the Swiss case, the article, in a next step, shows that already in the sixteenth to eighteenth centuries the mountain dairy system was not only part of a peasant's subsistence economy but also served the requirements of a nationwide and even international butter and cheese trading network.

Spatial perceptions of agriculture and site-specific production methods adapted to the local environment were neither static nor inevitable. Although dairy was an accepted mountain farming system, the character of the landscape did not inherently force people to engage in this type of farming. Even in the Alps the variety of what we call Alpine mountain farming was so great that it is nearly impossible to present it in brief form for the whole Alpine region.[12] From this point of view, dairy farming can at best be described as a situated knowledge and activity, a flexible production method within limits set by the environment: a result of labour division between different geographical areas. As such, it was an integral part of Alpine farming systems and was influenced by community rules that regulated access to, and use of, mountainous meadows.

However, the connection of place and production should not be seen as a self-evident environmental protection practice. If some environmentalists argue 'that work on the land creates a connection to place that will protect nature itself'[13], such a view cannot be confirmed by this paper. Over the centuries, the notion of over-use and under-use of disposable land resources was constantly mentioned, and methods and regulations to balance the use of Alpine pastures can be read as strategies of conflict management. Furthermore, the commercialisation of pre-industrial dairy products was a source of conflicts that functioned between the limits of milk production and different economic interests on the market. As will be shown, some of today's 'traditional' dairy products shape these interrelations between nature, technology and the market.

In order to understand the character of milk production as a site-specific method, the following remarks, in the main, will concentrate on the period between the sixteenth and eighteenth centuries. The final third of the paper, however, gives a brief summary of the nineteenth century and the develop-

ments that precipitated the crisis of the Alpine dairy farming system that finally led to the notion of under-use. Comparing former conflicts surrounding the management of shared resources and today's problems with the under-use of the mountain regions, we can demonstrate differences in the evaluation of the landscape: until the turn of the nineteenth century, agriculture, as a site-specific production system, was hardly called into question. If this changed in the nineteenth century, it was because of the transformation of a rural perception of the landscape to one of nationwide agricultural territories with open markets. As will be argued in this paper, one of the most significant indicators of change that shaped modern milk production was the idea of dairy as an area-independent branch of agricultural production. Across Europe and without any regard for soil conditions or vegetation zones, agricultural regions which had been used for grain production were being converted to intensive dairy farming, and to a new system of milk processing and trade, no longer determined by regional farming practices. Thus, dairy farming acquired an entirely new goal: whereas traditional dairying had served agricultural strategies of land use, the modern milk industry yoked itself to the service of the market.

Most histories of dairying date important stages and activities associated with the industrialisation process of dairying back to the 1870s. Since that time, new breeding techniques and feeding regimes; the introduction of mechanical machines like the milk centrifuge; experiments with milking machines and pasteurisation technology; the fast introduction of fresh milk supply, followed by new 'factories' for diversified milk products, radically changed dairy manufacturing.[14] What is often neglected, however, is that the dynamics that caused the rise of an industrialised and highly engineered milk production were based upon the re-evaluation of agricultural strategies of land use.

To make this evident, the goal of the last part of the paper is to explore some of the challenges to old perceptions of the landscape that happened within the so-called 'organic phase'[15] around the turn of the nineteenth century. A closer look at these stages of agricultural modernisation before 1870 and the consequences of these developments for mountain dairy farming will be described, especially the fact that cheese production moved from the mountains to the valley, plunging mountain dairy farming, which had hitherto been extremely adaptable to changes in the economy, into a crisis. It will be shown how local agricultural reformers reacted: how they tried to overcome the crisis and stabilise the 'traditional' farming system under the conditions of an emerging international milk industry.

3. THE 'NATURAL' ENVIRONMENT OF DAIRY FARMING

Whereas narratives of an industrialised dairy farming system usually neglect landscape and soil but start with the cow as productive force, our ancestors

judged dairy farming as a strategy of land use. Not only in the Alps but also in other regions of Europe the saying 'Dairy farming is land use'[16] was taken for granted. With this sentence people reflected the long-standing rule that animal production for human food has been linked to soil. To balance the equilibrium between grain production and animal husbandry was one of the fundamental rules of all pre-modern farming systems.[17] Thus, the production of extraordinary dairy products in great quantities was the expression of an adequate fodder supply. An old farmers' rule holds that 'cows give milk through their mouths!'.[18]

Unlike today, there existed no nationwide markets for animal feed. The available fodder was instead dependent on the way the land was being used, i.e., the relationship among all types of land management such as arable farming, permanent meadows, forests, pastures, orchards, vineyards, etc. In general, farmers did not use the arable crop in order to produce fodder, only periodically the fallow land supplied fodder for livestock. Today, specialisation and market access have resolved this issue. Milk can be produced on a year-round basis with a feeding system of silage, hay, and grain. In earlier times, farmers needed to adjust more to the variety of land areas which had developed through the symbiosis of rock formations, elevation, climate and vegetation. All mountainous areas were characterised as potential *dairy zones* due to their steep cliffs, rocky terrain and difficult climatic conditions. In addition, coastal wetlands, river meadows, highland and lowland moors, which could only be made arable through large-scale cultivation work, seemed like obvious locations for animal husbandry and dairy farming.[19]

Up to the nineteenth century, and despite the fact that people drew agricultural boundaries in different ways, it was a strong belief that most plants and animals had their natural habitat, outside of which they did not exist. In regions with deciduous forest, one agrarian reformer wrote in 1853, the farmer would be well advised to breed goats, rather than cattle or sheep; in oak and beech tree forests he should prefer pig breeding. Dry and spacious areas should be allocated to sheep, fertile gardens and orchards to bees, lush meadows to cows.[20]

Against this background, the idea of dairy zones as a synonym for spacious and lush meadows, good air and healthy herbage evolved in conjunction with rural experiences, farming practices and increasingly scientific expertise (in the Alps since the sixteenth century).[21] Over the centuries, it became a core concept of knowledge, more and more autonomous and self-evident, and hardly traceable back to its origins. In any case, the idea of characteristic dairy zones survived regional farming traditions and – as will be shown later – guided even the work of agricultural reformers during the industrialisation of agriculture and dairying.

In the Alps, the defining natural feature of dairy zones were the Alpine pastures, those mountainous areas at various elevations which, due to the high humidity and cold weather that induced a short vegetation period, only lend themselves to animal husbandry. These permanent Alpine pastures gave the

mountain range its name. However, the German words Alm (Bavarian) and Alp (Alemannic), which predate the Roman era, also denote the cultivated areas in the mountain range, which, through clearing and grazing, constantly changed in size and form over centuries.[22]

The evaluation of these Alpine pastures was highly dependent on the differences of elevation in connection with climatic variations. An old farmers' proverb holds that the grass is always better the higher one goes, and at the top it is so good that even farmers might like to eat it.[23] In fact, with increasing elevation plant growth diminishes and with it the yields, but since the intensity of sunshine increases, Alpine plants process greater amounts of energy; their protein and fat contents are higher. Animals react in a similar manner. Because of the demands of Alpine living on their bodies, animals are slower to fatten than during the same length of time in the valley, and milk output falls by a considerable amount in the Alps. However, milk is creamier when manufactured at higher elevations. Still today, it is a scientifically proven fact that Alpine milk contains between 15 percent and 30 percent more fat than in the valley.[24]

Moreover, Alpine products were considered to be tastier and healthier because of herbs found only there, containing high percentages of ethereal oils.[25] Butter produced in the Alps in the summer could be valued by its yellow hue and improved spreadability – an advantage that was not unimportant in trade. In addition, the high percentage of ethereal oils was said to improve the salivation and digestion of cattle; and it was claimed that the mountainous climate was generally much healthier for cattle and gave them considerably greater resistance to disease.[26]

In addition, Alpine pastures should benefit from the cultivation. Grazing animals, with their dung, improved the natural soil quality and changed the plant cover by favouring certain plants while eschewing others. Old-growth grass, tall-herb communities and high-growing grass disappeared with animal husbandry and especially cattle farming. They were replaced by plants that were said to have a favourable effect on milk. All yellow-coloured plants were held responsible for the deep yellow of the butter. This is how the buttercup acquired its name. And dandelions are still called *Milchkraut* (milkwort) in many Alpine villages. A lot of botanical names have their roots in these traditional folk beliefs.[27]

The local flavour of the high mountainous meadows showed up again in their products, which is why the cheeses were named after the Alpine pastures where they were produced: *Urnerbödeler* is cheese made in *Urnerboden*. *Albulataler*, *Entlebucher*, *Appenzeller, Saanen* or *Emmentaler* cheese: whole regions were identified with certain types of cheese, or, like in the *Domodossola* region, names such as *Val Formazza* showed their special relationship with dairy farming. As these descriptions attest, the links between landscape, animal and product represented a strain of thought with several components. The notion of dairy practices encompassed perceptions about the influence of the terrain on plants,

animals and their products, or more generally, the ties between different parts of nature.

