

The whitewaters of the Adour. Control and development over time

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Abstract: The "courtaou"¹ of Esclozes, located about an hour's walk from the tourist site of Payolle, comprised around twenty huts, which had been in ruins for over fifty years. One of these huts and the adjoining milking shelter, built of dry stone, were restored to their original state by the Pierre des Esclozes association, created for this purpose in 2012. A water supply channel over a kilometer long was also put back into operation.

This project, carried out by volunteers and supported by the municipality of Campan, has attracted many visitors. During the summer, members of the association come every week to maintain the site. These days, along with the two major annual projects announced in the press, provide opportunities for new encounters.

Various projects and research have developed alongside these activities concerning pastoral life and the history of the remarkable gravity-fed irrigation system that characterizes the Campan Valley. The site thus contributes to informing and mobilizing volunteers to better understand the evolution of the landscapes and the waterways that shape them, as well as the methods of their regular maintenance.

Key words: courtaou; valley; cowshed; mountain

1 A mountain landscape shaped by pastoral life

1.1 In the Campan valley, the sources of the Adour

The Campan Valley (65710), oriented from northwest to southeast, is narrow but not enclosed (Figure 1). It is subject to the passage of humid westerly winds from the Atlantic. High peaks trap the clouds. Abundantly snow-covered in winter, they also receive spring rains and summer thunderstorms. At the foot of the peaks and rocky cliffs, verdant forests and pastures cover the steep slopes.

Numerous lakes have formed at the foot of the Arbizon, the Bastan, Quatre Termes, and Midi peaks. Streams flow from them, swollen by countless springs. Two powerful torrents plunge into the valleys carved by ancient glaciers. They meet at Sainte-Marie de Campan. Soon joined by a third at the exit of the Lesponne valley, they will form the Adour River.

Water is the treasure of the mountain people of Campan. They have learned to tame it. Thanks to it, they have enjoyed relative comfort despite the harshness of their narrow valley.



Figure 1. Upper Adour Valley
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1.2 Ancient Pyrenean societies: a unique vision of family, heritage and community

In the Campan Valley, a small democratic society proved capable of ensuring the continuity of a particularly prosperous agro-pastoral organization for centuries.² It combined undivided family property and communal goods. Solidly structured and resolutely conservative, it discouraged unions outside the community and valued solidarity within it.

The agro-pastoral community was a form of commoner republic, largely unaffected by feudal powers. Family property, managed by the "head of the household", was transmitted through an absolute right of primogeniture that applied to daughters as well as sons³. The extensive common lands were governed by the assembly of herders and farmers, "the neighbors", through the elective institutions they established for this purpose.

This spirit of independence and solidarity persisted after the revolution and into the 20th century. The richness of community life today testifies to this state of mind⁴.

1.3 The upper Adour, a prime location for agro-pastoralism: water, high-altitude pastures and hay meadows

1.3.1 The management of whitewater allows for the distribution of an essential resource

The waters of the Adour River are well-suited for irrigation and powering mills. Accustomed to collective work, the inhabitants of Campan, using streams (Figure 3 and 4) and ditches, created a multitude of small canals dug into the hillside, following the contour lines (Figure 2). In the mid-17th century, Louis de Froidour had already described such developments:

Since these mountains abound with springs and brooks all the way to their furthest reaches, the inhabitants have carved countless small channels along the hillsides. By means of these watercourses they irrigate the meadows, keeping them perpetually moist; this renders the land so fertile and lush with grass that it outshines any fine pasture I have ever laid eyes on.



Figure 2. Outlying barns and small canals in the hay meadows
© Association Pierre des Esclozes



Figure 3. Campan (Hautes-Pyrénées), water intake for the Esclozes irrigation canal from La Gaube
© Association Pierre des Esclozes



Figure 4. Campan (Hautes-Pyrénées), regulation of the flow of the irrigation canal
© Association Pierre des Esclozes

Using flat stones as sluice gates, and according to precise schedules, the water was distributed among the meadows according to their surface area. These regulated distributions were called: the "bégades⁵".

Meadows irrigated in this way were also abundantly enriched by the addition of manure collected from the "courtaous" and stables. Hay and aftermath yields were then considerable.

