TOPO-CADASTRAL WORKS FOR THE ESTABLISHEMENT OF A ZOOTECHNICAL FARM USING AFIR FUNDS

A. SMULEAC[1], C. NICORICI[1], R. PAŞCALĂU[1], Laura SMULEAC[1]

[1]Banat's University of Agricultural Sciences and Veterinary Medicine "King Mihai I of Romania" from Timisoara, 300645, 119, Calea Aradului, Timisoara, Romania
Corresponding author: laurasmuleac@usab-tm.ro

Abstract. *Topo-cadastral works are necessary in the planning and execution of almost any form of construction. In this paper suck works are going to be used in order to establish a zoo technical farm in the West of Romania, Turnu village, Arad County. By far not many zoo technical farms exist in the area. These works are going to be done using maps and topographic plans, as well as GPS and AUTOCAD designs. The article encompasses a multifaceted topographic survey for the identification and registration of a zoo-technical farm type immobile comprising the farm head office, stables, silos and concrete slabs for registration in the land book. The farm where the topographic works are executed is a farm specializing in the breeding and fattening of cows for the production of milk. The building will also be equipped with renewable energy installations/solar panels (new funds requested) and the verdant walkway is easily accessible by workers and visitors. This project is funded through accessing European funds via AFIR. Succeeding topographic-cadastral works are used in many fields but they have many difficulties caused during the process of production and the issues regarding reform of maps which were being used.*

Keywords*: topo-cadastral measurements, zootechnical farm, land, European Funds*

INTRODUCTION

The territorial Administrative Unit of Turnu from Arad County has a total of around 1200 inhabitants [https://www.pecica.ro/].

Geographical position: Location and GPS coordinates (in WGS84 system) (figure 1) Latitude, Longitude: 46.256898, 21.126108 = decimal degrees 46° 15' 24.8322", 21° 7' 33.9882" = in degrees minutes seconds

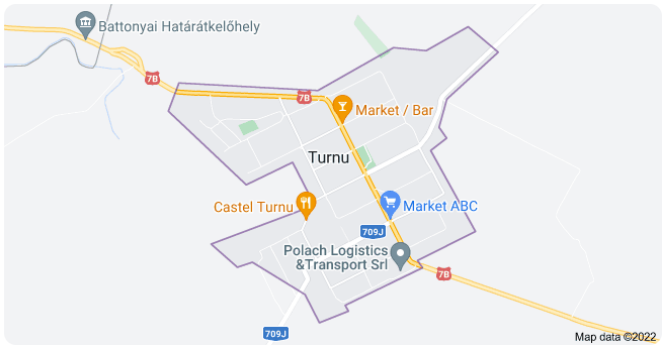


Fig. 1 – The studied zone

The present work aims to carry out the topo-cadastral works for the extension of a livestock farm for cows from Turnu, Arad County through European funding.

All cadastral works represent the identification, measurement, description and registration of buildings in technical documents [Babuca et al. 2009; Șmuleac 2020], as well as their representation on the cadastral plans and the storage of data on computer media.

Systematic registration ends with the registration of information in the land register. The cadastre determines the position of the boundaries of the neighboring buildings, based on measurements [https://www.ancpi.ro/].

MATERIALS AND METHODS

The first operation performed in the case of topographical works, is the recognition of the land [Lalu et al. 2020, Popescu G.], in order to identify the work area (figure 2) with the estimation of the density of the elements to be topographically raised, i.e. the characteristic elements that must be represented on the plans, as well as the operations of identifying the points in the RGIR (Geodetic Network of Thickening and Lifting) carried out in advance, also checking the integrity of the materialization of these points and the importance for achieving the stages of achieving the topographical elevation.

Fig. 2 – Location of the studio area [GOOGLE MAPS, 46.243259,21.115261]

The materialization on the field [Şmuleac et all, 2020] of the topographical points is called marking. The topographical points materialize on the ground through landmarks, which remain on the ground even after the measurements are finished [Şmuleac et al. 2019]. The topographic surveys were carried out using the Leica FlexLine TS07 total electronic station (Figure 3) and the determination of the checkpoints was carried out with the Leica Viva GS07 GPS equipment.

The Leica Viva GS07 GNSS system is a robust equipment with the highest levels of quality. The technology used is Leica RYK plus type, with the possibility of connection to GPS satellites (L1,L2,L3C, L5), Glonass(L1, L2,L3) and QZSS(L1,L2,L5,LEX) satellites (Figure 4).

