

Sustainable Technologies of Earth Constructions in the Banat High Plain Area. Typology and Evolution.

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Abstract

Prior to the conquest of Banat by the Habsburg administration, the settlements of local Romanians and Serbs looked entirely different. According to the principles of the new administration, the formerly existing settlements were relocated and systematized and new settlements were founded, all of these on very clear rules. Instructions on the building materials used and the housing plan are repeatedly issued and an indirect stylistic influence is noted through the systematization plan itself.

In general, there was a 3-step evolution in terms of the predominant material used:

- dwellings made of braided rods and earth mixture,*
- dwellings made of rammed earth,*
- brick and stone dwellings.*

Consequently, earth is the binder on which constructive methods were adapted to existing local resources. At the end of the 20th century, the social structure of Banat plain area changed radically due to the departure of the Germans, replaced afterwards by Romanians. Because of the precarious situation of the new inhabitants, they did not bring radical changes to the existing households, but they neither maintained them and many households are degraded today due to the use of inappropriate materials.

The article highlights the main architectural elements that defined the early periods of systematization in the province of Banat and how they determined a specific identity of this region through coherence and functionality. The construction techniques used demonstrate an efficient adaptation of existing resources and draw attention to the architectural value of the 18th century settlements and the risks to which the rural identity of the region is subjected by the contemporary practices in the field of construction. The lack of continuity in the preservation and improvement of the earthen building stock leads to the loss of the elements that defined them originally. However, the interest of earth construction is steadily rising today due to the international influence towards sustainability.

Rezumat

Lucrarea accentuează tehnicile de construcție din zona de câmpie înaltă a Banatului în timpul administrației habsburgice și consecințele acestora asupra dezvoltării ulterioare a regiunii. Măsurile

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de sistematizare evidențiază caracteristicile dezvoltării durabile în ciuda ritmului accelerat de creștere economică. Există o trecere treptată de la tehnicile constructive tradiționale din secolele XVIII-XIX (locuințele din nuiete și argilă, respectiv pământ compactat) la metode mai rapide (locuințe din văiușă, cărămida arsă și piatră), dezvoltate împreună cu meșterii nou-veniți.

Tranziția are loc treptat, pornind de la resursele locale disponibile și terminând cu un transfer de cunoștințe între populația locală și noii coloniști, fapt care devine evident ulterior cu apariția stilului baroc și clasic.

Datorită condițiilor politice instabile (deportări, imigrații, colectivizarea în regimul comunist și în prezent tranziția bruscă la capitalism), există o lipsă de continuitate care se traduce în depopularea localităților rurale, abandonarea tehnicilor de construcție și adoptarea unor împrumuturi stilistice discutabile.

Keywords: earth construction technique, systematization, sustainable development, household typology, transition

1. Historical context

Immediately after the occupation of the Banat province, the military administration began its organizational work and in order to assess the possibilities of the province's fiscal exploitation, a general conscription of Banat that was completed as early as 1717. This conscription was finished in the coming years by elaborating detailed land plans, which will cover all inhabited or deserted settlements of Banat.

The Vienna Court had focused its attention on a more vigorous development of the Banat economy. Colonization was a requirement stemming from the very status of the province Banat at the border of the empire. Military and religious causes, driven by the need to strengthen the borders and create a mass of Catholic population on which the Habsburg monarchy is based, led to massive colonization of the Banat with a German population as well as with other nationalities (Italian, Spanish, French, Bulgarians etc.)

The process of colonization was a complex and complicated action, requiring the overcoming of major obstacles, first of all the resilience of rulers that had to allow the departure of inhabitants of their fields, then transport from places of origin to recruitment centers.

The colonists were settled on the strategic routes used mainly for military reasons, but also other natural factors contributed; this area of the first colonization was on a higher terrain, located at the rising of the swamp regions and in the west of the mountain, where the climate was considered more bearable for the newcomers and the soil more fertile. The court also wanted to have a faithful human resource that could be recruited for the army or oppose resistance to a possible Turkish invasion, in close cooperation with the military units. The colonists brought with them advanced agricultural and handicraft techniques which can be seen throughout the following years of development.