Consequently, it is not surprising that when the first naturalists and doctors directed their attention to the Alps, they too soon discovered these links. The products of the lowlands could not match the quality of Alpine products, said Hippolyt Guarinonius, doctor and humanist, in the sixteenth century.[28] In 1541 the famous doctor Konrad Gessner wrote his *Libellus de lacte et operibus lactaria,* describing the fertility of mountainous nature in the quality of its products.[29] To the educated classes in Europe the fame of mountain products was soon such a cliché that travellers were surprised not to see cows 'walking up to their bellies in grass'. Ludwig Wallrath Medicus, a German author who in 1795 wrote a report on Alpine farming, was certainly disappointed to find 'just short and rather low grass'.[30]

4. DAIRYING AS INTEGRAL PART OF MOUNTAIN AND VALLEY FARMING

In contrast to farming systems in other regions, the Alpine farmers faced specific problems resulting from the mountainous area. The diversity of landscapes was dominated by the combination of altitudinal belt, varying terrains and difficult climatic conditions. The first and most important effect of these environmental conditions has been restrictions to grain production. Swiss historian of economics Christian Pfister estimated for the canton Bern that in the eighteenth century valley regions could use three-quarters of the farmland for grain production; lower highlands less than 40 percent, upper highlands about 15 percent; and mountainous regions only 4 percent.[31]

Moreover, the environmental impact of land use in the Alps could change within very small areas; this becomes even clearer if we compare the basic conditions in only two Swiss cantons. While contemporaries in the canton Bern distinguished three agricultural zones – the so-called 'cornland' dominated by three-field rotation, the Emmental (a hybrid of permanent meadows and farmland for grain and potatoes production) and the 'upperland' (mountainous areas with grass – especially swampland in the valleys), in other parts of Switzerland, e.g. *Grisons* (located in the East), permanent grassland dominated the strategies of land use in so far as the canton, on average, was located at an higher altitude. Estimates from around 1900 placed available pasture resources at about 50 percent of all productive soil; at the same time in the canton *Valais* about 35 percent of all productive soil was defined as pasture.[32]

But even if the natural environment forced many farmers to concentrate on livestock production and animal husbandry, this did not result in the same kinds of livestock production. With regard to forage requirements and land resources, farmers, in general, can annually support only a restricted number of animals,

whereby the daily plot allowance is variable with the sort of animals and their differing needs in nutrition, frequency of returning to pastures, plant growth and climate conditions. Like other land management systems concentrating on animal husbandry, Alpine farming required decisions to be taken regarding the composition of the herd, whether animals were to be fed through the winter or purchased in the spring or – with regard to cattle and dairy farming – whether more cows for milking or breeding purposes were desired.[33]

According to these preconditions, not only did the amount of small livestock and horses differ considerably within various cantons during the seventeenth and the eighteenth centuries, but, as Swiss historian Jon Mathieu pointed out, even the cattle farming based upon decisive distinctions highly influenced the possibilities of dairy farming.[34] Three specialisations can be distinguished: in regions in which mainly livestock farming (milk cows, bulls or draft oxen)[35] was conducted, to a great extent milk was needed to suckle young cattle, with little left over for butter and non-fatty cheeses. However, if the focus was on butter and particularly marketable fatty cheese, then, conversely, farmers decided against extensive cattle farming. A third and important specialisation was the production of fodder that was sold to cattle breeders, cattle traders and dairymen who tried to maintain their herds through the winter. As early as the late Middle Ages this kind of agricultural specialisation could be found in the core dairy farming areas in Switzerland. [36] It meant that farmers largely did not own cattle but instead rented out and leased farmstead meadows and lowland pastures or sold grain and hay fodder (particularly in the winter). In fact, the regional and local division of labour in livestock production was so well developed by the eighteenth century that there was an active exchange of grain for cattle and milk products between mountainous regions and lowlands.[37]

Whatever the relationship between different regions and various parts of the farm has been, it is impossible to describe the historical variety of farming systems that developed under these circumstances and that could change even within a small municipality. Thus, the following section constructs an ideal model of several characteristics of Alpine cattle farming as they can be synthesised from a huge amount of literature on this topic. [38] At first, all types of production were governed by the dictum that the use of the limited land resources had to be coordinated depending on the season. The unifying feature of mountain farming compared with lowland farming, which was largely concentrated on arable farming, was a graduated farm organisation. That meant that mountain farms consisted of permanent settlements, and farms in the valley or lower altitudinal belt and one or several settlements at various elevations which were used only part of the time.[39]

The mountain farming schedule envisaged homestead grazing in the spring, i.e., until mid-May or early June. Then the farm family took its cattle and migrated for approximately one month to the spring meadow, which was cut later in the year. In mid-June cattle were herded up to the highest Alpine meadow

elevations. In the *Vorarlberg* region (Austria) cattle were supervised in community Alpine meadows by hired shepherds while the families returned to the spring meadow or the valley to keep producing hay.[40] From mid-September to early October the cattle were once again put out to pasture at the lower altitudinal belts before returning home to graze. The hay made in the early summer on the spring meadow was stored there and brought to the valley in the winter months according to requirements. In early November the family went back and only around mid- to-late December did the animals return to the stalls for the next five months.

The number of stages depended both on the mountains' elevations and how soon the cliffs jutted out once the forest, meadow and evergreen tree zone had been passed.[41] Another feature was that the Alpine meadows were divided by farming stages. The lowest and the most fertile Alpine meadows, which were most important in economic terms, were mostly hay- making and cow pastures. When milk cows grazed there, then butter and cheese were produced. Above them were the pastures for non-milk cattle production. The roughest, driest and steepest slopes were the exclusive domain of sheep.

Moreover, location dictated the degree of utilisation. With increasing altitude, vegetation started to grow later in the year, the first snow came earlier, and the number of grazing days went down. Some high Alpine pastures could only be used for a few days, and others up to six months. Thus, the division of summer and winter resources was a complicated business for which it was difficult to define general rules. The effective use of one and the same Alpine pasture, too, sometimes required that cows and heifers had to be moved from one area to another. Over centuries, for example, the cows of the village *Törbel* in the canton Valais were grazed on the *Moosalp* following a regular schedule, with either one or two weeks in five different sections and four weeks at the homebase. 'The cows were grazed in one spot after the morning milking, then taken higher up in hot weather to escape insects, returned to pasture in the late afternoon, milked again around 5 P.M., given further good grazing in the early evening, and turned into their enclosure at nightfall.'[42] In one case, owing to the steepness of the landscape, grazing was avoided from a certain elevation upwards, and in another case hay was only harvested at the lowest altitudinal belts.[43] On many Alpine pastures, even as early as the late Middle Ages rented or purchased cattle were brought to pasture and in the autumn either driven back to where they had come from, sold or slaughtered.

The type of Alpine use also determined what equipment needed to be taken from one grazing stage to the next along with the cattle. For a long time there were only barns, stalls and implements on cow pastures. A mountain hut, near a stream, was a sure sign of dairy farming that was conducted only on those meadows, which could be used for several months. Since the seventeenth century it became more usual to set up barns for shepherds as well as for Alpine animals other than cattle; above the tree line they were made of stone, and in

the forests, of massive logs.[44] Their architecture hardly changed in the period thereafter. A living area for the Alpine herdsmen or dairymaids, a cattle shed for the animals and a feeding station were all the comfort that they afforded. The centre of the hut was occupied by an open fire, over which the large copper cauldron was fixed to a rotatable, wooden crane (a tree trunk with a branch jutting out at nearly a right angle). In the autumn it was taken down into the valley and in the spring it was carried back up. The rest of the equipment was rather modest; milk was processed using a set of pails, bowls, cloths, wooden stirring instruments, storage and transporting vessels, and a butter keg.

5. BALANCING OVER- AND UNDER-USE OF MOUNTAINOUS RESOURCES

Since the higher elevations were not suited to year-round settlement, the question of who owned or regulated access to Alpine meadows was decisive from an economic and an ecological standpoint. A cooperative solution was needed for questions like who could take what cattle to what Alpine meadow, who was supposed to participate in the vast work of taking care of the landscape, and to whom the buildings and the products of a typical Alpine summer (cheese, butter, dung) belonged.[45]

These issues became all the more pressing when the manorial system was abolished, population grew noticeably, and city markets flourished, all of which thrust mountain meadows since the sixteenth century into a position of outstanding economic importance. About the same time, the use of Alpine pastures for sheep and goats was replaced by cattle as the demand for both cows and cheese grew from the more densely populated plains. As a consequence, many Alpine regions in Switzerland became more integrated with economic development in north Italy and in the Swiss lowlands. No longer was clearing back forest and creating new glades in the mountains a risk-free proposition. Already in the sixteenth century, several northern Alpine areas were judged by contemporaries as dangerous frontiers, and many farmers were forced to convert their farmstead meadows in the valley to hay meadows.[46]

Whatever ownership forms managed to prevail in the period thereafter,[47] in most cases people strove to keep ownership and rights of usage separate. That afforded flexibility in the use of meadow resources and the products of an Alpine summer, yet at the same time required exact cooperation. Nearly everywhere only village or commune residents were eligible to join the cooperative. Citizens of other communities were barred from joining but could let their cattle graze on an Alpine meadow for a hefty fee. Even on private Alpine pastures, the only legal form where ownership and rights of usage were identical, foreign cattle were a frequent sight. If an Alpine pasture was in the community's collective ownership, this, in turn, did not automatically mean the milk was processed in

cooperative fashion. On very large and highly productive community Alpine meadows, the facilities and implements were often privately owned and milk was independently processed. There were consequently many mixed forms between strict individual cheese dairies and cooperative operations with hired shepherds, farm labourers and dairymen. It often happened that the owners of the Alpine pastures herded their cattle jointly but sold the milk to a dairyman who bought it at a fixed price and processed it at his own risk. Or, the owners, farm families and village neighbours, exchanged milk, after the milk of the entire herd was, in turns, processed by every member of the Alpine cooperative on his/her own account.[48]

The most decisive reason for the separation of ownership and rights of usage was the problem of finding that fine line between the overgrazing and selective grazing of feeding grounds. Overgrazing, in particular, required from an early date resource-conserving measures that were regulated in a specific legal document – the Alpine ordinances.[49] This codified legislation, which appeared as early as the fifteenth century and more often along with the intensification of Alpine farming from the sixteenth centuries onward, sought to strike a balance between limited natural resources and growing economic interests, similar to agreements on the time of sowing and harvests of the fields, irrigation rights, forests or use of commons.