The data processing was carried out with the help of the Leica Infinity program, and the processing and realization of the situation plans was carried out with CAD programs.

The distance between the points is determined by the concrete conditions in the field, by the degree of coverage with vegetation or constructions, by the purpose of the topographical elevation and by the topographical equipment provided by [Herbei M. et all, 2013].

Fig. 3 Leica Viva GS07 GNSS System

Fig. 4 Leica FlexLine TS07 Total Station

RESULTS AND DISCUSSIONS

In order to carry out the project for the defilement of a livestock farm, the following stages were carried out and carried out in order to start the works, according to STAT 5091/71 and STAS 9824/1-87 and the Norms and laws in force for the execution of the works (C 169/88; C 56/85; C 16/84; Law 10/95):

1. Preparation of the land for the start of works:

- vacating the land made available for the execution of constructions that would prevent the work;

- the stripping of the topsoil, its transport and storage in the fixed places. The thickness of the topsoil layer was established by surveys.

2. Objective marking

Its drawing is done in two stages:

- fixing the landmarks in the field and the axes of the constructions, based on the situation plan;

- drawing the works in detail, according to STAS 9824/1-87.

3. Execution of excavations:

When carrying out the excavations, the following must be taken into account:

- the natural balance and the balance of the land around the foundation pit or around the foundations is not damaged for a sufficient distance so that the stability of the surrounding buildings existing and/or under construction is not influenced:

- ensure the preservation or improvement of the characteristics of the earth under the foundation sole;

- ensure the safety of work during the works.

If the execution of excavations for foundations involves the unveiling of existing underground networks (water, sewer, electrical) that remain in operation, measures must be taken to protect them against damage.

These measures to protect them against damage were foreseen in the project and the execution of the excavations was carried out only after obtaining approval from the institutions operating those facilities. The execution of the foundation excavations over an electrical cable was carried out only in the presence of the representative of the institution operating the respective electrical network, who indicated and controlled on the spot the measures to be taken to protect the cable and avoid accidents.

4. Safety of excavations and protection of stalls

Foundation excavations with unsupported vertical walls can be executed up to depths (according to C 169-88) of: - 0.75 m in the case of non-cohesive and poorly cohesive lands; - 1.25 m in the case of medium cohesion land; - 2,00 m in the case of land with very high cohesion. Over these depths the walls will necessarily support with horizontally placed wooden cabinets placed with spun and horizontal splinters between the walls of the excavation. Support with vertical cabinets can also be used in the case of soils with low consistency (sands, etc.) or when the created digging depth is over 5 m. The following measures must be taken to maintain the stability of the banks: - the land around the excavation is not loaded and not subject to vibration; - the soil resulting from the excavation is not stored at a distance of less than 1 m from the edge of the foundation pit: in the case of excavations up to 1 m deep, the distance may be taken equal to the depth of the excavation; - measures shall be taken to rapidly remove the rainfall or accidentally derived waters; - if, due to unforeseen causes, the foundation is not poured immediately after digging and phenomena are observed that indicate the danger of subsidence, measures are taken to support the wall in the respective area, or to transform them into walls with slope. The contractor is obliged to permanently monitor the appearance and development of longitudinal cracks parallel to the edge of the excavation, which, if not caused by the drying of the earth, may indicate the beginning of the collapse of the banks and to take measures to prevent accidents.

5. Inspection of works and approval:

In the preparation stage of the excavations, the following objectives are pursued and the following documents are drawn up that will be part of the documentation of the construction book:

➢ the takeover of the site is made on the basis of a protocol of delivery - receipt of the site and of the landmarks, signed by the beneficiary and the designer as predators and the contractor as a recipient;

➢ the contractor ensures the drawing of the objective on the established site;

➢ the confirmation of the execution of the drawing and of the leveling operations in accordance with the provisions of the project shall be ensured by the minutes of drawing the works, signed by the beneficiary and the contractor.

The qualitative reception of the construction works will be made in compliance with the Normative C 56-81. It will be analyzed the verification by the beneficiary and the contractor of the digging at the level required by the project. The confirmation of the verification and the findings shall be recorded in the report of the verification of the foundation quota.

6. Use of the resulting material:

The land resulting from the excavations will be loaded into the dump truck and will be transported in arranged warehouses, established by mutual agreement with the beneficiary and the executor, obtaining in this respect the consent of the mayoralties under whose jurisdiction the respective space is located. The beneficiary and the contractor will establish on the basis of a report the actual quantity of transport of the land.