2. Social Context

The social condition of the people in the high plain area of Banat can be illustrated by the accounts of illustrious foreign culture travelers - such as Francesco Grisellini in the 18th century or, for the 19th century, brothers Arthur and Albert Schott that were astonished to see the extent of ignorance as well as a massive presence of superstitions and obscure practices of influence, the expression of an ancestral fear that dominates all European people throughout the Middle Ages and the early modern age. To put it in context, almost 80% of Europe's fifty million adult inhabitants of those times were

illiterate, 85% percent of the population lived from agriculture.



Fig.1 (right). Petrach Zortan” - One of the oldest paintings representing a peasant from Banat, by Alessandro Magnasco (1667-1749) at the command of Franz Paul Count of Wallis (1677-1737)

Fig.2. (left) picture of an extended family, three generations of peasants from Banat, dressed in the traditional harbor at the beginning of the 20th century, almost unaltered by import elements. The woven inscription on the young woman's coat - Victoria Cincu - places the origin of this family somewhere in the Buzias area. The photo was scanned after the original kept in a private collection in Timisoara.

The emancipation of the local population started in the 18th century but with more obvious consequences in the 19th century. A set of norms, rules or habitudes that violate old practices and affect the traditional mentality are thus imposed by the Habsburg Empire. Instead of habit and empirical practice, it is attempted to establish sanitary assistance, the use of recommended treatments by doctors, the setting of prophylactic measures. In addition to this, there is an intense preoccupation with schooling, education becoming a state matter strengthened by economic or sometimes even fiscal means. The state sees in schooling a necessity for raising economic power.

The new administration imposed on the province of Banat an accelerated development pace not met up until that time. A leading place in this vast modernization program is the systematization of urban and rural localities.

3. Sistemization

The concept of modernization of the Banat province was based on an ample systematization program, including urban and rural localities. The development of this program belongs largely to Banat's first military governor, Claudius Florimund Mercy - the skillful military that fought with Eugene of Savoy against the Turks, who realized during the peacetime the modernization of the province, which was entrusted to him.

According to Johann Heinrich Schwicker, between 1768 and 1772, 24 new localities were founded with 2,097 homes for about 15,000 people, and between 1784 and 1786 another 14 new settlements and another 13 were increased, totaling 2,880 new homes for 1,550 families. The administration sought to colonize as many craftsmen as possible in order to achieve this ample utility program.

The plans of the new settlements were developed by the Aulic specialists in Vienna according to the rationalist principles of spatial thinking and fashion. All the newly established villages are based on a geometrically designed plan, named in the Schachbrettdorf German literature, a chessboard village. Paragraph 13 of the Impopulations-Haupt-Instruktion (the Banat Settlement Regulation of 1768) states that the planning of new settlements is done by engineers. The rectangle divided into a grid is the geometric shape most appropriate for a predefined settlement in Banat. Through a regular geometry of the settlement, it was desired to influence the inhabitants towards an orderly life.

The principles that have been modeled on the territory of Banat were those of the mercantilism and absolutism of the Habsburg administration found in the use of land, morphologies of settlements, lotisations, architecture, etc. Thus, the old settlements have been relocated, systematized or re-established according to very clear rules.

The land area required for a family to be developed (arable land, meadow, orchard) was regulated, and the plots on which the households were to be built were between 23-29m street front and 140- 190m deep. Originally, these batches could not be divided by being inherited by the elder son, but in some cases this rule was abandoned resulting in different batches. This original organization has transformed over time with society, but never radically as the whole Banat cultural landscape has been transformed during the Habsburg colonization. With the growth of the population in the 19th century, new settlements had emerged, the old settlements had either expanded or densified, but had preserved the spatial and constructive characteristics of the previous villages. Only a general trend towards diminishing the lots due to the decrease of land availability, but also examples of unification of properties in the case of wealthy families.

A radical phenomenon occurs in the 20th century within the social structure of the high plain area of Banat, when the colonists left the province and Romanians were brought into their place. Due to the precarious material situation of the new inhabitants, they did not make radical changes to the Swabian households, but they did not maintain them properly, as many households were degraded today by using inappropriate materials.