The farmers meticulously maintained these irrigation ditches and improved them over centuries, generation after generation. These enormous hydraulic works, in turn, helped regulate the water flow, thus limiting flood damage. Furthermore, trout were particularly abundant due to the spawning grounds that developed in the irrigation canals; for a long time, they provided a valuable supplementary income.

Summer pasture huts: the "courtaous"

For a very long time, no doubt, shelters and livestock pens had been set up in the high-altitude communal pastures, the summer pastures⁶.

To facilitate the herding and milking of livestock, buildings were added to the existing structures. Built between 1,200 and 1,800 meters in altitude, and particularly numerous in the Campan valley, they are one of the characteristics of its landscapes (Figure 5).



Figure 5. Campan (Hautes-Pyrénées), extract from the cadastral map of 1825
©AD Hautes-Pyrénées, section Z 3P332/27

The "courtaou" is a dry stone enclosure⁷. The larger ones are associated with two structures, also made of dry stone, whose roofs are covered with slate or vegetation. A hut serves as shelter for the cowherd; an elongated building open on one side protects the animals for milking and shelters calves or sick animals (Figure 6).

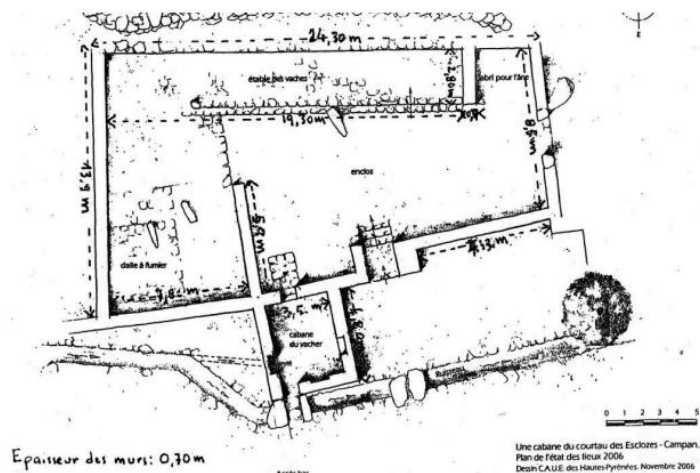


Figure 6. Campan (Hautes-Pyrénées), plan of an enclosure of the "courtaou" of Esclozes, drawing CAUE of the Hautes-Pyrénées November 2006
© Association Pierre des Esclozes

The water supply for these stables is absolutely essential. Where a ditch can be laid nearby, the shepherds have built "leytès"⁸. The "leyté" keeps the milk cool to ensure its preservation and promotes the separation of the cream (Figure 7).

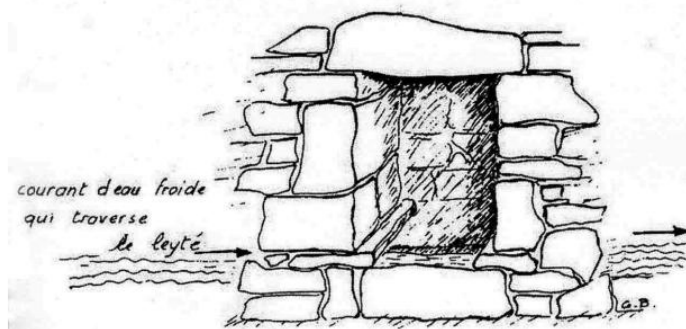


Figure 7. Campan (Hautes-Pyrénées), sketch of a "leyté": milk niche
© Association Pierre des Esclozes

This precious water could not be wasted. From the "summer pastures" the irrigation ditches were extended towards the hay meadows staggered along the "slopes" from the lower limit of the communal pastures to the bottom of the valley⁹.

The cowherd, often a very young man or even a young woman, lived in the cabin during the summer. He was in charge of the herds and milked them morning and evening (Figure 8). Several times a week, a sister, a younger brother, or a cousin would come up to bring him supplies. The precious cream was brought back down on the return trip. In the valley, the lady of the house, whose duties were reserved for her, oversaw the production and sale of the butter. Figure 8.