Following the topographical elevations and the identification of the land books, two areas have resulted:

- The area of 9578 sqm, land set up in the Land Registry with no. 300074 Pecica and

- The area of 10500 sqm, land set up in the Land Registry with no. 304244 Pecica (figure 5, 6, 7).

The present work proposes to achieve the extension of the current cow farm, by creating a new stable for 178 cows, maternity area, manure basin inside, milking robots area with suplant where an office consisting of prefabricated metal container, manure basin outside, technical room for housing the pumps of the outer manure basin, garbage platform and outdoor platforms will be placed.

The cows will be housed in individual bunks, the cleaning will be ensured by a system consisting of 3 robots for cleaning, which will transport the manure from the cows in an inner basin of 140 cubic meters, and periodically, the basin will be pumped into the outer basin with a diameter of 25m.

The proposed stable is structured as follows:

-It will house 178 cows, with individual bunks,

-Maternity area cows, with straw bed bedding;

-Forage mass on the side areas on a width of 4.30m;

-3 Milking robots;

-3 robots for cleaning;

-Manure tank under the stable;

-Dairy with locker room area, toilets, technical spaces and veterinary office;

-Manure tank outside ø25m;

-Adjacent to the external manure basin, a technical room will be made, for housing hydraulic pumps and a garbage platform made of L-shaped reinforced concrete diaphragms. In transverse profile, the projected transverse slope is 2.0%, ensuring the rapid evacuation of meteoric waters to the roadway channels [Sham L. et all, 2014, 2016].

In longitudinal profile, the slope projected along the roadway will be 0.2%, with discharge into the existing trench at the edge of the plot, with the prior passage through the arc hydroc separator[Popescu G. et all, 2016].

In order to ensure the rainwater runoff and the optimal functioning of the sewerage system, the cleanliness will be ensured on the designed platforms. Particular attention will be paid to cleaning the gutters of the roadway. They will be inspected and cleaned annually, and after any major storm, which canlead you to clogging of the gullies [Şmuleac L. et all, 2017; Miță R. et all, 2020; Şmuleac et all, 2022].

The land proposed for the development of the project is intravilan, composed of 2 adjacent plots of land:

The site is composed of adjacent lands:

-CF 300074 Pecica, with an area of 9578 sqm, on which the existing farm is built, it is proposed to partially carry out the auto / paved platform and to carry out repair works on the coarse feed silo, according to the expertise report no. 89/2018;

-CF 304244 Pecica, with an area of 10500 sqm, on which it is proposed to achieve the extension with a new stable, manure basin, manure platform and technical room.

The 2 buildings (CF 300074 Pecica and CF 304244 Pecica) will be unified in the period between the approval of the General Urban Plan of The City of Pecica and the completion of the implementation of this project (figures 5, 6 and 7).

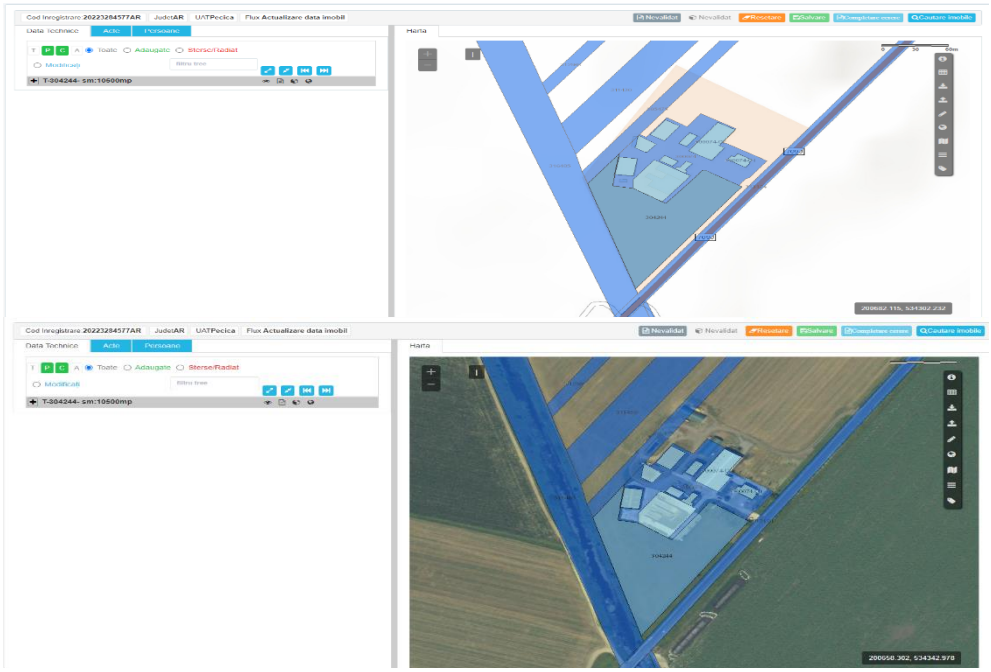
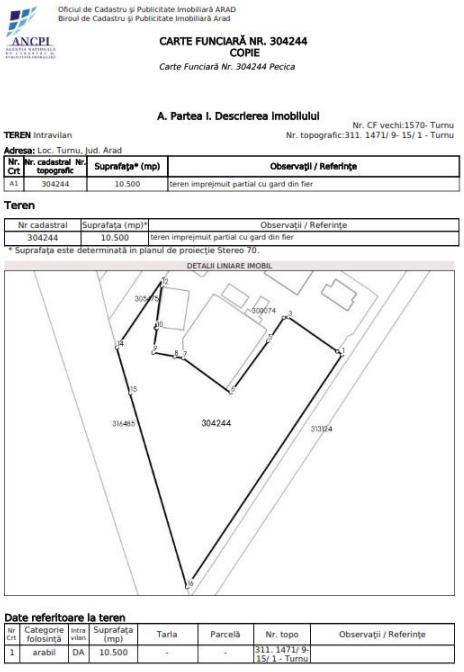