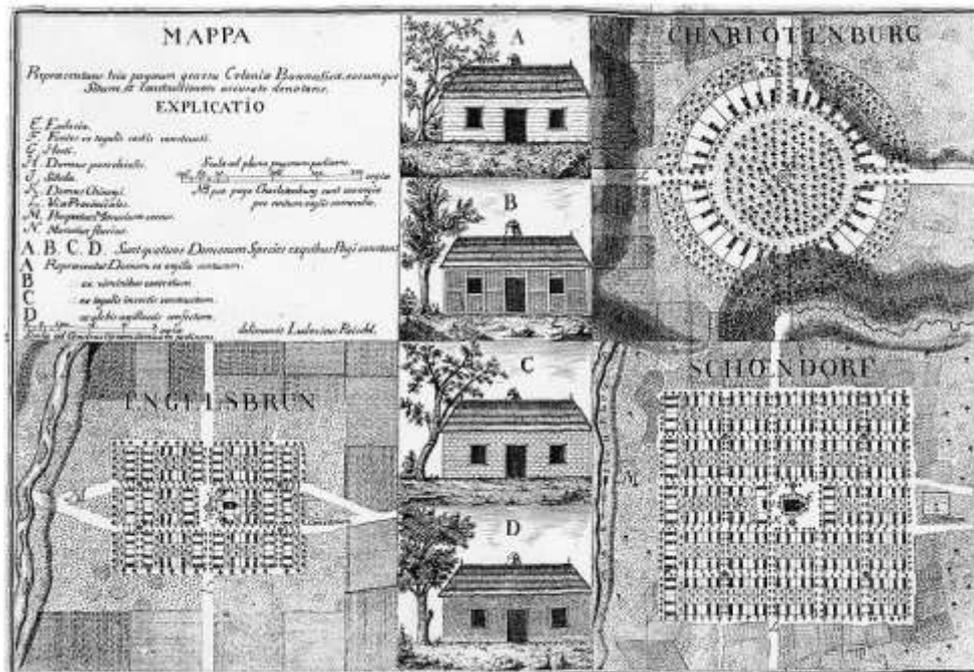


Fig.3. Types of rural planning in the Romanian Banat during the Habsburg administration, Ion Gabriel Panasiu, http://www.simpara.ro/ara7/a7_02_13.html



Fig.4. Types of rural dwellings in the Romanian Banat during the Habsburg administration, Ion Gabriel Panasiu, http://www.simpara.ro/ara7/a7_02_13.html

4. Housing Typology

Due to the intense systematizations undertaken by the Habsburg Empire, the structure of the household from the pre-Austrian colonization (before the 18th century) was substantially altered, but the local construction technology is maintained. Thus, further reference is made to the evolution of traditional households and houses from the 18th century, when they were built by the Habsburg administration, following a regulatory system.

The colonists' households were initially equal (sometimes there were other typologies depending on the size of the family or according to the administrator), but with the material, social and cultural development of families, the households also turned to meet these needs.

Partitioning varies from single-cell homes to multi-cellular homes. The tricellular dwelling is increasingly preferred, consisting of two rooms arranged symmetrically to a central utility room. This plan is in line with both the local tradition of succession, which requires the firstborn to remain with the parents after marriage, thus providing enough housing for both families.

In the first phase, households grew only long, annexing new household spaces (slopes, stables, workshops, etc.) in parallel with the transformation of old annexes into living quarters. It is important to note that the architecture and the way of occupation of the colonists' land has strongly influenced the architecture of the local population (lot positioning, architecture and constructive systems). Prispa is an element considered to be taken from the local architecture (from Romanians and Serbs). Initially, colonists' homes lacked a porch and only had a prolonged cornice on the side of the access. Through time, these buildings have borrowed this constructive element. Also, the appearance of the summer kitchen or elderly home as a building block opposite is considered by some to be an influence of Serbian architecture.

An evolution of this typology is the L-shaped or U-shaped household that is open to the street. And this typology is found throughout the Banat province, being dominant in the northern zone. Much later, the houses appear along the street (half the width of the lot), then the houses with the total closure of the street front. Chambers with parallel fronts with the street were considered a sign of prosperity. Only later barns could be built perpendicular to the lot (after the middle of the 19th century), and when there was a house on the street along the front, the passage through the house and the barn was made in the extension. In the areas where we have this typology we have continuous street fronts.