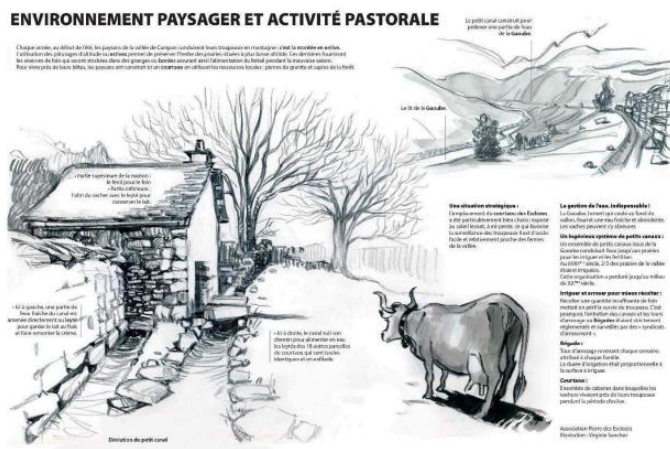


Figure 8. Campan (Hautes-Pyrénées), work in the "courtaous" (traditional stone huts)
© Association Pierre des Esclozes

The shepherd also dried the dung on the flagstones of the enclosure. The manure was brought down on a donkey's back or, if the "courtaou" (a type of pasture) was easily accessible, in a cart pulled by a pair of cows. Sometimes, at the end of the season, it was dumped into the ditch that carried it down to the meadows below.

Life was harsh in the "courtaous" (villages), but on beautiful summer evenings, it was brightened by the songs and dances of the young people. Often, to woo his sweetheart or to escape loneliness (aueyèr in Gascon), the shepherd became a poet. He contributed to an anthology of the Bigorre language passed down orally during evening gatherings; and for this reason, long ignored by folklorists¹⁰.

Several enclosures are often grouped together in sites suitable for their installation. They can then form veritable seasonal villages, including, at "Esclozes", up to twenty cabins.

A permanent herd allowed for a continuous production of milk and butter.

Through hard work, it was then possible to obtain exceptional yields of hay and aftermath on meadows that were often very steep but well exposed, enriched by manure and abundantly irrigated.

The harsh winters make grazing on summer pastures impossible for several months. However, the abundance of fodder allowed for the maintenance of a large herd throughout the year.

In this respect, Campan differed from the neighboring valleys where farmers sold part of their livestock in the autumn and bought some back in the spring.

Easy access to nearby towns and trade

The valley opens wide downstream from Campan. It offers easy access to the spa town of Bagnères-de-Bigorre and the market towns of the Lannemezan plateau.

Taking advantage of these opportunities for trade, the people of Campania developed the butter trade. The quality and consistency of their production made it appreciated by merchants who ensured the distribution of this luxury item throughout the region and as far as Bordeaux and Toulouse.

The sale of a renowned butter has long ensured the remarkable prosperity of the valley¹¹.

2 The story of a "hydraulic monument" built for livestock farming purposes

The wealth and uniqueness of the Campan valley, as we can see, lay in the development of the summer pastures and the irrigation canals that crisscrossed them, carrying water to the hay meadows. The Upper Adour remained, until the Second World War, a true monument to gravity-fed irrigation.

The hydraulic installations are, in fact, very old. It is possible that the Cistercian monks who settled in the valley in the 12th century were at the origin of their development or even their creation¹².

2.1 A complex and regulated gravity-fed irrigation system

The shared use of water was so essential to the owners that it was the subject of a notarial deed in which each swore to respect the terms.

The third and final regulation of the Esclozes canal is dated May 11, 1893. It states that a first regulation had been written on July 26, 1583, which confirms that the first constructions of the "courtaou" of Esclozes and its ditch already existed during the second half of the 16th century.

The 1893 regulation concerns 23 owners: "... united in a free trade union association for the use of an irrigation and easement canal which originates at the Gaube stream...".

The watering season began each year on April 15th and ended on September 15th. The watering cycle, or "bégade", took place on a fixed day and time every eight days¹³. Each cycle consisted of 24 hours of watering and began at 4:00 AM. For each landowner, the watering duration depended on the area to be irrigated.

The canal maintenance was to be carried out by all co-users every year on June 5th. Without having received a summon, all users were required to gather on June 5th at 8:00 a.m. for a roll call, which was repeated at the end of the workday. If a landowner was unavailable that day, they were required to provide a worker.