The Alpine ordinances came about due to specific disputes and changes in ownership and demarcation, but also often to increase harvests.[50] In one way or another the issue almost always boiled down to preventing over-use of the Alps. Cattle overpopulation on an Alpine pasture could cause ecological problems: their vegetation cover destroyed by too many animals, and unable to recover quickly. Conversely, if there were too few animals, they were selective in grazing, which meant that some fodder plants gradually disappeared and that the pasture turned to weed. In a long-term perspective, this, too, would decrease the available fodder and the biodiversity of the meadow.

Since a basic rule was that eligible herders could only drive their cattle to the meadow if they had kept them over the winter without purchasing additional feed, often cattle had to be rented if a pasture faced the threat of under-grazing. Apart from this, there were very specific rules to prevent the short-term overgrazing of the meadows. Maximum limits on use (maximum head of cattle, expressed as cow rights = the right to bring one cow to an Alpine pasture in the summer[51]) and strict use time periods (neither too early nor too late, etc.) were intended to prevent this problem.[52]

The proper number of animals, grazing in a specific time period, was the important factor. However, the same holds true for the beginning and end of the grazing period. Joint herding was the key. What has today been degraded to a folklore event, in fact served to ensure previously that none of the eligible herders was first to show up with his cattle at the fresh pasture. Compliance with the set numbers and times was strictly enforced.[53] To sum up, the Alpine

pastures were not only used as the most productive economic zone but at the same time were also recognised as the most ecologically sensitive zone and used with special care. Through ownership and possession the use and care were provided. But also a certain amount of social control was organised to give the cultivated land additional stability. This included a great deal of maintenance and repair work of barns, paths and water resources, improving eroded areas, and clearing away debris from avalanches on Alpine pastures in spring. Such work also aimed to prevent obstruction (blockage and damming caused by trees, rocks, etc.). This maintenance and repair work always required a great deal of labour that had to be resolved as a collective task. Thus, not only a certain political framework was necessary, sometimes even feudal lords (the counts of Tyrol, for example) supported farmer's cooperatives because they had realised that short-term exploitation of their land would undermine their own sovereign authority as well as their power.

6. BUTTER AND CHEESE – PRODUCTS OF THE SUMMER MEADOW

Rules met practical needs in land use and were tailored to characteristics of the cooperative's environment. Careful control of access, fair division of maintenance and repair work and, particularly, the proper number and assortment of animals shaped the centuries old form of Alpine farming systems. Within this system of flexible grazing and range management, the production of butter and cheese also helped to strengthen the utilisation of mountainous areas. It enabled flexibility within the limits set by the natural environment, the strategies of land use and the social structure of the communities. Here, too, the need of every community's families for food and communal property existed side by side. In the next section I shall address in more detail the materiality of the dairy practices, to shed more light on the inherent logic of the work with milk under the conditions of a specific environment.

In principle, butter and cheese can be produced year-round, and, of course, one can assume that the Alpine people did so in pre-modern times. Nevertheless, butter and cheese were represented as products of the summer meadows and irrespective of the extent to which dairy farming was done in the summer on the Alpine pasture, there existed no commercial cheeseries (dairies) in the valleys before the beginning of the nineteenth century.

Since the end of the eighteenth century, several authors have argued that the output derived from the Alpine pastures was negligible compared with the quantity of milk produced on the meadows located on lower elevations, in the valleys or near by the farms. Estimates provided by different methods of calculation produced a range of about 30 percent for the amount of milk produced and processed on the Alpine pastures in the summer months.[54] Why then, one wonders, have Alpine pastures been the dairy zone par excellence?

As the previous sections made quite clear, the intensive use of scarce resources encouraged diversification that utilised available pastures in different ways. But I would argue that it was not only a specific kind of labour economics that defined the value of mountainous meadows. Butter- and cheese-making on the Alpine pastures should also be explained by cultural values, e.g. the evaluation of the landscape and the quality of the products derived from it.

As previously argued, until the nineteenth century it was a widely accepted belief that the best dairy products derived from the mountains. The notion of butter and cheese as summer meadow products encompassed observations about topography, climate, plants and animals as well as visions of nature and health. However, what is important to mention is that these beliefs coincided with some technical problems in the manufacturing of dairy products in pre-modern times.

First, one should bear in mind that if dairying does not work with a constant flow of milk like today, people have to make decisions. If the amount of available milk is restricted, then, on the one hand, one can concentrate on butter and produce only a low-fat cheese from the skimmed milk. In this case, the milk stood one or more days in a flat wooden vessel until cream separated and floated to the surface. The cream was then skimmed off and churned into butter in a large keg. This skim milk (buttermilk), with the addition of sour whey, was then used to make a cheese. This old method of using milk was called either butter making or acid curd cheese making.[55]

On the other hand, if one decides to produce cheeses for a longer shelf life then one needs, in general, more milk and substantial parts of the milk fat.[56] This becomes all the more clear if one looks at the ratio of milk to raw yield of butter and cheese. For 1 kilogram of fatty cheese around 10 to 12 litres of milk are needed (the reader should bear in mind that 1 loaf of Emmental cheese now weighs around 100 kilogram).[57] There were different amounts of milk depending on the season. During the winter months, a considerable decrease of milk production was natural. Already in November, cows in calf gave less milk or even nothing, and from January to March almost all milk was needed to suckle calves (if the priority objective was cattle breeding even longer). Moreover, in the last few weeks before giving birth to a calf, cows do not give milk, and even throughout the rest of the year their output varies. If one takes nineteenth-century figures as a yardstick,[58] good cows provided 8 to 10 litres in the best time of the year, in June, yet in autumn their daily output often shrivelled down to 2 litres of milk a day. Since farmers saw to it that calves were born at the end of the winter, wherever possible, and that they were milked in the first few weeks (since the amount of milk provided by a cow rises with the weight of a calf), the Alpine summer coincided with the period of high milk yields.

To be able to manufacture 10 kilograms of cheese even in the best months – May to July – the milk of 10 to 15 cows was still necessary. Because most valley meadows were commons, Alpine villages and communities had limits on

their cattle herds; having 6 to 8 cows in the stall was already a sign of prosperity.[59] Only joint and often cooperative operation of cheese manufacturing on large Alpine pastures was able to bring together in one place enough cows to make it profitable to produce cheese that would keep. In the valley, one family might manage two or three cows without the help of farm labourers; on the Alpine meadows three or four labourers could take care of 50, 60 or even more cows together. According to data about an Alpine pasture of the Valais canton, raised at the end of the nineteenth century, two herders and their assistants supervised the grazing of about 210 cows and some 60 heifers and calves. The three dairies located on this pasture handled some 70 cows, each was staffed by a cheese-maker, a female milker, and a weigher. These full-time workers, altogether about 15 persons, relieved over 100 households of the daily chores of feeding and milking the livestock.[60] The work of this hired staff allowed the farm families meanwhile to concentrate on the demanding tasks of haymaking and grain harvesting etc. And even the owner of just one cow could purchase butter and cheese products from such places. [61]

7. DAIRY PRODUCTS FOR SELF-SUPPLY AND THE MARKET

The storage time of dairy products and the expert knowledge of herders and cheese-makers finally brings us to the market relations of early modern Alpine dairy farming. In general, the butter and cheese making in the mountains did not only serve the needs of the local population. Since the fifteenth century, the export of Alpine cheese did its part to spread the wondrous reputation of the Alpine milk. Unlike the rest of Europe, in the Alps many feudal landowners or monasteries began early on to share their 'fief meadows' with the rural populace without levying taxes in all cases. The population in the Swiss mountain cantons were the first to enjoy more freedom and independence than other farmers. Here, commercial cheese making was being practised as early as the fifteenth/sixteenth centuries.[62]

What is important here, however, is that the storage time of dairy products increased their sale chances, but not always their prices. Salted butter may be made from either sweet or soured cream. To ensure preservation, however, it had to be salted, more or less. Butter merchants usually tasted the products and mostly graded them after the salt was added. Thus, it was an important factor whether they found the butter mildly or heavily salted. While quality standards in the butter trade depended on the salt, cheese prices were up to the hardness of the sales offer. The harder a cheese was, the longer it could be stored and transported, the higher was its price.

In some parts of Switzerland, e.g. the canton of Glarus, butter and cheese (the so-called *Schabziger*) were exported; in other cantons, e.g. the Bernese Oberland, butter was the main commodity traded up to and into the sixteenth

century.[63] The mountain farms in this region that later became famous for their fatty cheeses supplied domestic demand and also conducted some trade with various cities on the Upper Rhine (Strasbourg, for one). Since 1481, however, city councils of the canton Bern repeatedly banned butter exports in order to guarantee the domestic supply of butter.[64] Paradoxically they achieved the exact opposite effect. During the sixteenth century many cheese farms, starting in the *Fribourg* alps, began to intensify the production of fatty cheese and to make such vast improvements in the technology that the product was easier to transport and therefore easier to export.[65]

From now on national and international trading exerted influence on the Alpine dairy practices. Prior to this, cheese was only exported at irregular intervals, usually accompanying cattle along the north-south transit routes. Only the Schabziger cheese from the canton of Glarus achieved fame beyond its regional borders; it was an acid curd cheese made of skim milk, which obtains its characteristic green colour from a certain herb (Trigonella caerlea).[66] Once the cheese farms, hit hard by the Butter Regulations, realised that fatty cheese was more lucrative,[67] an increasing number of them went over to fatty cheese production. Thus, the spread of fat cheese production enhanced the cheese trade. Between the sixteenth and eighteenth centuries the important Swiss cheese regions were the Greyerzerland (canton of Fribourg) and the Emmental, with its still renowned cheeses; the Bernese Oberland, with its famous *Sbrinz* or *Spalenkäse*; and the canton Appenzell. Alongside these existed several specialities like *Bellelay*, *Schwyzer*, Entlebucher or *Ursner* cheese and the already mentioned Glarner Schabziger.