From this stage, it is mentioned the typology of the houses that were initially disposed longitudinally but in time they were extended with a partial transversal body or along the whole street front. This

typology can also be found in all the province, being more visible in the central area of the old settlements where the families were wealthier. The roof is simple, in two slopes, and the cover material is out of straw and subsequently, out of manual or industrial ceramic tile.

The specific ambience of the rural environment is largely determined by the unity of the street fronts, an unity obtained by joining buildings that, although not identical, respect dimensions, proportions similar and the same ratio to the human scale. Observing the rhythm of buildings and even the windows of the facades are a key factor in shaping the unitary framework of the traditional village.

The 20th century represents the complete success of brick and stone architecture - in the second half of this century only in brick, although in the first decades there is still a large presence of houses in rammed earth or wood. It is remarkable that the triumph of the brick architecture is accompanied by a multicellular type of dwelling.

During the industrial period workshops and factories of construction materials (brick, pavements, tiles, glass, etc.) appeared in cities and large villages, which changed the appearance of the settlements and the old dwellings. Households were becoming more and more compact with a number of dwellings and annexes that close and define an interior space - the courtyard of about 400 square meters, relatively rectangular.



Fig.5. Typical village in the Banat high plain area, <http://www.cooperativag.ro/cercetarea-monografica-regionala-interbelica-cazul-banatean/>



Fig.6. 19th century, Storefront of Josefina Friedmann, <http://www.comuna-doclin.ro/istoric>

5. Construction technique

In terms of the predominant construction materials used for dwellings in the high plain area of Banat, there is a three phase evolution: dwellings out of woven rods and clay, then the dwelling made out of rammed earth, followed by the stone and brick dwellings.

The 17th and 18th centuries are dominated by dwellings made out of woven rods and clay. These houses are cheap and easy to build up, so they are also recommended for colonists. Almost all travelers of the eighteenth-nineteenth centuries perceive the presence of woven rods. Johan Fridel describes them in 1769, noting the ease and dignity with which the Romanians raised them: "Their houses are modest in proportions, woven from rods, clay-clad and covered with straw and reed, with small windows of which are blisters of ox or pig instead of glass. The Wallach beats 4 strong and young trees in the ground, puts four more above them, wraps a wall round about, covers it with earth, places some branches as a roof, then puts a reed and this palace is finished in 2-3 days.

At the beginning of the colonization period, there were some cases when a colonnade was built. Even in the second stage of systematization, some newly-established huts were built in order to give the newcomers a temporary shelter until the houses were raised. A description at the end of the 19th century, explains the appearance and function of the huts: "People in ancient times lived in huts. A pit is dug properly in the ground at 1 m deep, as long as it is (long and wide) over which the trees are placed in pyramidal form ". In conclusion, the hut, serving as a shelter and shield, was the modest dwelling of some peasant groups, and disappeared from Banat at the end of the 19th century, competing with other types of rural dwelling.

It is assumed that the architecture of rammed earth was known in the Banat area before the Austrian conquest, but it is certain that during the 18th century and early 19th century it gradually took the place of the previous technology: woven wood rods.

In the construction of the earthen walls, several procedures are known, the most common among the Romanians was the rammed earth technique within a wooden formwork. This technique was also used in the Hungarian plain on the territory between Tisa and the Danube. To the southwest, the process is also known on the territory of Slovenia and Croatia, to their contact area with the Pannonian Plain. But if the rammed earth technique used in all of these geographic areas resembles that of the Banat, the typology of the houses differs. For buildings with rammed earth walls, higher and stronger places were chosen because of floods. The raw material for the rammed earth was clay, extracted from pits dug at the edge of the village. Almost there are no villages that do not have such pits near them, from which generations of inhabitants have extracted clay for construction. There were preparatory operations necessary for its use in construction: the extracted earth was deposited inside the household, evenly distributed around the future walls, and in order to be compact, it was shredded with holes and it was sparingly sprinkled with water.

For the foundations of the earth walls a ditch with a width of about 60 cm, a depth of 50-60 cm or more, was dug up to reach the soil. When the foundation was ready, the entire perimeter of the future building was lined with thick planks with the help of pillars, they were tied up with ropes, and the distance between them was fixed at 1-1.5 m.