The canals had to be 55 cm wide and 22 cm deep. Water had to be supplied to houses and barns through a hole no larger than 4 cm in diameter, under penalty of a fine.

On June 5th, two trustees were appointed. Their role was to ensure compliance with the regulations governing water use and canal maintenance. They received complaints from dissatisfied property owners and resolved disputes. They were authorized to impose fines stipulated in the regulations and decided on the work to be carried out. Their decisions were recorded in writing before a notary. The trustees were eligible for re-election, and both women and men were eligible.

This type of organization was implemented throughout the valley.

There were 9 groups of canals. The most important, the Gaye canal, 10 km long, irrigated 280 hectares of meadows. In 1910, of the 1,500 hectares of natural meadows in Campan, more than 1,000 were irrigated. There were still 57 active irrigation associations in 1910¹⁴.

2.2 Irrigation leaves its mark on the landscape and social organization

For centuries, these rigorous practices governed the agricultural and pastoral activities of the valley. They had significant consequences:

- Agronomic: irrigation and fertilization of meadows made possible a second hay cutting, the aftermath, or even a third cutting in October or November.
- Economically, the cows, being better fed, gave more milk. Around 1880, 800 kg to 1 tonne of butter were sold weekly at the Bagnères-de-Bigorre market. These resources were supplemented by those from timber, wool and linen weaving, and various other businesses ¹⁵.
- Demographics: In 1313, Campan had approximately 500 inhabitants. The population grew very rapidly in the 17th and 18th centuries. The population peaked in 1825 with 4,329 inhabitants. Campan was then the third largest town in the Hautes-Pyrénées department¹⁶. The land register known as the "Napoleonic cadastre" was completed in Campan in 1825; it identified 270 owners of a summer pasture hut and about thirty "courtaous" (smallholdings) in the commune. By comparison, the commune had only 1,332 inhabitants in 2017 and practically no huts used exclusively by a livestock farmer.

Consequences for the landscape and land use: on the slopes, to prevent erosion, farmers planted many trees on the banks of the canals: ash, willow, alder, in particular. This reinforced the green character of the valley¹⁷.

The socio-cultural identity of the inhabitants of the Campan Valley has been forged over time through the collective management of water resources. The unique nature of these practices has attracted the attention of various researchers, historians, sociologists, and geographers who have studied their characteristics. Such studies continue today, driven by the growing interest in archaeology and the tangible and intangible heritage of agropastoral communities.

This is why the association "Pierre des Esclozes" has taken on the task of restoring a "courtaou", its "leyté" and its feed channel at the place called "Esclozes" or "Esclocdes" located near the tourist resort of Payolle¹⁸.

3 Scope of the restoration to the original state of a "courtaou" in the Campan valley

3.1 The creation of this work is the result of the efforts of a group of friends

For the "Pierre des Esclozes" association, the restoration of a "courtaou" (a traditional shepherd's hut) stems from a desire to showcase the appearance of the old seasonal pastoral shelters, now in ruins, in the summer pastures of Campan. One of the nineteen "courtaous" of Esclozes has been completely rebuilt by volunteers who refused to let them be forgotten and wanted to leave future generations a testament to these former practices.

The project originated within the University of the Third Age in Tarbes. In memory of one of its organizers, who died prematurely, a team came together based on friendships, goodwill, and expertise. The municipality of Campan, which owned the land, actively supported their efforts, and residents of Campan joined the volunteers from Tarbes. Over five summers, a complete "courtaou" (a traditional Basque hut) was rebuilt (Figure 9 and 10).



Figure 9. Campan (Hautes-Pyrénées), restoration of the cowherd's hut
© Association Pierre des Esclozes



Figure 10. Campan (Hautes-Pyrénées), restoration of the stable
© Association Pierre des Esclozes

The restoration, faithful to the original design, involved the enclosure including a drying area, a stable and its shed, as well as the adjoining cowherd's hut equipped with a leyté (a type of open-sided shelter) and a hayloft. Today, the dry stone walls stand once again, the slate roofs cover the buildings, and the freshwater supply canal feeding the hamlet has been restored for over a kilometer in its upstream course (Figures 11 and 12).