The shift in the method of production had some operational implications. Now, all elements of milk were used to make fatty cheese: i.e., the cream was not skimmed off, nor was it churned into butter. The use of rennet had been known for a long time but it was only the increasing trade that had such a decisive influence on the technology of making fatty cheese. The improvement spread by dairymen throughout the northern Alpine region since the end of the sixteenth century involved the hardness of the cheese. By subjecting the cheese mass to greater heat, cutting it into smaller pieces in the cauldron and storing the loaves in the pantry for a longer time, the cheese became considerably harder and thus more durable. In contemporary terminology, the cheese was 'burned'.[68]

The fact that the loaves of cheese became smaller through this method, though, was not in the merchants' interest. Duties on the cheese were determined by quantity and not by weight. Therefore, larger loaves of cheese were easier to sell than smaller loaves. The large Alpine pastures, having large cattle populations and thus being able to produce large quantities of milk, were especially suited to meeting this customer demand. The latter was only limited by the volume of the cauldrons, and they soon could hold over 100 litres. This explains the success of certain types of cheese, such as Gruyère or Emmentaler. As summer cheeses they sold well abroad; the soft cheeses made in the autumn remained

in Switzerland.[69] To meet international demand, other regions (e.g. Entlebuch) began during the eighteenth century to declare their cheese as Emmentaler and to sell it under that name.

At the same time this reorientation led to the standardisation of cheese-making methods across the country. The method originally brought to the Emmental Alps by Fribourg dairymen spread throughout the northern Alpine region.[70] Here, the milk was heated to at least 25–28°C, generally to 30–36°C, and tested on a forearm. When the desired temperature was reached, the pot was removed from the fire and filled with rennet from calves' stomachs.[71] The curd was then, in the cauldron, cut in the smallest pieces possible with a shaven pine twig, since the hardness of the cheese is in inverse proportion to the size of the pieces of curd. Time was of the essence since the mass would otherwise have become too sour. Once the whey was removed, the leftover quark was put into round wooden cutters with openings on the sides which allowed the excess cheese liquid to seep out. Under pressure from stones, the cheese then sat still for some time before being taken to a cellar for salting and maturing. After three to four months, the cheese, stored in kegs, could be transported down from the mountains by mule, and then shipped throughout Europe.

Between the sixteenth and eighteenth centuries many who could not subsist through farming entered the fatty cheese business. Labourers, milkers, cheese farmers trained by Alpine cooperatives, and the sons of farmers who did not inherit enough land to live on, reacted to the rising demand of cities for milk products.[72] In the canton of Bern, these so-called *kuher* jointly leased cow herds or bought pregnant cows and went from farm to farm with their animals through the farmstead meadows and Alpine meadows of their region in order to buy stall space and hay from farmers. With the success of this system, it became even more attractive for them to engage in dairy products trade.

This situation led to a unique contract between the farmers in the valleys and the cow herders. When the *kuhers* came down from the Alps in autumn, needing a home for themselves and their cattle, they were sheltered at the farms. The farmer fed and lodged everyone, human and animals, until his stores of hay for the cows and provisions of food for the humans were exhausted. The *kuher* then moved to the next farmer on contract, who again lodged him for a few weeks. This rotation went on for all the winter months, until it was time to ascend to the Alps again.

There was a great advantage for both parties. The *kuher* had shelter in winter, receiving food and everything he needed for his family and his animals. The farmer got the dairy products and also the dung he needed urgently for his fields. Soon wealthy city dwellers saw how profitable it was to invest in Alpine meadows. Patricians from Bern, who owned the most profitable alpine meadows, leased their meadows, complete with buildings and cheese vessels, to this newly developed guild of cow herders over the summer; the latter, as a

class of self-employed entrepreneurs, gradually purchased large herds of cows and became specialists in cheese manufacturing and trade.

Business with fatty Emmental or Gruyère cheese, which were increasingly being marketed under the collective trade name 'Swiss Cheese', went so well that in the eighteenth century, that other parts of Switzerland, like the Zurich region or Grisons, entered the dairy business. Regions like the Glarnerland or Appenzellerland, which had focused mainly on cattle trade until then, also began to specialise in dairy production and processing.[73] At the time many noted that a cattle epidemic would bring greater misfortune to Switzerland than a human epidemic.[74]

8. AGRICULTURAL MODERNISATION AND THE UPSWING OF VALLEY CHEESE FACTORIES

The Alpine farming system thereby proved to be economically quite adaptable and made farmers in well-connected regions and along the old transit routes rather prosperous. Between the sixteenth and the early nineteenth centuries the Alpine pastures were a highly productive economic zone for Alpine farmers in regard to livestock production and dairying; as the eighteenth century came to a close, this system began to disintegrate.

For a long time the literature mentioned the beginning of the Industrial Revolution as an explanation of this process, with not only the classical industries (textiles, mining and precision engineering) but also tourism, energy production and the expansion of transportation being cited.[75] This view, however, made farmers look like backward *'hicks'* who were lagging behind commercial and industrial growth. More recently, though, scholars have largely debunked all these clichés of farmers as Luddites.[76] In the Alps, too, agricultural modernisation was by no means an exogenous process; in fact, innovations with effects lasting well into the future were launched using local knowledge and experience.[77] That dairy farming lost its territorial roots and thus gave rise to the danger of potential under-use of the mountains was not the result of industrialisation and the economic marginalisation of agriculture.

In actual fact, the post-eighteenth-century agricultural reforms had the undoubtedly unintended side effect of pushing aside Alpine farming, and of driving a nail in the coffin of butter and cheese production.[78] Around 1760, the new physiocratic school of economic thought deemed land to be the key to economic progress. Consequently, its proponents demanded that agriculture be modernised. The idea was not to eliminate mountainous agriculture but to accomplish a fundamental land reform with a view to using more effectively the natural nitrogen cycle.

All proposals and measures for agricultural reform were based on four innovations: 1) abolishing the old style of meadow farming in all arable farming

regions (i.e., no longer allowing land to lie fallow and parcelling the communal pasture); 2) planting feed plants, such as clover and sainfoin; 3) summer stall feeding to make it easier to collect cattle dung and liquid manure; and 4) requiring that fields and meadows be fertilised more intensively with the increased quantities of dung.

In the past, lowland farmers – without questioning the complex system of mountain and valley farming in its entirety – had been able to share in the profitability of Alpine farming through leasing, renting out land or selling hay. However, as agricultural reform began to take effect, the vested interests began to change. Lowland farmers extended their cultivation of feed in the fields, left their cattle in stalls, and began to cultivate their meadows and fields more intensively. In some regions, the protoindustrial years of crisis (1770–1773) supported these ideas. In these years of fame, local authorities of the canton Glarus, for instance, started to prohibit the nationwide and international cattle sale (the centuries old and famous *Welschhandel*) and encouraged farmers all over the country to improve the milk production. Fodder scarcity and inferior feed quality, the harsh consequence of these measures, were accepted. Moreover, they motivated local authorities to accelerate land reforms.[79]

The process of change lasted decades; nevertheless, more and more farmers in the lower-lying grain-growing regions hoped to increase their incomes through artificial meadows or artificial feed and expanded their cattle husbandry.[80] Regions where, despite all the natural advantages of abundant vegetation, farmers had stubbornly adhered to the practice of planting grain, likewise reacted. For instance, the Allgäu region in the area at the foot of the Alps, where, around the turn of the eighteenth/nineteenth centuries, 'farmers, having received foreign ideas, thought of the natural possibilities of […] making the "yellow" and "blue"Allgäu (flax growing) into the blossoming "green" Allgäu'.[81] This reorientation was so radical that today, in the Bavarian part of the Allgäu, the farm landscape is said to have been completely 'greened'.

However, when the feeding situation in the lowlands improved, the next logical step was to bring dairying down into the valley. Swiss author Jeremias Gotthelf, in his 1850 novel *Die Käserei in der Vehfreude,* described this with stunning acuity:

> 'clover, sainfoin, and alfalfa came into the land, and stall feeding became possible, the forests were opened-up, meadows made arable and potatoes planted 'en masse', not just as a sort of dessert. Where cattle were in stalls, there was dung, large and small dung, and it was used copiously and sensibly. As more dung was available, arable land grew, as did the herds of cattle and specifically the cows that could be used [...[As the number of cows grew, so did the milk, for everything is interlinked, and one grows from another in an uncommon manner, and often in such a fine line that man does not even see the thread, a much finer thread than between cows and milk.'[82]

Yet Gotthelf also noted that farmers at first remained sceptical. To be sure, in an initial movement between 1790 and 1810 many of them introduced fodder cultivation, stall-feeding and the manufacture of fertiliser, and also participated in a reform of community ownership of land. Nevertheless, there was little support for bringing cheese making out of the mountains. In fact, fatty cheese production, in connection with stall-feeding, became the subject of decades of heated debate, especially among economic schools of thought:[83] too deeply rooted was the conception that high-quality fatty cheese could only be made out of Alpine milk and that the good reputation of Swiss cheese had its roots in mountain farming.