The interior of the formworks were made of wood to keep the same distance and thus to avoid the future wall of presenting corrugations. There was a certain order to beat the walls, first of all the long facade behind the building, the short facades, then the median walls and finally the long facade from the courtyard. All the walls had a thickness of 60 cm, except for the one from the courtyard, which was 50 cm thick, and the openings would be laid in it. Earth was rammed from the ends to the middle by small teams of beaters (2-4 people), thus ensuring the teams rest. At each level of the formwork, three layers of earth were struck; the same material as the corners (wires, thorns) were placed along the walls in the middle to provide additional crack resistance. At the end of the first level, the pillars unraveled from the ropes, and the formwork rose higher, then the pillars were reunited and another level was beaten. Also at the third level of the planks the distance between the formworks decreases by 2-2.5 cm, at the length and width of the construction, so that the wall that had 60 cm at base, at the upper part it had only 45-50 cm, thus gaining great stability. The walls reached the height of 1.9-2.5 m. Up, along the walls was a belt beam, and on it the transverse beams.

The techniques described above were built up to the beginning of the 20th century, and in some parts of the Serbian Banat even to the 20's, not only the houses, but also the main annexes of the peasant household: stables, barns and so on there are villages where enormous fences (Nicolinț,) are built with the same technique.

To help the colonists and speed up the housing process, the imperial administration developed other home projects. The proposals were ultimately focused on reducing costs. This way, there has been a sort of standardization of the building elements (doors, windows, etc.) as well as the choice of the cheapest and most readily available building materials and techniques. Some researchers say that the first houses built for newcomers used low quality materials that had to be quickly put to work, which in short time led to the need for capital repairs or the more solid reconstruction of the whole dwelling. Karl Eugen Reb studying the evolution of Swabian households in Banat, said that the model for a first type of colonist house constituted the so-called "Franconian household" spread in Lower Austria, E. Lammert and H. Gehl assert with great certainty the opposite: "The German colonists built their homes according to the local models found here. Neither during the establishment of the settlements nor in the further development of the household, the foreign influence in the original places can be recognized, regardless of the West Germanic house combined with the stable of the household in Central Germany, also called the French house to other types of houses".

Moreover, Georg Bleyer, in a study published in *Neuer Weg*, states that the inner structure of the traditional Swabian household that could be spotted in the 50's of the 20th century, similar to the Franconian type, represents an evolutionary stage reached only in the 19th century, as a result of the interpretation of some Slavic prototypes and not as an influence of the French House. This constructive type was not used during the colonization, but it was a result of independent perfection until it entered the generally accepted tradition while the reasons underlying this structure are, in general, those of an economic nature.