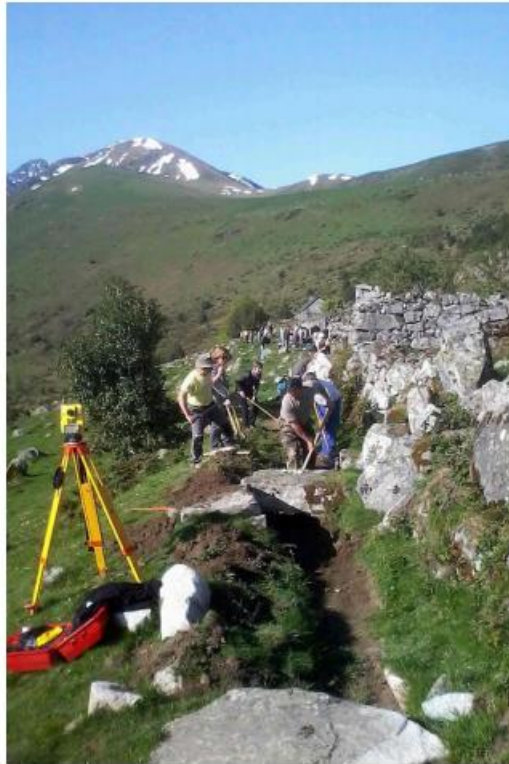


Figure 11. Restoration of the Esclozes irrigation canal
© Association Pierre des Esclozes



Figure 12. Many volunteers are involved in this initiative
© Association Pierre des Esclozes

Begun in 2012 and completed in 2016, the restoration of this "courtaou" (a traditional stone shelter) has made it a popular destination for excursions. Located near an unguarded mountain refuge maintained by the municipality of Campan, it freely welcomes visitors (Figure. 13). The "Pierre des Esclozes" association is responsible for its upkeep; a small team climbs the mountain for this purpose every week during the warmer months.



Figure 13. Transmission of memory by former farmers who worked at Esclozes
© Association Pierre des Esclozes

3.2 Such a repair is in line with the current trend in the valuation of heritage assets

The subsidies provided to mountain agriculture have, until now, allowed livestock to remain on the summer pastures. As soon as the snow melts and the grass regrows, the herds leave the valley to ascend to the high pastures. However, a profound transformation of agro-pastoral models has taken place. Milking and milk processing have been abandoned. Today in the Haut-Adour region, meat production is by far the dominant activity.

However, like most mid-mountain areas, Campan is currently facing a decline in pastoral activity while spontaneous reforestation is progressing. To remedy this situation, the municipality is putting its summer pastures "to pasture" ¹⁹.

Each summer, approximately 1,200 head of livestock—horses, cattle, and sheep—are brought down from the plains. Three herdsmen, paid by the municipality, look after the animals. This livestock helps stabilize the pastures, which are becoming overgrown. However, the summer pastures of the Campan region are generally threatened by imbalances. Depending on the area, they are exposed to overgrazing or undergrazing, demonstrating that the management and care of the herds remain central to pastoralism.

The restored "courtaou" bears very concrete witness to a vanished pastoral way of life, but it also takes on another meaning. It is not simply a new destination for walks to visit the work of past generations. This "courtaou" is the sign of a spirit of renewal visible everywhere in the summer pastures, here in the Pyrenees as elsewhere in France and in other countries²⁰.

Today, this vigorous movement in favor of seasonal shelters in the mid-mountains shows that it is no longer just a matter of preserving works of the past under the heading of "popular arts and traditions" but of picking up the thread of know-how, of rediscovering gestures, of renewing thoughts in light of current events (Figure 14).



Figure 14. Schoolchildren discover the "courtaou"
© Association Pierre des Esclozes

A well-maintained "courtaou" thus appears as one of the possible expressions of an imagination open to the unfolding of a "new landscape"²¹. For restoring an enclosure in this way allows each passerby to receive quiet hospitality of the mountains. And thus welcomed, visitors can observe the influence of the climate and the seasons, the current transformation of the landscapes, the impact of mobility adapted to the work of livestock farmers, the exploits of athletes, as well as the contemplation of walkers. Last summer, at Les Esclozes, we met a teenager who, upon discovering the place, declared to his parents: "This is where I want to live!"