Fig. 5 Situation according to the CF of Ethera, CF 300074 and CF 304244 Pecica, Arad



Oficiul de Cadastru și Publicitate Imobiliară ARAD
Biroul de Cadastru și Publicitate Imobiliară Arad

ANCPI

CARTE FUNCIARĂ NR. 304244
COPIE
Carte Funciară Nr. 304244 Pecica

A. Partea I. Descrierea imobilului

Nr. CF vechi:1570- Turnu
Nr. topografic:311. 1471/ 9- 15/ 1 - Turnu

TEREN Intravilan
Adresa: Loc. Turnu, jud. Arad

Nr. Crt	Nr. cadastral / Nr. topografic	Suprafața* (mp)	Observații / Referințe
A1	304244	10.500	teren imprejmuit partial cu gard din fier

Teren

Nr cadastral	Suprafața (mp)*	Observații / Referințe
304244	10.500	teren imprejmuit partial cu gard din fier

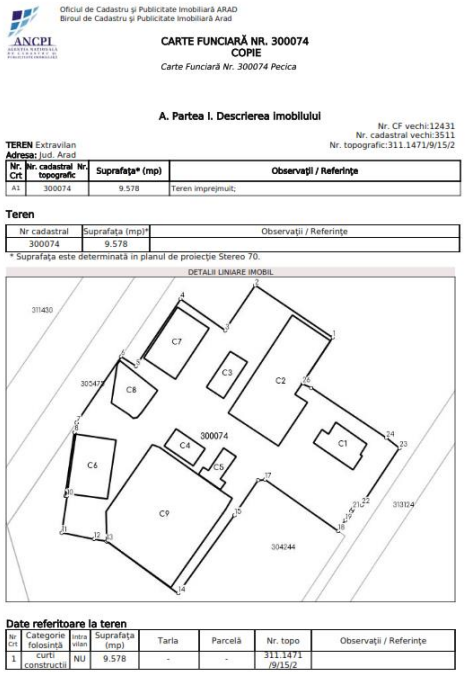
* Suprafața este determinată în planul de proiecție Stereo 70.

DETALII LINIARE IMOBIL

Date referitoare la teren

Nr Crt	Categorie folosință	Intra vilan	Suprafața (mp)	Tarla	Parcelă	Nr. topo	Observații / Referințe
1	arabil	DA	10.500	-	-	311. 1471/ 9-15/ 1 - Turnu	

Fig. 6 View of CF 300244 Pecica, Arad



Oficiul de Cadastru și Publicitate Imobiliară ARAD
Biroul de Cadastru și Publicitate Imobiliară Arad

ANCPI

CARTE FUNCIARĂ NR. 300074
COPIE
Carte Funciară Nr. 300074 Pecica

A. Partea I. Descrierea imobilului

Nr. CF vechi:12431
Nr. cadastral vechi:3511
Nr. topografic:311.1471/9/15/2

TEREN Extravilan
Adresa: Jud. Arad

Nr. Crt	Nr. cadastral / Nr. topografic	Suprafața* (mp)	Observații / Referințe
A1	300074	9.578	Teren imprejmuit;

Teren

Nr cadastral	Suprafața (mp)*	Observații / Referințe
300074	9.578	

* Suprafața este determinată în planul de proiecție Stereo 70.