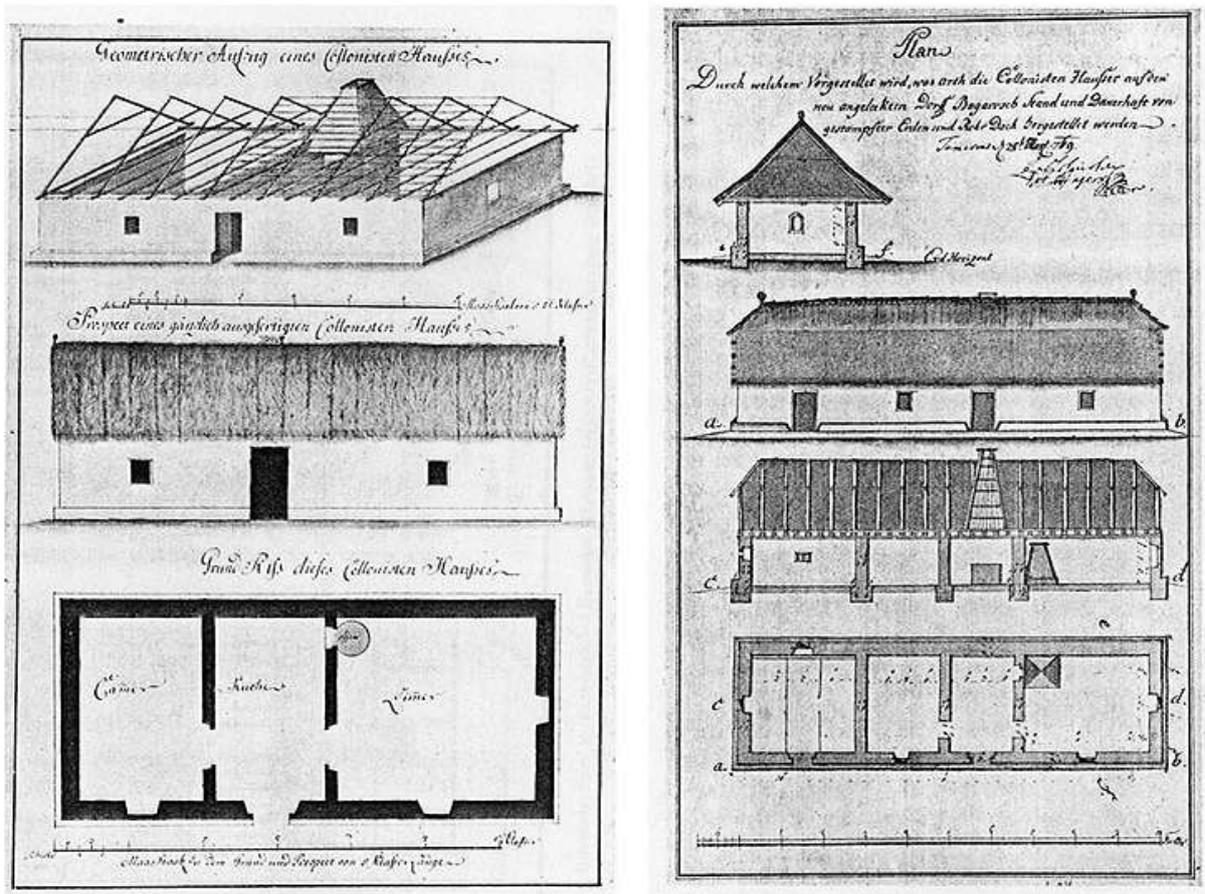


Fig.7. House project for the Romanian banana during the Habsburg administration, Ion Gabriel Panasiu, http://www.simpara.ro/ara7/a7_02_13.htm

Since the beginning of the 19th century, with the Confederation Constitution of 1807, only the construction of durable material houses is permitted for the border area. In addition, by the middle of the century, the authorities have granted border guards a tax exemption for ten years if they accept to build a stone home.

6. Further development

The lack of a nobleman in Banat resulted in the 18th century architecture in the absence of baroque houses or country houses. It is only after the sale of the domains at the end of the century and the beginning of the 19th century that the noble residences, the houses of the estates will be raised, all in one way or another the tribute to the new classicist style. Many of Banat's craftsmen take advantage of this optimal opportunity to learn the profession at a contemporary level, and the ones learned to apply them, of course, in a form adapted to the spirit of folk architecture, and to the construction of peasant

houses. Some elements of style used in the compositions of the so-called Peasant Baroque are testimony to these influences.

Both the public buildings in the center of the locality and the dwelling houses will be designed to best meet the requirements of this new framework. Between 1720 and 1810, Baroque-inspired churches were erected in Banat, and with the construction of the churches the new formal elements were revealed.

If, to this point, the baroque was at the edge of the area of influence by adapting it to such a wide scale, namely to all nationalities and to all confessions, the Baroque style deployed its gravitational center eastwards in the center of Europe taking its place the more and more obvious classicism. The time difference and its adaptation to a space away from its origins gave the baroque manifestations the chance to develop in these landscapes, in original forms and variants, both architecture and literature, art, landmark and other areas of manifestation, primarily in terms of the need for representation.

As a result of the increase in welfare, often due to the poor quality of the buildings made in a hurry, the German settlers moved to renew this dwelling house with a more sustainable one. This second house also had a new function: the representation of well-being. Starting from urban models already made under the influence of the late Austrian Baroque, this house will present a round fronton. The Swabian villages adopted the first forms of a curved fronton after Baroque models. The appearance of such a fronton in the Romanian villages can only be mentioned from the second half of the nineteenth century, sporadically at the beginning, generalized especially in the last decades of the last century and the first decades of the 20th century.