Reshaping a landscape requires establishing a broad sense of the common good. A different mountain economy is thus spontaneously envisioned today.

3.3 All this beauty has been bequeathed to us thanks to the work and frugality of our ancestors

Should pastoralism be an expression of resistance or of becoming? The restored "courtaous" invite this reflection (Figure 15 and 16).



Figure 15. Campan (Hautes-Pyrénées), the "courtaou" in ruins
© Association Pierre des Esclozes



Figure 16. Campan (Hautes-Pyrénées), the restored enclosure
© Association Pierre des Esclozes

Many believe that the knowledge of local stakeholders, when applied to current events, has a real capacity to guide the changes that the Upper Adour Valley is destined to experience. This capacity is unique to mountain people, who have demonstrated remarkable ingenuity in leveraging the mountains' many resources and adapting to socio-economic shifts.

The canals and ditches are the result of the ingenuity and know-how of rural societies whose frugality and endurance in the task have produced landscapes that we find today to be of great beauty.

The beauty lies in the understated elegance of a structure that nonetheless required a solid understanding of hydraulics to control the slope and flow rate, to bring and distribute water over such distances, and to calculate irrigation times based on the ratio of meadows to be irrigated. These careful and meticulous actions, tending to such a hydraulic ecosystem, are the most direct expression of what culture fundamentally means.

These networks of channels and ditches made of earth, stones, sand, and grass, created and maintained through techniques inherited from ancestral traditions, can nevertheless be disrupted by careless interventions. This hydraulic symbiosis is, paradoxically, a porous system whose impermeability depends closely on the flowing water that fluctuates within it and the life that develops there. It is, in fact, a "complete" ecosystem²².

3.4 The Haut-Adour region is part of the transition that is currently transforming the way mountain tourism is practiced

The gravity-fed hydraulic system developed from the high meadows of Campan once supplied not only the lands of the Upper Adour valley, but also all of its built-up areas: hamlets, villages, and thermal spa.

Bagnères-de-Bigorre was thus irrigated right to the heart of its medieval center. Like the villagers, the townspeople had taken care to create channels distributing fresh water to each of their houses. *The 1864 Plan of the Small Canals* (Technical Department of the City of Bagnères-de-Bigorre) details this hydraulic system in detail²³.

The hydraulic systems connected the entire valley, the mountains, the countryside, and the villages. They were the expression of a profound harmony between people, plants, and animals, between rural and urban life. The maintenance work currently carried out by several volunteer associations testifies to the living memory of ancient skills and the awareness of the need to pass them on.

By encouraging people to "build community" through the shared maintenance of the landscape, their achievements bring to life, in Haut-Adour, the notion of "intangible cultural heritage" as defined and promoted by UNESCO.

In this respect, the recognition of gravity-fed irrigation in the Upper Adour region is highly relevant. The new water

law, which aims to restore the ecological continuity of waterways, is causing concern among riparian owners attached to their traditional uses, as well as among owners of hydraulic infrastructure to whom water rights are still attached. However, the "Joint Declaration of the General Assembly on the Transition of Mountain Tourism", considering the need to examine mountain development models, commits to pursuing a calm and constructive dialogue with the various stakeholders involved in order to "ensure sustainable economic activity, create jobs, improve the living conditions of residents while preserving a mountain environment that is both exceptional and fragile"²⁴.

To ensure that such a squaring of the circle does not remain futile, it is good to note that processes are underway, initiated by permanent or temporary residents.

Here in the Upper Adour, the term "ruisseau" (stream), "agau", refers both to the bed carved by the river and to the channel created by man. It shows that the language has preserved, since time immemorial, the principle that one is inseparable from the other.

Conflicts of interest

The author declares no conflicts of interest regarding the publication of this paper.