DETALII LINIARE IMOBIL

Date referitoare la teren

Nr Crt	Categorie folosință	Intra vilan	Suprafața (mp)	Tarla	Parcelă	Nr. topo	Observații / Referințe
1	curti constructii	NU	9.578	-	-	311.1471 /9/15/2	

Fig. 7 Visualization of CF 300074 Pecica, Arad

The location, from a topographical point of view, is plan [Casian A. et all, 2012], in the plain area, with obstacles constructions with rare density, and low height, located in the rural area. Evaluation of wind action on constructions", indicative CR 1-1-4/2012, the site is located in the area with reference values of the dynamic wind pressure, qb = 0.5 kPa. Land category II: open field - grassy and/or isolated obstacle sites (trees, buildings) at a distance of at least 20 times the height of the obstacle, z0 = 0,05 m, kr2(z0)= 0,036, = 2,66 (Figure 8).

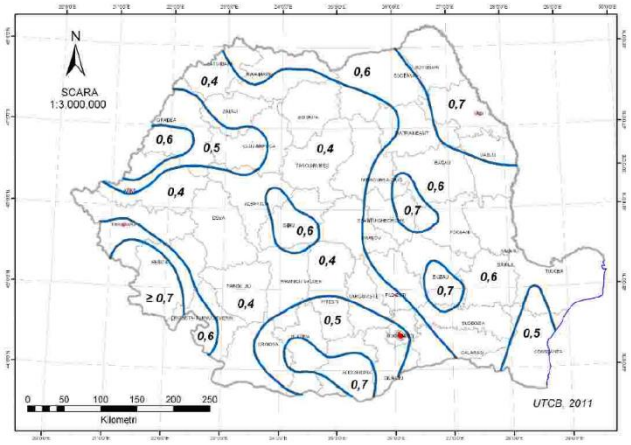


Fig. 8 Zoning of reference values of the dynamic wind pressure, q_b in kPa, *IMR = 50 years*

Four manual drillings F1, F2, F3, F4 were performed on the studied site. In the F1 drillings, F2 the filling has a thickness of 1.00m, and up to the depth of -3.70m compared to C.T.N. was intercepted a dusty clay complex tan-yellow plastic consistent, up to the base of the drilling (-5.00 compared to C.T.N.) there was met a sandy complex with gravel and brown-yellow boulders saturated with medium stuffing. Drillings F3, F4 show a similar structure of the soil, with the difference of the thickness of the filling of 0.80m.

The groundwater was intercepted at the depth of about. -3.00m compared to C.T.N. in the drillings performed (February 2021).

The variation in groundwater level is related to the amounts of precipitation fallen in the area. It is provided a maximum ascension regime of the groundwater up to the depth of -1.90m compared to the C.T.N. From the data presented above, as well as from those collected during the field works, the following peculiarities of the prospected amplified can be synthesized: the land surface is not affected by physico-mechanical phenomena.

The foundation ground is the sandy dusty clay complex, consistent plastic. The minimum foundation depth recommended for construction is Df=-1.20m compared to C.T.N.

According to the seismic macrozonation, according to the seismic design code P100-1/2013, the site falls within the Banat seismic zone, with the coefficients ag = 0.20g (peak value of the land acceleration for anti-seismic design) and TC = 0.7 s (the period of control of the response spectrum) for earthquakes having IMR = 225 years (average recurrence interval) and 20% probability of exceeding in 50 years (figures 9, 10 and 11).

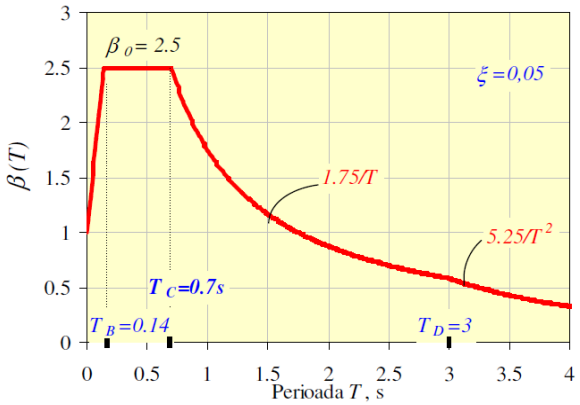


Fig. 9 Normalized elastic response spectra of absolute accelerations for the fraction of critical damping ξ=5% in seismic and field conditions in Romania, β(T)