In fact, the first commercial cheeseries, established in the valleys around 1820, were not established by farmers but by agricultural reformers[84] or dairymen with business acumen, who could sense that Alpine pasture farming was headed downhill, or cheese traders.[85] The latter were primarily concerned with shortening their transportation routes when they attempted to convince valley farmers of the virtues of dairy production. In addition to cheese factories, they created warehouses where they could store unripe cheese purchased from the Alpine meadows and allow it to age. Gradually non-farmers began to acquire expertise in cheese making and to refine it as they pleased.

These cheeseries, however, presented farmers with a new type of competition. Soil quality, fodder, care of animals and Alpine pasture farming were no longer relevant. Cheese traders naturally were no longer interested in those issues. Their sole concern was cheese as a raw material, which – as people were slowly beginning to realise – could easily be produced in large quantities and sufficient quality in low-lying areas. However, a sensible method of organising the procurement of the quantities of milk needed to produce fatty cheese was needed, since no single valley farmer had herds the size of those brought together in the Alpine meadows. Joining forces to form cooperatives seemed to be the answer, and not just to this problem. United, cooperative farmers could resist the prices forced upon them by cheese traders and – if they could reach an agreement – run cheese making operations themselves.

Despite initial objections and resistance among farmers and cheese traders, the cooperative model spread quickly from its origins in western Switzerland.[86] The constant improvements in the transportation infrastructure from the 1840s and the reduction (in some domestic transportation routes, total abolishment) of customs duties served to convince the last doubters that cheese could also be manufactured in the valleys. In 1847 an agricultural census in the canton of Bern counted 217 valley cheeseries; a decade later this number had already swollen to 355.[87] Only mountain cheese production failed to benefit from the general upswing; its share of Alpine cheese production steadily declined.[88]

9. DOUBTS CONCERNING PROGRESS

Because the production conditions in the valley were by no means more favourable than on the mountains, and technological improvements in cheese making were not implemented immediately, farmers – in the beginning – had good reasons to be sceptical. Into the 1860s the equipment in valley cheese factories was no different from that of their counterparts in the mountains. Only around this time did it become standard practice to use walled-off cheese cauldrons with outer covers, an iron grate, ventilation and a direct link to the chimney instead of open fires.[89] And it was only in 1877 that Wilhelm Lefeldt (1813–1913) invented the milk centrifuge, giving cheese-makers a useful way of skimming cream off the milk more quickly and efficiently.

Predictably, the upswing and profitability of dairy farming were accompanied by efforts to extract the maximum profit from meadows and milk cows. To natural dung were added all sorts of artificial fertilisers, and natural fodder was joined by many varieties of artificial feed. The cheese factories soon realised the cost. Despite improved facilities and careful use of production techniques, Swiss cheese factories began to see a noticeable increase in defective cheese output in the 1870s (i.e., it was improperly fermented, did not keep as long, or the dough crumbled, etc.) and exporters noted that the general quality decreased. Operators of cheese factories were agreed that the cause of this decline in quality was to be found in the intensification of feeding, the use of artificially preserved liquid manure and all other types of artificial fertiliser. In an ironic twist to history, the end of the nineteenth century saw calls for a return to natural feed and meadow grazing.

Nevertheless, the new system was not fundamentally called into question. Only mountains and mountain farming were considered to be impediments to innovation. Interest in the economic potential of the higher elevations died; it is telling that Bernese citizens sold their Alpine properties one after another around the mid-nineteenth century. The Emmental cow herders' foray into the world of free enterprise came to a quick end. By the 1860s the former capital of cheese making in the Bernese Oberland had been reduced to a cattle-supplying area for the lowlands.[90]

By this time politicians, civil servants and the educated classes (especially the clergy and doctors) felt the increasing need to save Alpine farming. During the heyday of Alpine farming complaints had often been made about overgrazing of Alpine meadows. With the advent of valley cheese factories the arguments were turned around: now accusations were being made of apathy and neglect of Alpine meadows. The fact that the highest Alpine pastures were gradually being abandoned altogether and that, at more accessible Alpine pasture locations, cattle were being left alone without herders, was considered to be a sign of indifference on the part of farmers.[91] Critics noted that buildings were falling apart, roads were being buried by landslides, and fences were no longer

being repaired. Moreover, piling fertiliser next to the huts at the milking stands instead of spreading it over Alpine meadows seemed to be a scandalous waste of valuable fertiliser.[92]

Mountain farmers were increasingly being criticised for being backwards, averse to innovation, and hidebound. However, backwardness was not being seen as a sign of ecological friendliness or as a result of increasing competition; on the contrary, Alpine reformers saw such backwardness as a sacrilege to an inherently bountiful natural environment. They claimed that humans caused much greater damage than landslides and other natural disasters. It was not only the 'unmitigated thoughtlessness with which the high Alpine forests were, and sometimes still are, being laid to waste and destroyed at the hands of humans'[93] which encountered harsh criticism. What was worse, they said, no lush meadows were being planted in place of the high Alpine forests: only barren landscape and devastation remained.

Riding a wave of national sentiment, the mostly bourgeois, urban reformers in Switzerland felt compelled to take matters into their own hands. On 25 January 1863, some 30 men from all parts of the country convened to form the Swiss Alpine Farming Association.[94] Their job was to unite activities to improve the Alpine landscape. In the founding document, '[a]ctivity in the pure Alpine air and a diet of cheese, butter, milk and meat' was praised as a source of health, physical strength, and the spirit of freedom of the Swiss people. The shepherd, who embodied these Swiss virtues, could not be allowed to fall into oblivion, nor could his regions be allowed to suffer under the indifference of modern man. It was said that there were *'immense treasures to be had'* in the mountains.[95]

More and more, the Alpine dairy tradition was transformed into national milk symbols that could be used as marketing instruments in the transition of the *old* Swiss dairying practices into an industrialised milk business under the conditions of an emerging international trade. As a new kind of crisis management it did not only help to integrate the different local identities within Swiss agriculture (lowland and mountain farmers; region and nation). The creation of a typical Swiss product was also aimed to improve the competitive position of Swiss products, 'because we have to confess, that since the 1870s it (the Swiss dairy industry, BO) in its quality evolution did not withstand the competition of foreign countries.'[96]

One of the brightest thinkers among the founders of the new association, the country pastor Rudolf Schatzmann (1822–1886) who hailed from the Bernese Oberland,[97] wrote in 1872: 'Milk is the fundamental material of our nation, to build and support its ability to work'.[98] With those ideas in mind, reformers of the Alpine dairy farming responded in two ways. On the one hand, the aim was to catch up to the economic boom in the valley by improving Alpine farming. People like Schatzmann thought that science and technology would provide the tools to that end. They used lectures, essays, courses, exhibitions and inspections of cheese factories to preach tirelessly the gospel of the latest

achievements in the science and technology of dairy farming to the mountain inhabitants. Thinking that in order to save Alpine farming dairy farming needed to be modernised, Schatzmann's greatest triumph was the opening of the first Swiss milk testing station in Thun on 1 September 1872. This was later joined by another station in Lausanne.[99]

On the other hand, promoters of the Alpine dairy farming system used their activities to persuade the urban population about the healthy and tasty products of the mountain meadows. In his *Alpwirthschaftliche Volksschriften* in 1873, Schatzmann praised 'the aromatic Alpine herbs and the fresh, healthy Alpine air' as the important conditions 'for healthy, strong and beautiful cattle and tasty butter and cheese.'[100] Schatzmann, like his companions, made no secret of the fact that every innovation in the valley made the soil there more attractive, thus exposing ever more painfully the disadvantages of higher elevations. Nevertheless, he never got tired of reminding his fellow citizens that Alpine nature was the pride of the Swiss national economy. And if the whole nation would comprehend this relevance, he predicted, this would usher in a golden future of mountain dairy farming.

10. COMPETITION THROUGHOUT EUROPE AFTER 1870

These predictions would turn out to be a fallacy. By this time the writing was on the wall: Alpine milk producers, whether in the mountains or in the valleys, would soon face unimagined competition. Across Europe and without any regard for soil conditions or vegetation zones, agricultural regions, which had been used for grain production were being converted to intensive dairy farming beginning in the 1870s. In all those places where one used to say that 'cattle guarantee true pure yield only in those open and fertile pasture areas not capable of arable farming which are used for cattle husbandry, but not in general in usual arable farms where cattle are and must be only held out of sheer necessity'[101], now farmers were beginning to grow interested in cattle and its products as a goal of production.

Between 1870 and the beginning of World War I, cow's milk became a mass consumer good which was increasingly being sold as fresh produce, especially as a beverage. Within just a few decades, dairy production in a country such as the German Empire achieved a production value on a par with that of coal mining.[102] Even Emmental cheeses, despite being traded as a Swiss specialty, were soon no longer the exclusive preserve of Switzerland. Starting in 1914 fake Emmental cheese was produced in Germany, France, Italy and even in Finland and Russia.[103]

The spread of dairy farming throughout Europe represents an agricultural evolution of gargantuan proportions, and its story cannot be told in this paper.[104] Let me say this much: the fact that livestock husbandry, dismissed by many

central European farmers as useless and burdensome, suddenly seemed profitable, was foreshadowed in the debate on agricultural reform following the end of the eighteenth century but only came into being once developments in international grain markets created the harsh conditions for this change. Europe's last major famine was in 1846/47; in the years that followed, the liberalisation of the grain trade and the effects on distribution of an increasingly wider and more closely linked network of railroad lines were able to offset an under-supply and not just at the local level. National and international markets were able to establish themselves for the long haul, which was soon followed by price wars. Agriculture based traditionally on grain production became unprofitable and needed to be replaced with other sources of income. The structural change in agriculture was accelerated by the fact that numerous farmsteads were sold or changed from full-time to part-time farms and by the migration of wage-earning farm labourers to the cities.