But not all Baroque houses were newly built houses. In many cases, where the construction of the rammed earth technique was well done, only the façade was replaced, which was done exclusively for a representative purpose, this purpose generalizing almost the entire surface of the Banat after the revolution of 1848 1849. Decorating the facades of houses, especially those of Baroque influence, had become a new branch of folk art in Banat.

On other public buildings, a great variety of new forms of construction and decoration have been overlapped and forced through the construction and decoration of the dwelling house, the mirror of a rapid development of the province in less than a hundred years. This development included the changes in the structure of the rural population until the beginning of the nineteenth century, the consolidation of the peasant economies and the accelerated differentiation of the peasantry, which will also be reflected in the differentiation of the popular architecture.

The establishment of the peasant baroque appeared in Banat already at the end of the eighteenth century, the way and forms of achievement being brought either by calfs left from these areas on their training trips or by Austrian craftsmen established on these lands.

Until the first half of the nineteenth century, the façade was approximately square, and the height of the gable wall was equal to the height of the house to the cornice. After this period, the width of the façade widened, and around 1900 the cross-sectional house appeared.

Both longitudinal and transverse houses are characterized by horizontal decorative elements (cornice, socket, ornamental strips marking) that dominate the composition and contribute to the uniqueness and identity of the entire street profile. The proportion and grouping of voids (doors and windows) and vertical decorative elements (frames, columns) have the role of harmonizing and balancing the composition of the façade.



Fig.8. Serbian House from 1927, <http://www.banaterrea.eu/romana/banatul-romanesc-casa-sarbeasca-din-1927>



Fig.9. Typical house of the Swabians, 20th century, <http://muzeul-satului.ro/planifica-vizita/ce-pot-vedea/expozitia-permanenta-arhitectura-vernaculara/gospodarii/borlova-judetul-caras-severin-1897/>

The relatively few decorative elements have been applied in various compositions, from the beginning some motifs and procedures are noticed, which are not missing today, two hundred years later, in the compositions applied by craftsmen on new houses in the villages of Lunca Timisului. The year of construction, various forms of the tree of life, solar signs, religious motifs, window frames, as well as some structural elements (the prominent cornice and, as vertical elements, imitation of columns and pilasters made of plaster relief) are part of the repertoire more frequent and perennial of this area.

The desire to decorate has also been maintained for the new edifices emerging during the gradual urbanization of the rural environment, in cross-country houses that do not offer so well-marked surfaces as the longitudinal house. In this type of house the fronton from the street disappears as an ornamental field; the ornamentation will be applied on the new facade, on the front of the yard or on the gates.



Fig.10. Abandoned dwellings in the Banat high plain area,
https://adevarul.ro/locale/timisoara/fotoreportajbanat-1_50acf2d07c42d5a6638c6a7a/index.html

7. Conclusions

The colonists' houses from the first systematization period were largely oriented to the types of houses of the local population of Banat high plain area. The existing models provided optimal solutions, suitable for all areas where German, Italian, Spanish colonists were seated. Considering the construction technique in the first period of colonization, no element was brought from the areas of origin located in the territorial states of the Habsburg Empire. Thus, the absence of tradition-related norms has facilitated the choice of the most practical type, which is usually the one in the area.

The administration has shown flexibility and availability to local conditions in the sense of, making good use of constructive traditions, the experience and skill of the average local population to build every single house. Afterwards, craftsmen turned to other creations in folk culture, or took on details and incorporated them into traditional decorative compositions. If the new settlement plan in many

cases was imposed by the administration, this step in taking over the items did not occur without the consent of the locals. It is a decision that is accomplished by the extent of the individual contribution to strengthen the taste of the community.

The transition takes place gradually, starting from the available local resources and ending with a transfer of knowledge between the local population and the new settlers fact that becomes obvious later on with the appearance of the Baroque and Classical style. This methodical approach of acquiring and transferring knowledge from each nationality makes the regional development sustainable despite its accelerated pace.

Even though the traditional construction techniques are discarded nowadays because of a sudden transition towards more commercial option, the interest for earth construction is steadily rising today due to the international influence towards sustainability. Also, the abandoned dwellings in Banat become a viable option against the chaotic urban sprawl. What remains to be done in this context is the reconstitution and update of knowledge about sustainable techniques that have determined, beginning with the 18th century, a specific regional identity through coherence and functionality.

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