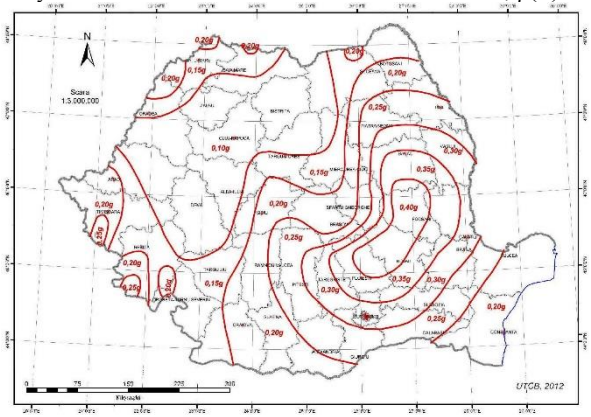


Fig. 10 Zoning of the Romanian territory in terms of peak values of the acceleration of the land for ag design for earthquakes having the average recurrence interval IMR = 100 years

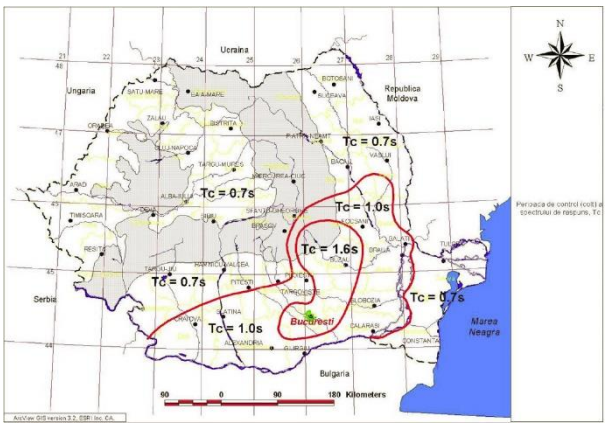


Fig. 11 Zoning of the Romanian territory in terms of the control period (corner), TC of the response spectrum

As technical characteristics and parameters specific to the investment objective, the proposed stable has the following areas:
Milkiness - 21,08m^2; Locker room dirty area men - 6,01m^2; Locker room dirty women's area - 5,97m^2; Men's bathroom - 6.59m^2; Women's bathroom - 6.64m^2; Locker room clean area men - 5,40m^2; Locker room clean women's area - 5,40m^2; Hallway - 20,25m^2; Cleaning box - 2.58m^2; Room disinfectants - 4,09m^2; Veterinary office - 13.54m^2; Drug deposit - 4.19m^2; Water distribution room - 12.66m^2; Technical room - 7.63m^2; Stable - 3102,68m^2

Total built area - 3860.00m^2
Developed built area - 3975.09m^2
Total usable area - 3839.80m^2

The percentage of land occupancy and the land use coefficient , for the extended area, CF 300074 Pecica:

$$\text{Proposed P.O.T.} = \frac{3860,00}{10500} = 36,76\ \%$$

$$\text{C.U.T. proposed} = \frac{3975,09}{10500} = 0,38$$

Regarding the garbage platform we will have:

•Continuous foundations with reinforced concrete sole with C16/20 sole, with a width of 80cm, a sole height of 50cm and a depth of 1.20m from the TNC.

•Reinforced concrete diaphragms in a thickness of 20cm of C30/37 class concrete, up to the elevation of +2.00m from the CTS.

• The platform will be made of diaphragms on 2 sides (4 and 8m), L-shaped

•Materials used:

- oFoundations in contact with the land is: Concrete C16/20
- oDiafragms exposed to manure: Concrete C30/37
- oConcreate steel BST500C, OB37

•Concrete exhibition class:

- Foundations in contact with the land is: XC2
- Plate on soil, basin and other elements exposed to manure: XF1+XA1

• The board on the ground will be made in accordance with the exterior platform design.