This change of heart among farmers, which did not take place in an uninterrupted fashion, was also accelerated by the processes of urbanisation and industrialisation. All across Europe, the growth of cities exposed the limits of the traditional system of food supply. The hunger for land of industry and residential areas pushed agriculture increasingly from central locations to the fringes; and trade in foods, which were transported across large distances, naturally became more and more important. Whereas relatively durable foodstuffs such as grain were quite adaptable to the new sales requirements, the market for perishable fresh produce reacted with price increases. In pre-industrial Europe, the dairy industry, for stock-building purposes, had largely meant butter and cheese, but in the last thirty years of the nineteenth century fresh milk (as a beverage and an ingredient in fresh dairy products) was characterised as a peoples' foodstuff in the cities. That made it rather lucrative. Converted into Reichsmark, between 1855 and 1865 milk cost between 9 and 10 pfennigs per litre when purchased from a farmer in the city of Berlin. By 1875 the price had gone up to some 14 to 15 pfennigs, and in the 1880s it held firm at around 18 to 20 pfennigs, of which the producer pocketed 12 to 15 pfennigs[105]

The farmers based in the immediate vicinity of large consumer centres were understandably the first to react to the observation that the price of fresh milk was rising faster than that of other agricultural products. Many of them sold their farmland as construction sites, often involuntarily, and only practised pure dairy farming on their remaining property. In extreme cases, these farms had no independent agriculture anymore but instead purchased nearly all the necessary fodder on the fodder markets, which were growing fast due to imports. Without their own fodder base, they could only purchase highly pregnant or freshly lactating cows, milk them for a lactation period, and then sell them for slaughter.[106]

Such highly specialised 'milking-only' farms were not the only consequence of the increasing urban demand for milk. Milk production, which began to frag-

ment, just before the turn of the century, into individual markets for fresh milk, butter, cheese and industrially manufactured durable dairy products, became more and more enticing to all farmers. Even the more remotely located farmyards were able to share in the milk boom. Their milk was distinctly cheaper than that of the milking-only farms, especially once hygienic measures and improved transportation networks helped to resolve the tiresome transportation problem. Conditions became increasingly favourable for making cow's milk a multipurpose raw material.

11. IMPLICATIONS

The implications of this development for mountain farmers were obvious. Alpine mountain farming, traditionally based on livestock husbandry, could not easily share in the profits from the growing consumption of milk and dairy products. To this day the transportation of fresh milk from the mountains to the vicinity of consumption centres has remained a technological problem. And cheese factories, in light of the sudden torrent of milk products, only had a chance to compete in expanding markets if they had enough ways and means of distributing their products to city markets.

Although some Swiss regions were particularly well suited to this type of distribution, international competition still made its presence felt almost immediately. From the mid-1880s the number of new cheese factories began to stagnate. Even in the highly productive canton of Bern, there were no more cheese factories in 1923 than in the 1880s (625), although the quantity of processed milk had risen from 1.2 million litres in 1884 to 2.07 million in the 1910/1911 farming year. The region, though a participant in the upswing, had lost its site-related advantages.

The fact that the intense competitive pressure had a less severe impact on the Alpine meadows can once again be attributed to the adaptability of mountain farming. Over the course of the nineteenth century the number of abandoned Alpine farms gradually decreased. It was especially because of the change in the makeup of the Alpine livestock that the loss of Alpine meadow area was held in check. Cows were increasingly disappearing; animals not requiring human herders (pups and heels) remained. The tradition of butter and cheese making in the summer decreased; the use of the Alpine pasture livestock breeding persisted. An awareness of tradition, economic necessity, the availability of labour in sufficient quantities and tourism in the Alps were further reasons why many Alpine cooperative farmers and individual farm operators insisted on sending cattle up to the Alpine meadows in the summer.

Only after World War II did the Alpine population become less willing to farm the land under increasingly difficult farming conditions; and as increasing numbers of young people left the mountain villages, the system collapsed. At

that time, however, townspeople attached value to the aesthetic and ecological functions of mountain farming. In view of the increasing environmental problems in major metropolitan areas, the desire to flee the cities for a pure environment during increasingly long holiday periods increased and formed new forms of land use. These new tendencies also influenced Alpine agricultural policy. Thanks to regional promotion measures, mountain farming survived. Since the end of the 1970s even more cows have been brought to the Alps to graze. In some places the milk is delivered to the valley in appropriately equipped vehicles, by cable car, or even by helicopter.[107]

From an agronomic perspective such measures seem dubious. At the same time when the mountainous milk production was stimulated, on a European level milk quotas were enforced in order to stop overproduction of milk. Since 1984 European farmers are allowed to produce a stipulated maximum amount of milk. But what seems plausible from an agronomic perspective seems necessarily desirable from an environmental policy point of view. Because mountainous food production is promoted in order to create a landscape which is valued as a 'natural environment,' today's dairy farming has become a kind of gardening technology.

NOTES

[1] For the history of the European agricultural policy in general, see: Ingersent 1999; Priebe 1985. For the ecological change of mind in agricultural policy, see Heißenhuber 1994. I would like to acknowledge the great help of Michael Dear, who has translated an early version of this paper.

[2] Quoted in Niederer 1996, 372.

[3] Greif, Franz and Klaus Wagner, Österreichische Berglandwirtschaft - Stütze der Marktproduktion oder ökologische Restlandwirtschaft, in Anwander Phan-huy 1997, 39. See also Dax 1998, 153–9.

[4] The Alpine panorama marketed by the tourism industry includes not only rough and inhospitable mountain ranges but also the rural man-made farming landscape with its specific fauna, buildings and implements. Unlike in North America, where the concept of 'wilderness' plays a key role in environmental policy debate, historically developed cultural landscapes determine what constitutes nature in Europe. This consensus in society that addresses farmers' reproductive achievements in nature led to the tasks of '*Erhaltung der natürlichen Lebensgrundlagen, Pflege der Kulturlandschaft, dezentrale Besiedlung des Raumes'* ('Maintaining natural foundations of life, taking care of the cultural landscape, and the decentralized settlement of the area') being incorporated into the Swiss Federal Constitution in a referendum in 1996. As a consequence, direct agriculture-related payments have risen dramatically, from 100 million Swiss francs in 1993 to 745 million francs in 1998. Whereas in valley farming some 15 % of gross agricultural earnings come from direct subsidies, in the highest mountain farming zones this figure is a whopping 50%. See *Mehr Natur in der Landwirtschaft - eine Zwischenbilanz* 1999.

[5] Over-use, pollution and the waste of resources became not only the main *leitmotifs* of environmental policy but also of environmental history. See the report of Stine/Tarr 1998.

[6] This was tendered by UNESCO in 1971 to promote the planning and testing of new forms of land use. Along with 100 other countries Switzerland and the other Alpine countries, in the mid-seventies, developed the mountain project *Der menschliche Einfluss auf die Gebirgsökosysteme*. During the 1980s this was followed by 10 further similar projects (2 French, 4 Swiss, 3 Austrian and 1 West German project). A summary is to be found in Messerli 1989.

[7] Ibid, 65.

[8] Porter 1998, 219.

[9] Ibid, 8. As Donald Worster suggested, the way we use the land reflects our understanding of nature. See Worster 1993. William Cronon pointed out that our understanding of the relationship of humans and nature is itself dynamic. See William Cronon, Introduction: In search of nature, in Cronon 1995, 23–56. In this sense, research of the last decade is increasingly focusing on the interrelatedness of land, labour and technology, especially with regard to the construction of urban environments. Very influential has been Cronon 1992. Conceptions of property and products, practices of land use developed as expressions of specific living conditions, political systems and cultural values are already explored in his book Cronon 1983. See also White 1991; Steinberg 1991. Compiling a history of land use is a large undertaking, done by many scholars working in a variety of fields. Differences in the scope of various disciplines are described by Matt Osborn, Sowing the Field of British Environmental History, http://www2.h-net.msu.edu/~environ/historiography/british.htm#9.

[10] I refer to his essay 'Are You an Environmentalist or Do You Work for a Living?': Work and Nature, in Cronon 1995, 171–85.

[11] The significance of this farming system to the Alps is reflected in a wealth of literature. There are a large number of studies – dated and recent, regional and national, social scientific, cultural-geographical, historical and legal in nature – which have addressed this type of farming. One of the few studies to deal with Alpine farming as a land-use strategy from an ecologic perspective is the work of US cultural anthropologist Robert M. Netting. See Netting 1981. Above and beyond the literature quoted in the further course of this paper, I would like to refer the reader to the literature overview in Mathieu 1992, 233–4.

[12] It was French geographer Emmanuel de Martonne who in 1926 made the now classic attempt to bring some order to the variety of types which had developed encompassing not only various sovereign territories but also within them owing to differences in land ownership, legal relationships and nature-related methods of use. To greatly simplify the issue, he distinguished between six regions seeming to follow along an invisible north-south line originating in the earliest periods of human settlement. All are combined farming types, between mountains and valleys, between grain and cattle husbandry/dairying/forestry, the cultivation of vegetables, fruit and wine, and chestnut orchards. See Bätzing 1991, 150.

[13] White, Richard 1995, 'Are You an Environmentalist or Do You Work for a Living?': Work and Nature, in Cronon 1995, 171.

[14] Melanie Du Puis tells the story of the US dairy industry. In her path-breaking work she explains how milk was constructed as 'nature's perfect food' and how this ideal shaped patterns of consumption as well as the implementation of a new production system. Du Puis 2002.