References

- [1] BUISAN Georges. *Hier en vallée de Campan*. Tarbes : Association Guillaume Mauran, 1999.
- [2] BUISAN Georges. *Des Cabanes et des Hommes; vie Pastorale dans les Pyrénées*. Pau: Cairn, 2006.
- [3] CELMA Jean-Yves. *Hautes Pyrénées; Sentiers et courtaous en vallée de Campan*. Campan: SAMC Édition, 2002.
- [4] CUBERO José Ramon. *La Révolution en Bigorre*. Toulouse: Privat, 1989.
- [5] DUFFOUR Pierre. *Bigorre...gens d'ici*. Oloron Ste Marie: Mont Hélios, 2007.
- [6] FLAMBARD Julie. *Vers un nouveau paysage agro-pastoral. Étude rurale en vallée de Campan dans les Hautes-Pyrénées*. École Supérieure d'Architecture de Versailles: Projet de fin d'études, 2020.
- [7] GRATACOS Isaure. *Femmes Pyrénéennes. Un statut social exceptionnel en Europe*. Toulouse: Privat, 1987.
- [8] GUÉNÉE Anne-Claire. « Irrigation gravitaire par béals de Lozère » . *Monumental*, Semestriel 2-2019, p. 86-87.
- [9] LEFEBVRE Henri. *Les communautés paysannes pyrénéennes (Thèse soutenue à la Sorbonne en 1954)*. Bagnères de Bigorre (2014) : Sté Ramond/Centre historique de l'Arribère, 2014.
- [10] LEFEBVRE Henri. *La vallée de Campan*. Paris : PUF, 1963.
- [11] LEFEBVRE Henri. *Pyrénées*. Pau: CAIRN, 2000.
- [12] LUQUET, Omer. *La vie économique dans la vallée de Campan*. Thèse pour le doctorat: Université de Toulouse, Faculté de droit, 1935, 172 p.
- [13] RAVIER Xavier. *Le récit mythologique en Haute Bigorre*. Aix en Provence: Edisud/Éditions du CNRS, 1986.
- [14] RENDU Christine et coll. *Estives d'Ossau; 7000 ans de pastoralisme dans les Pyrénées*. Toulouse: Le pas de l'oiseau, 2016.
- [15] SABATIER Richard. *Archéologie en Haute Bigorre; Cahier n° 3*. Bagnères-de-Bigorre: Ed. OAPHB65, 2021.
- [16] SOULET Jean-François. *La vie dans les Pyrénées du XVI^e au XVIII^e siècle*. Pau : CAIRN, 2011.
- [17] SOULET Jean-François. *Les Pyrénées au XIX^e siècle*. Toulouse : Eché, 1987.

Notes

1. Courtaou: enclos en montagne permettant d'abriter pendant la belle saison les vachers et leurs troupeaux (d'après G. Buisan)

2. «C'est ici [dans les Pyrénées Occidentales], qu'a pris ses formes typiques ... la république agro-pastorale autonome... À la veille de la Révolution, les « vallées libres » avaient encore leurs états, leurs parlements locaux. »

Lefebvre, 2000, p. 83-84.

3. « Le droit d'aînesse et tous les avantages et fonctions attachés à la primogéniture s'appliquent aux femmes dans les Pyrénées Centrales et Occidentales, fait exceptionnel en Europe... Jusqu'à une époque fort récente, la notion de patrimoine prime sur celle de lignage. » GRATACOS, 1987, p. 79 et 81.

4. « L'association, c'est comme un principe de vie pour les Pyrénéens... Ainsi sont nées à des dates inconnues mais certainement très lointaines, ces associations d'abord purement pastorales qui devaient devenir par la suite de puissantes entités politiques et économiques: les communautés de vallée. » SOULET, 2011, p. 34.

5. Luquet, 1935, p. 94-95.

6. « Autre particularité, et non des moindres, des pays pyrénéens, les biens privés ne représentaient qu'une faible partie du territoire de la vallée; dans beaucoup de cas, certainement pas plus de vingt pour cent. » Soulet, 2011, p. 37.

7. « Le courtàu, c'est l'endroit en montagne où l'on rassemblait les troupeaux, où il y avait des cabanes, où l'on s'occupait des vaches. » Buisan, 1999, p. 11.

8. « Une sorte de niches construite en pierre qui servait de réfrigérateur naturel grâce à un courant d'eau fraîche qui la traversait en permanence. » Buisan, 1999, p. 23.

9. « Les prés sont arrosés par des canaux d'irrigation (agaus) qui amènent, parfois de très loin, les eaux des ruisseaux. Des dérivations passent à travers les laiteries. Les canaux ont été entrepris et entretenus par des syndicats constitués dès le XVI^e siècle et peut être plus anciens encore. » Lefebvre, 1963, p. 219.