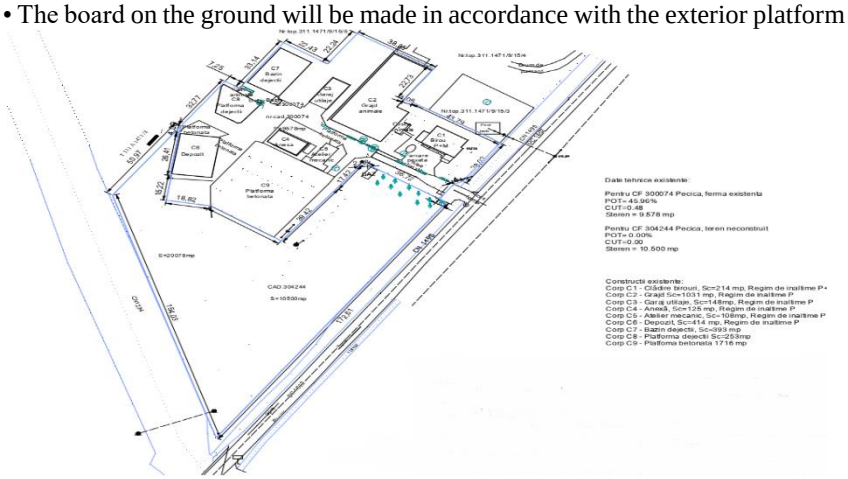


Fig. 12 Existing situation plan

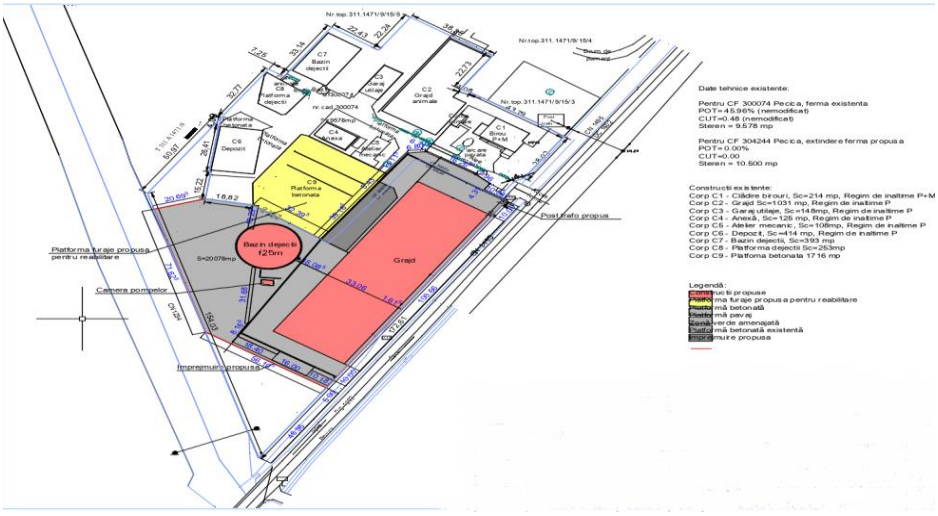


Fig. 13 The proposed situation plan

The parking proposed for arrangement will be achieved by extending the existing platforms in the courtyard of the beneficiary's headquarters.

Inside the parking lot, a concrete platform was designed for the movement with the tractor, in order to ensure the functionality of the farm, within its premises.

On the concrete platform, there are no parking spaces, being intended exclusively for traffic with the tractor, or for cars, and the parking for cars will be made in the area of the existing parking lot (Figures 12, 13 and 14).


Fig. 14 extension and endowment of the dairy farm in turnu locality

CONCLUSIONS

AFIR – Agency for Financing Rural Investments

The total amount available for investments under Measures 4.1 is 760 million euros, according to AFIR [https://www.afir.info/] for the October 2021 – January 2022 session. Applicants eligible for support under sub-measure 4.1 - Investments in agricultural holdings are

farmers whose holding is located in Romania and who carry out an agricultural activity. The amount of support granted starts from 30% and can reach a maximum of 90%, depending on the economic size of the holding, the type of beneficiary and the investments to be made through the project. For livestock farms with an economic dimension up to 500,000 euros OS, the rate of non-reimbursable public support will be 50% of the total eligible expenses. According to AFIR, the value of the support starts from 350,000 euros and can reach 1 million euros for certain types of investments.

For these categories of farms and for certain types of investments, the intensity may be increased by 20 percentage points, but the combined support rate may not exceed 70%.

At the same time, in the case of livestock farms with an economic dimension between 500,000 - 1,000,000 euros SO, the rate of non-reimbursable public support will also be 50% of the total eligible expenses, but the amount of support starts from 400,000 euros and can reach up to 1.5 million euros. For livestock farms with an economic size over 1,000,000 euros SO, the rate of non-reimbursable public support will be 30%, and the value of the support can reach 1.5 million euros, depending on the investments proposed to be made through the project.

As for the beneficiaries of cooperatives, producer groups and producer organizations, the rate of non-reimbursable public support will be up to 90% and will be able to reach up to 1.5 million euros regardless of the type of investment and the size of the farm. The intensity of support starts from 50% and will be able to increase by 20 percentage points for certain types of investments, but the combined support rate cannot exceed 90%.

