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Cost-benefit Analysis for Modernization the Agricultural Working Roads

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Abstract
To achieve this CBA we use a series of specific steps and process documentation and references provided by the guide in preparation for submission of projects CBA as 125/FEADR/2010. The content of the cost-benefit analysis it is described in the document developed by the European Agricultural Fund for Rural Development "Recommendations for developing cost-benefit analysis". For a clear image of the situation described in the project we will try to analyze three scenarios. The method used in developing the financial analysis is " discounted cash flow ". The chosen project is an example, but the dates and figures are real.

Keywords: CBA, FEADR, scenarios, financial analysis, cash flow

JEL Code: D61, H83, H87, H81

Introduction

In order to accomplish this cost-benefit analysis we will use a series of stages which are specific to the documentation drawing process, but also to the references given by the CBA elaboration guide concerning the project deposition on 125 measure /FEADR/2010. The cost-benefit analysis for the targeted investment « The modernization of agricultural exploitation roads, beneficiary Local Council » was elaborated considering the provisions and general rules by domain. A first step in preparing the documentation is to identify the project. The next step represents the project objectives convergence with the National Plans, regional plans, strategic plans, community policies. Having an overview on the framing of the project within the mentioned strategies and plans guidelines, the work will be continued focusing on options and feasibility analysis.

A first aspect which precedes the elaboration of such an analysis is to establish the purpose, the objectives, the target, framing the project on the funding lines and to establish a graphic of future work execution.
Beside these steps it will be followed the accordance between the designs, approvals and agreements, revenue and expenditure budgets as well as the compliance charges imposed by the current legislation.

It will be taken into consideration the Emergency Ordinance no. 34 from April 19, 2006, concerning the assignment of public procurement contracts, the public works concession contracts and services concession contracts (with subsequent amendments), but also the financial analysis elaboration, the cost-benefit analysis elaboration within the feasibility studies in accordance with the legal regulations, but also to Government Ordinance no. 28/2008.
The cost-benefit analysis for the targeted investment « The modernization of agricultural exploitation roads, beneficiary Local Council » was elaborated considering the provisions and general rules established through these framework documents:

- Guidelines on the methodology for achieving the cost-benefit analysis, Working Paper no. 4, August 2006;
- Decision no. 28 from 9th of January 2008 regarding the approval of the framework-content of the economic and technical documentation related to public investment, as well as the

structure and methodology for the estimate overall development for the investment objectives and intervention works;
- Cost-benefit analysis guide of the investment projects - European Regional Development Fund, Cohesion Fund and ISPA - European Commission, August 2006.

The cost-benefit analysis content is described in the European Agricultural Fund for Rural Development elaborated "Recommendations on the development of cost-benefit analysis". Beside these framework documents we also mention the Applicant Guide for accessing 125 MEASURE – "The improvement and development of the infrastructure related to the agricultural and forestry progress and adaptation".

A first step in preparing the documentation is to identify the project. In the proposed example this aims the modernization of the exploitation roads in Motca village, Iasi, for economic and urban development in Motca village, but also the increasing the living standards of the population and highlighting the area potential.

The generated effects by the modernization of these roads will positively influence the living standards of the local and will facilitate the access of the agricultural machinery to the arable lands. For the improvement of population traffic and life conditions is proposed the modernization of these roads through a modern road system execution.

Considering the FEADR recommendations regarding the CBAs elaboration, the objectives should include social and economic components connected to the project, not only physical indicators, and it should exist indication on how their level of achievement will be measured, but also mentioning the used statistical sources.

The next step represents the project objectives convergence with the National Plans, regional plans, strategic plans, community policies. For this it will be checked:
- The projects convergence with the National Development Plan (NDP) is the fundamental instrument by which Romania is trying to recover as quickly as possible the socio-economic development disparities towards the EU. NDP is a specific concept of the European economic and social cohesion (Cohesion Policy) policy and it represents the strategic planning document and multiannual financial programming, elaborated in a wide partnership, which will guide and stimulate Romania's socio-economic development in accordance with European Union Cohesion Policy.

It is required a clear emphasis of the 2007-2013 NDP specific nature. It does not substitute a National Strategy for Economic Development, but an essential component. In cohesion policy acceptance, NDP represents a prioritization instrument of public development investments. The rationale development of NDP is to set the assigning directions of investments public funds with significant impact on economic and social development, from internal sources (state budget, local budgets, etc.) or external sources(structural and cohesion funds, EU funds for rural development and fishing, external loans, etc..) in order to reduce the development gaps towards European Union and internal disparities (Ex. urban-rural, region, X region towards national average, etc).