[15] Following the model drafted by Paul Bairoch the first 'organic' phase started in the late 18th century and ended during the major depression that hit the European agriculture from 1875 to 1890. The second phase is described as the mechanic phase, lasting until the Great Depression. The third phase is classified as being in the period of the welfare state and thus the post-World War Two period. See Pfister 1995, 176.

[16] Schneider 1916, 7.

[17] Still a good reflection on the complex interplay between grain and animal production offers Riemann 1953.

[18] Rüger 1851, 7.

[19] Besides the coastal countries of Netherlands (the Belgian nickname for the Dutch is *kaaskoppen*), Denmark, Ireland, Sweden etc., it was particularly the northern Alpine countries, at first Switzerland, which had a pronounced and often highly developed dairy farming system. In France, besides the Alps, especially the Massif Centrale, Les Vosges, Les Pyrenees and Corsica have been the *old* cheese regions. In the more arable-farming-oriented regions, the milk of cows, goats and sheep was a by-product of animal husbandry (but a well-liked one), available in pitifully insufficient quantity and only on a seasonal basis.

[20] Stamm 1853, 372.

[21] I took the phrase from Sally McMurry who describes how dairying families in Oneida County, NY, thought this way when they started an intensive milk production in the middle of the nineteenth century. McMurry 1995, especially. Even today, Italian farmers in a small Alpine village think in terms of dairy zones. See Grasseni 2001.

[22] In French the high-elevation meadows above the tree line are called *montagne, alpage, alpe*; in Italian, *alpeggio;* in Slovenian, *planina*. In the following I will use 'Alpine pastures' for the grazing areas and 'Alps' for the mountains. For a definition of the German-language terminology see Bätzing 1997, 15. At the fringes of the Alps and in the eastern Alps the meadows were and are relatively small, whereas in the high mountains of the Central Alps they can today be as large as 25 sq km with elevations varying by up to 1,000 metres. Alpine farming was done in all Alpine countries and, in evolved forms, also in other European mountain ranges such as the Pyrenees, Jura, Vosges, Apennine and Carpathians.

[23] Quoted in Bätzing 1991, 29.

[24] See Mathieu, Jon, *Bedeutung des Alpwesens in der frühen Neuzeit,* in Carlen and Imboden 1994, 97.

[25] During the nineteenth century studies were repeatedly run to prove these relationships. In most cases the assumptions were confirmed. See Anderegg 1894: 504–9.

[26] Cattle traders called this increased resistance to disease the dowry of Alpine summer herding. It was assumed that cows raised on an Alpine meadow would never lose this constitution. According to today's knowledge, the life-span of an Alpine cow is roughly six months longer. See Bätzing 1991, 29.

[27] See Frehner 1919.

[28] See Stremlow 1998, 53.

[29] Gessner 1541/1996.

[30] Medicus 1795, III/IV, 23–4.

[31] Pfister 1995, 158-160.

[32] Mathieu 1992, 235.

[33] Mathieu refers to a statistic of the year 1866 that counted, on average, six calves to ten cows in Grisons and only two calves to ten cows in Valais. In this specific case, the data do not point to a greater milk production in Valais. In relation to cattle owners and local population, both cantons possessed quite the same number of cows. Mathieu 1992, 235.

[34] Ibid, 234/5.

[35] Regional differences in Swiss cattle raising between the seventeenth and nineteenth centuries are reported in Anderegg, vol. 2, 1898, 363–75. Farmers and cheese makers in Appenzell left the raising of cattle to cattle farmers in the Bregenz woods, Montafon and the Valois valley, and they bought young stock every year at the cattle markets in the Vorarlberg, in Bludenz, Schruns, Dornbirn, Feldkirch, and Schwarzenberg (today Austria). See Weishaupt 1998, 17. See also Orland 2003.

[36] Examples of feeding contracts from the seventeenth and eighteenth centuries can be found in Ramseyer 1991, 46–9.

[37] For more precise information see Braun 1984, 58–69.

[38] There are precise descriptions of this system for several centuries and for various regions. For the following section I will refer to: Hösli 1948; Mathieu 1992; Netting 1981; Frödin 1940/1941; Penz 1978; Aegerter 1983*;* Vogler 1987/1804; Berchtel 1990; Groier 1990; Nägeli-Oertle 1986; Carlen/Imboden 1994; Kärntner Landwirthschafts-Gesellschaft 1873.

[39] At times the farms were so far apart that one had to march for several days to get from one to another. The community of Törbel in Valais, for example, used the Oberaaralp near by Ober Hasli, in the canton of Berne, which was still a three-day trek. See Netting 1981, 26.

[40] See Groier 1990.

[41] Depending on the natural circumstances a distinction was made between two or several grazing stages. In addition, the Alps were divided into lower alps (< 1,300 m), middle alps (1,300 – 1,700m) and high alps (> 1,700 m), though the borderlines, especially to the lower-lying spring meadows, were fuzzy. On the definition of the German terminology see Berchtel 1990, 47/8.

[42] Stebler, F.G., Die Vispertaler Sonnenberge, in: Jahrbuch des Schweizer Alpenclub, 56 (1922), quoted in Netting 1981, 64.

[43] The spring meadows, farming areas lying below the Alpine meadows, were an in-between stage between the valley and the high Alpine meadows and were most likely to have stalls, hay huts or abodes. In the Italian Alps and Ticino, there are to this day spring meadow communities, small villages with chapels, and in some cases even schoolhouses.

[44] In general, the lower the grazing altitude, the more complete and more comfortable the buildings were. Especially in the spring meadow, which was grazed in the spring and again in the fall/winter, there were rather comfortable buildings where the farm family and all its accoutrements moved to in the spring. For one thing, these abodes shortened

the distance between the valley farm and the Alpine meadow farm, and for another, they made the hay harvest, which was scheduled for the summer, much easier since hay harvesting was concentrated mainly on the spring meadows.

[45] Besides the above literature, see also Stolz 1949/1985; Burmeister, Karl-Heinz, *Rechtsverhältnisse an den Alpen (Mit besonderer Berücksichtigung von Vorarlberg)* in Carlen 1994, 17–36.

[46] Hösli reports Alpine pastures in the canton of Glarus which, out of their owners' greed, were made useless as early as the sixteenth century through over-use because avalanches and wild streams destroyed the remainder of the forests and piled ashes and rubble onto the meadows. Hösli 1948, 313.

[47] Four types of ownership, with many mixed and transitional forms, developed since then and can be found even today: 1. commons, which belonged to all the farmers of a village or community, 2. cooperative Alpine meadows in which farmers from several places in a valley or region joined forces to use an Alpine meadow together, 3. private Alpine meadows which were owned by a family, and 4. Alpine meadows which were farmed on behalf of clerical or secular landowners. Following the French Revolution, in the north and west numerous meadows were sold as national property and came into the possession of individuals. In the Eastern Alps (Slovenia), by contrast, many farmers remained serfs of the large landowners until and into the nineteenth century, yet had the rights to chop wood and take animals to pasture on the Alpine meadows. See Stolz 1985, 147–270.

[48] A more detailed discussion of the differences between individual and cooperative milk production and processing is offered by Mathieu 1992, 234–51. In order to find out how much cheese and butter (including lean cheese) every member of the cooperative was to receive at the end of the season, the milk of his cows had to be measured. The yield of butter and cheese to be expected at the end of the Alpine farming season depended on this measure of the sample milk production. The measurement days were a rather tense matter, for everyone tried to get as much out of it as possible: cheese farmers tried to milk as little as possible during trial milking, while the farmers were speculating on their cows yielding as much milk as possible. Even before the measuring day supervisors were sent up to the Alpine meadow to ensure that milk was not drawn the day beforehand or that the Alpine meadow personnel didn't drive the animals around and tire them out, which would reduce their output of milk.

[49] Many of those ordinances have remained unchanged over centuries and, like the '*Grindelwalder Taleinungsbrief*' dating back to 1404, are still in force to this day. What is interesting about the Grindelwald case is that this union of Alpine pasture owners took the development of the tourism into its own hands. See Aegerter 1983; Nägeli-Oertle 1986.

[50] Burmeister, Karl-Heinz, *Rechtsverhältnisse an den Alpen (Mit besonderer Berücksichtigung von Vorarlberg)* in Carlen 1994, 19.

[51] The number of animals allowed on to the meadow was set depending on the type of soil of the meadow, its fertility (say, in terms of special grasses that grow there), and its general state (e.g. rocky terrain, swamp). Cow rights were converted depending on the amount of fodder the animals needed. 1 cow right = 2 dry cows, 4 calves, 6 sheep, 12 goats or 1 foal. One horse was worth 2 cow rights. See ibid.

[52] If that was not enough, then in some cases the foreign animal was summarily sent home, the grazing period of domestic animals shortened, only 'valuable' cows allowed but not goats, etc. See Anderegg, vol. 2, 1898, 650–3.

[53] Generally someone from among the Alpine meadow owners was elected in charge of enforcing these rules and also decreed that all members of the cooperative were to participate in the building and improvement of paths, sidewalks, fences and huts, as well as the cleaning, care and fertilization of the meadows and pastures.

[54] Data from Mathieu 1992, 236.

[55] See Gutzwiller 1923, 21.

[56] This has been reflected to this day in the character of the types of cheese. Tomme, which came about in the north of Savoy, is to this day a small cheese which originally developed from individual meadow farming where there was not enough dairy production to make larger cheeses. For the history of individual cheese types see Nantet 1994.

[57] The amount of butter produced depended on the skimming method. Only in the 1870 were centrifuges developed, which allowed 3.8 kg of butter to be made out of 100 kg of milk. Before then, butter output was much lower. See Anderegg, 1894, 528.