The investments for which the 20% increase in the support rate can be applied are those made by young farmers, those related to Agro-environment and organic agriculture, investments in areas facing natural and other specific constraints, or, for collective investments.

The project analyzed in this article "EXTENSION AND ENDOWMENT OF THE DAIRY COWS FARM IN TURNU" submitted on Measure 4.1 [https://www.pndr.ro/] from ARAD County, PECICA CITY in 2018 received the financing with a value of the financing contract of 1499400 lei.

BIBLIOGRAPHY

AFIR, AGENCY FOR FINANCING RURAL INVESTMENTS, AS SEEN ON THE 19TH OF APRIL 2022 ON https://portal.afir.info/informatii_generale_pndr_investitii_prin_pndr_sm_4_1_exploatatii_agricole

BĂBUCĂ, N. I., CIOLAC, V., POPESCU, C., SUMULEAC, A., & SPILCA, M. (2009). GPS SOLUTIONS FOR ROADS: DIFFERENT GPS OPERATION TYPES AND APPLICATIONS. Research Journal of Agricultural Science, 41(2), 9-13

CASIAN, A., ȘMULEAC, A., & SIMON, M. (2019). Possibilities of using the UAV photogrammetry in the realization of the topo-cadastral documentation. Research Journal of Agricultural Science, 51(2), 96-106.

HERBEI, M., HERBEI, R., DRAGOMIR, L., & SMULEAC, A. (2013). The analysis of cartographic projections used in Romania. Research Journal of Agricultural Science, 45(2), 127-136.

HERBEI, M., ȘMULEAC, A., & POPESCU, C. (2018). Digital cartography and mobile GIS, Mirton Publishing House, Timisoara.

LALU, A. V., SIMON, M., ŞMULEAC, A., & ŞMULEAC, L. (2020). Topographic-Cadaster Works For The Design Of An Ecological Parking For The Ag-Timiseni Monastery. Research Journal Of Agricultural Science, 52(3).

MIȚĂ, R., SIMON, M., COPĂCEAN, L., ȘMULEAC, A., HERBEI, M., & POPESCU, G. (2020). Using geographical information systems in order to achieve the urban cadastre in the subcetate neighborhood of arad with the help of modern technologies. Research Journal of Agricultural Science, 52(4).

PAUNESCU, R. D., SIMON, M., ȘMULEAC, L., PAȘCALĂU, R., & ȘMULEAC, A. (2020). Topocadastral works regarding the realization of the gas distribution network in the locality of Constantin Daicoviciu. Research Journal of Agricultural Science, 52(3).

POPESCU, G., POPESCU, C. A., HERBEI, M., & SMULEAC, A. (2016). Measuring the parameters that influence the phenomenon of displacement and deformation of the ground at Mina Livezeni. Research Journal of Agricultural Science, 48(1), 147-155.

POPESCU, G., POPESCU, C. A., HERBEI, M., DRAGOMIR, L., SMULEAC, A., & DOROBANTU, S. (2019). Monitoring Of Excavation Works Using Modern Measuring Technology. Bulletin Of University Of Agricultural Sciences And Veterinary Medicine Cluj-Napoca. Horticulture, 76(2), 236-244

ŞMULEAC A., M HERBEI, GEORGE POPESCU, TIBERIU POPESCU, COSMIN ALIN POPESCU, COSTEL BARLIBA, LAURA ȘMULEAC. (2019), 3D Modeling of Patrimonium Objectives Using Laser Technology, Bulletin of University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca. Horticulture, Vol. 76, No 1

ȘMULEAC, A., ȘMULEAC, L., MAN, T. E., POPESCU, C. A., IMBREA, F., RADULOV, I., & PAȘCALĂU, R. (2020). Use of Modern Technologies for the Conservation of Historical Heritage in Water Management. Water, 12(10), 2895.

ŞMULEAC, L., NIȚĂ, S., IENCIU, A., ȘMULEAC, A., & DANIEL, D. (2016). Topographic survey for the monitoring of the impact of the BRUA/ROHUAT pipe on water flow in the irrigation system at Fântânele, Arad County, Romania. *International Multidisciplinary Scientific GeoConference: SGEM*, *3*, 333-340.

HTTPS://WWW.PECICA.RO/

HTTPS://WWW.AFIR.INFO/

HTTPS://WWW.PNDR.RO/

HTTPS://WWW.ANCPI.RO/