10. « ...pour ces hommes des hauteurs (les paysans montagnards), pour ces colonisateurs de l'altitude, l'imaginaire et le réel sont assumés? dans un seul et même vécu, l'un campe toujours sur les terres de l'autre. » RAVIER, 1986, p. 254.

11. « Cette communauté de Campan abonde en bétail à laine et le beurre y est beaucoup meilleur qu'en aucun autre endroit des montaignes de Bigorre, lequel est soigneusement recherché par les marchands de Cieutat qui le transportent et revendent à Toulouse. » Guillaume Mauran, *Sommaire description du País de Bigorre* (1614).

12. On attribue l'amenée d'un savoir-faire hydraulique dans le Haut Adour à des moines cisterciens venus du lieu-dit « Cap-Adour » dans la vallée en 1136, et qui donnèrent son nom à « La Mongie ». Fuchs et coll, *Commune de Campan et Asté, monographie historique, site de la vallée de Campan*. DREAL Midi-Pyrénées septembre 2011, p. 4.

13. « ...c'est à dire le tour de chacun pour prendre l'eau du canal avec le jour et la durée. Pour l'alimentation en eau des gens et du bétail, chacun avait droit à un minimum permanent: c'était la quantité d'eau qui pouvait passer à travers un trou de quatre centimètres; de ça on ne pouvait pas l'en priver. Ensuite, pour l'arrosement, chaque propriétaire avait droit à une durée en heures (ou en journées) proportionnelle à la surface à irriguer. » Buisan, 1999, p. 23.

14. ARDISSON Luc, « L'utilisation agro-pastorale de l'eau dans l'économie traditionnelle de la vallée de Campan » in *Bulletin de la Société Ramond*, 1991, p. 55 à 64.

15. Archives départementales de Tarbes, Fonds Causi. Vallée de Campan J.-CH. Boué Ingénieur agronome, p. 15 à 19.

16. BERTHE Maurice, *Le Comté de Bigorre au bas Moyen-Âge*, École des Hautes études en Sciences Sociales. Paris 1976, p. 98 à 136.

17. CAVAILLÈS Henri, « l'association pastorale dans les Pyrénées », in *Le Musée social*, 1910, p. 45 à 80.

18. L'appellation « Escodes » est conforme à l'usage des anciens Campanois. Le terme désigne les eaux séparées du courant principal. La rigole d'alimente, en effet pour chaque cabane, un petit canal dérivé qui coule au fond d'un « leyté ».

19. « Le montagnard peut accueillir sur les estives, individuellement ou collectivement, des animaux venus de la plaine, mais en quantité limitée. D'où une forme originale et très ancienne de contrat le « bail à cheptel » (gazaillé en termes locaux). » Lefebvre, 2000, p. 83.

20. L'inscription à l'Inventaire national du patrimoine culturel immatériel de l'UNESCO des systèmes gravitaires d'irrigation de la Lozère en fournit un exemple. Projet porté par le Comité pour la mise en Œuvre du Plan Agro-environnemental et de Gestion de l'Espace.

21. Se reporter à l'article d'Anne-Claire Guénée, Chambre d'Agriculture de Lozère, dans la revue *Monumental*, Chantiers / actualités Patrimoine de l'hydraulique. Semestriel 2-2019, p. 86-87.

22. Écosystème complet, c'est-à-dire, incluant les humains dans les interactions entre biotope et biocénose. Se reporter aux écrits de Bruno David, Président du Muséum d'Histoire Naturelle, notamment à l'ouvrage collectif: *Manifeste du Muséum. Humains et autres animaux*, Paris: Relief Éditions, 2019, 96 p.

23. SIG Haute-Bigorre, fruit du partenariat OAPHB / Consortium Huma-Num PARIS TIME MACHINE (UMR 7041 ArScAn). Description en cours des enchaînements hydrauliques des petits canaux ayant desservi en eau de service les maisons de ville, les jardins et les parcs à Bagnères- de-Bigorre jusqu'au milieu du XXe siècle.

24. États Généraux de la transition du tourisme en montagne – Déclaration commune du 24 septembre 2021.