[58] See *Die Milchwirthschaft im bayerischen Allgäu* 1895, 6. In it, it says that milk output decreased by the day starting in mid-August. Some dairymen said that this autumnal decrease in milk output was attributable to the blooms of various plants that only grow during that time of year. See also Anderegg 1894, 493.

[59] From the Allgäu it is reported that the communes allowed day labourers to own one or two cows 'out of mercy and charity.' Flad 1989, 13.

[60] Data quoted in Netting 1981, 65.

[61] In some places the production of rennet cheeses was shifted to the high Alpine meadows, whereas butter and lean cheese were made on the spring meadows on the way up to the higher elevations in the spring and on the way down again in the fall.

[62] There was certainly plenty of justification for the Swiss Alpine population gaining a reputation for industriousness and Switzerland being termed a pre-capitalist, agro-bourgeois society. According to Biucchi 1985, 53. To the Swiss cattle and cheese trade in this period, see Braun 1984; Grass 1988; Ruffieux/Bodmer 1972.

[63] More exact data for the canton of Berne is provided by Schatzmann 1861, 8–19.

[64] For the centuries-old conflicts surrounding the supply of butter in Switzerland see Anderegg 1898, vol. 2., 534/5; Gutzwiller 1923, 44–6.

[65] According to Gutzwiller the two areas where hard rennet cheese had the longest tradition were Greyerz (Gruyère) and Schwyz. In 1548 the middle and upper Bernese Oberland manufactured hard cheeses. The new method of manufacturing cheeses was taken further north into the Simmental and Emmental valleys by French Swiss tenant farmers from Alpine meadows. At the same time it was these tenant farmers who in the Emmental region began to export hard cheeses. Gutzwiller 1923, 22.

[66] In the Middle Ages Glarus conducted extensive cattle trading. The vast majority of milk was used to raise calves, with the rest being used to make butter or Schabziger cheese. As early as 1464 the Landsgemeinde (cantonal assembly) in Glarus decided to affix a seal on their cheese to protect it from imitation. See Anderegg 1898, vol. 2, 534. In the fifteenth and sixteenth centuries trade in Schabziger cheese is said to have become considerable, and there is evidence that in the seventeenth century this cheese, along with

other products from that region, was loaded onto the region's own ships and transported to Rotterdam, the Netherlands, and from there on to England, Russia and even as far away as India. See 50 Jahre Schweizerische Milchwirtschaft 1937, 11.

[67] According to a study conducted in 1788 revenue from the manufacture of fatty cheese, in respect to the market prices of that period, exceeded that of butter and lean cheese making by nearly one-third using the same amount of milk. See Anderegg 1898, vol. 2, 504.

[68] See Ramseyer 1991, 57.

[69] This exacerbated the butter shortage; therefore, some dairymen made a sort of pre-curd butter. Pre-curd was the layer of fat floating on top of the milk being heated in the cheese-making cauldron. However, this butter was of inferior quality and therefore hard to sell. Ibid.

[70] In Hungary cheese making using rennet became a part of the processing of cow´s milk, from at least the early seventeenth century through the influences of foreign dairy specialists employed on particular seignorial farms. See Eszter Kisban, 'Milky ways on milky–days: the use of milk products in Hungarian foodways', in Lysaght 1994, 15.

[71] Various substances can be used to coagulate the milk quickly, causing a firm curd to develop. The most frequently used substance is the digestive juice contained in the stomachs of calves, kid goats and other ruminants. In the southern Alpine regions, where young stock was too valuable to be slaughtered for their rennet stomachs, the rennet of deer was used, as were thistle blossoms and fig tree juice. The rennet is added to heated milk, the trick being to find the perfect balance between time, temperature and amount of rennet. Milk then separated into solid components (curd in the case of rennet cheese and quark in the case of acid curd cheese) and its fluid component, whey.

[72] Ramseyer 1991 studies this development in depth.

[73] In the German areas at the foot of the Alps (Allgäu and Swabia) the political and economic implications of a non-unified Germany prevented a similar upswing from taking place. Dairy farming was only practiced as part of self-sufficiency farming. The chaos of the Napoleonic wars, which hit this area particularly hard, as well as the parcelling of the already-postage-stamp-sized farms which intensified following the end of the eighteenth century all did their part to put the region in economic limbo. The Austrian Alpine regions of Tyrol, Steiermark, Bohemia, Moravia, Galicia and Bukovina fared no better. See Lindner 1955, 79–81.

[74] Quoted in Hauser 1961, 135.

[75] See e.g. Franz 1994; Schmidt 1990.

[76] Today economic historians give agriculture more credit for the economic upswing than economic theorists did for a long time. See Mathias/Davis 1990; Hudson 1992; Buchheim 1994, 49–54.

[77] Pfister 2002, 7–14.

[78] For this whole section see Pfister 1995, 175–202.

[79] See Hösli 1948, 45–52.

[80] Data on the size and composition of cattle herds demonstrated the new priorities. In the canton of Berne, around 1760 the grain-growing areas still had a large number of draught animals, particularly oxen, whereas in the mountainous regions the cows were in the majority, commensurate with their significance for cheese making. Transitional areas, also called field grass areas, were also already heavily oriented toward dairying.

After 1790 (until 1911) the cow population began to outgrow that of horses, oxen and sheep in all parts of the country by an incredible, yet varying extent. Pfister 1995, 189.

[81] Lindner 1955, 20.

[82] Gotthelf 1850/1984, 235.

[83] See Gutzwiller 1923, 88.

[84] See Guggisberg, vol. 2, 1953, 123/4.

[85] Many of the cheese dealerships had been established by former dairymen or cow herders. In the 1810-1820 decade many of them emigrated to the Bavarian Allgäu region and there tried to manufacture the same quality of heavy and fatty cheese from their home region. A local cheese trader from Allgäu, Karl Hirnbein (1807–1871), imported another type of soft cheese from Belgium: *Limburg* cheese. See Flad 1989, 26–32.

[86] The farmers of a village established an association to build a cheesery. The capital was usually obtained by issuing stocks; it bore interest and was paid back in increments. Less frequently, the capital was obtained and repaid by only one entrepreneur. Once the interest had been repaid, it was used as a reserve fund for new buildings, repairs, etc. In addition to the building company, there existed an operating company which comprised all milk deliverers, who did not have to be identical with the members of the building company. The operating company provided cheese makers and laborers for an operating period, usually only for the summer. Only toward the end of the nineteenth century did year-round operations become standard practice. For more details see Anderegg 1894, 87–9. According to Anderegg envy, jealousy and mistrust among farmers led to several cheese cooperatives being given up soon after having been established. The milk was sold instead.

[87] This period of growth slowly came to an end in the 1870s. Exact figures are in Pfister 1995, 198.

[88] It is estimated that in 1870 in all of Switzerland there were about as many valley cheeseries (2,600) as Alpine dairy farms (2,800). See Anderegg 1894, 87.

[89] In the 1880s a type of cart-borne fire was developed in which, unlike open fires and closed fires, the heat could be discharged using a portable cart, called the fire cart; when not in use, this cart could be moved away from the cauldron and to a water heater. Attempts had been made since the 1860s to use steam heating methods but this innovation found little support because the steam often found its way into the milk, and customers claimed to be able to detect an aftertaste in the cheese. The first working steam cheese factories were not built until after the turn of the century. In 1913 there were five cheese factories with open fires and hanging cauldrons in the canton of Thurgau, 132 cheese factories with cart-borne fires, and 40 steam-operated cheese factories. See Gutzwiller 1923, 98–100.

[90] To avoid bankruptcy, some of these cheese specialists – as an irony of history – now sold the hay in the valley. Or they intensified livestock breeding to satisfy the demand for cows in the valleys. See Ramseyer 1991.

[91] They claimed that these cattle grazed grassy cliffs barren with impunity, and that in some cases the grass was even uprooted, causing the grass cover to thin out and exposing it to trampling. They also criticised that fact that once the cattle were finished, sheep and goats could take their turn at grazing, causing further damage to the grass cover, and that on the lower spring meadows horses could graze with impunity. See, for instance, Schild 1852; Wilhelm 1868; Trientl 1870.

[92] von Tschudi 1865, 299.

[93] Ibid, 298.

[94] See Schild 1865.

[95] Ibid., 14.

[96] As one dairy expert put it in retrospect: Widmer, A., Aus der Vorgeschichte, in: 50 Jahre Schweizerische Milchwirtschaft 1937, p. 23.

[97] For his personal history see Wahlen 1979.

[98] Schatzmann, Rudolf, Die Milchfrage vor der gemeinnützigen Gesellschaft des Kantons Bern, Aarau 1872, quoted in: Kollreuther 2001, 22. Since 1859 Schatzmann edited the *Alpwirthschaftliche Monatsblätter*, published annually altogether six times until 1866 by publisher J.J. Christen in Aarau.

[99] These were modeled on Alpine testing stations already in place in several locations in the German and Austrian Alps. See Die Alpenversuchsstationen 1867.

[100] Schatzmann 1873, 3.

[101] Found in Theoretisch-praktisches Handbuch der größeren Viehzucht from 1810, quoted in Abel 1986, 66.

[102] In 1934, 237 billion litres of milk were manufactured, having a value of 2.3 billion Reichsmark. The value of coal produced that year was 1.94 billion RM, and that of raw iron production 0.66 Milliarden Reichsmark. See Reif/Pomp 1996, 77.

[103] Schneider 1916, 43.

[104] See Orland forthcoming.

[105] See Martiny 1891, 10.

[106] See Reif/Pomp 1996.

[107] See Nägeli-Oertle 1986, Brechtel 1990, Groier 1990.

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