Regarding the NDP's strategy, given the global objective of reducing development gaps toward EU and beginning from a comprehensive analysis of socio-economic current situation, are set six national development priorities, which bundle a variety of important areas and sub-areas:
- ✧ The increasing competitiveness and the economy development based on knowledge
- ✧ The development and modernization of transport infrastructure
- ✧ Environmental protection and quality improvement
- ✧ Human resource development, the promotion of employment and social inclusion and administrative capacity strengthening
- ✧ The development of rural economy and increasing the agrarian sector productivity
- ✧ Reducing the development disparities among the country regions

Within NPD" Transport infrastructure" section is specified that ".... Romania's transport infrastructure has known a continuous development, but failing to reach the parameters required by a competitive European economy. Hereby the density of public roads and railways in exploitation is below EU countries average .... ". As conclusion we can say that is clearly noted that the present project is in direct agreement with the 2007-2013 National Development Plan foresight, directly satisfying the NDP second priority.

The Strategic Guidelines for 2007 – 2013 Cohesion Policy pays a very important attention to the road networks modernization and development objectives, being considered objectives with impact on both population safety and economic activities.

The European Strategy for Sustainable Development also provides modernization measures and strategies, infrastructure networks development and expansion, regarding both safety and fluidity.

Having an overview on the framing of the project within the mentioned strategies and plans guidelines, the work will be continued focusing on options and feasibility analysis. It will be tried the achievement of three work hypothesis which can generate significant qualitative and quantitative effects for choosing the optimal variant.

According to FEADR foresights is expressly stipulated the following "The beneficiary must prove that the recommended scenario choice is the optimal one in terms of socio-economic." It will be analyzed at least two variant: the zero variant (variant without investment) and the investment variant. For a clear image on the existing situation, in the project described area we will try to analyze three such scenarios in order to remove possible errors.

- ✧ The zero option - without achieving any investment, leaving the situation as it is right now.
- ✧ The maximum option - the achievement of planners recommended investment and the modernization of targeted roads
- ✧ The average option - the execution of summary repairs for the projected route.

We will illustrate the methods of analysis in this three variants.

In the first situation it is called for a detailed description of the present situation in the project targeted region. For example, "... the 195DE exploitation road, leaves from DN28A main road, from Motca village and connects to Boureni village, the road ending in DC111 communal road intersection. At 0+080 km, the DE 195 road is passing over the Motca river, the bridge being included in the infrastructure development programme in the established rural space (OG7/2006) and is under construction. From DC 111 communal road is made the connexion to DN 2 (E58), found at a distance of about 450m. The DE 75-73/2 exploitation road leaves from DN28A national road and is located in Motca. The road ends in Motca agricultural holdings. Exploitation roads are registered in the V technique class (as Ord.MT No. 46 / 27.01.1998 - on grounds of traffic intensity), but by its present technical state (earth roads in a degradation state, found under the influence of surface water, because the collecting and controlled evacuation system of the rainfall water is inadequate-clogged about 50 - 80% of the length), it has a seasonal road nature, with traffic interruptions on rainy days."

Under this scenario the lack of any investment to remedy the present situation has the following major disadvantages:

- ✧ High risk in terms of safety for the traffic area. There are many potholes and bumps
- ✧ The high risk that the route becomes unusable (on parts) in the periods when its rehabilitation is impossible (during winter)
- ✧ The failure of the road system development and modernization
- ✧ Maintaining the gaps between Romania's transport infrastructure and the EU.
- ✧ Promoting a negative image of the people in rural areas
- ✧ The reduction / the economic development termination rate/ social/ cultural served area
- ✧ The loss / the impossibility of using the existing infrastructure in the future because overtime the existing route state will aggravate and it will not be used

Minor advantages of zero variant:

- ❖ No need for investment, the situation remains the same.

The second scenario refers to the maximum variant, the achievement of the planners recommended investment and the modernization of the local roads. For descriptive analysis was used the identification of this variant advantages and disadvantages. The major advantages of maximum variant are:

- ❖ The increasing safety of the impact areas road traffic
- ❖ The decreasing of the gaps between Romania and other regions
- ❖ The decreasing of economic, social, cultural and investment discrepancies between our country and EU member states
- ❖ The providing of a infrastructure for a further regional development in the areas economic fields
- ❖ The maintaining / the increasing of economic / social / cultural development rhythm of the area

Minor disadvantages of maximum variant:

- ❖ High investment cost
- ❖ Is executed in 6 months, a longer period of time than the duration of the medium variant

The average option analysis: requires the sectors summary repairs execution covered by the project in question.

Minor advantages of medium variant:

- low investment
- deadline 4 calendar months

Major disadvantages of medium variant:

- the lack of a sustainable road system works
- keeping the gaps between Romania's N-E area and the rest of the regions
- the decreased attraction for potential investors
- keeping the risk concerning the possibility that the road can be affected and become unusable in periods when repairs can not be executed.

In the following it will be accomplish an advantage analysis through which it will be taken into account the parameters followed in the previously 3 generated variants:

Table no.1

Version / Parameter analysis	Version zero			Version average			Version maximum		
	Social	Technic	Economic	Social	Technic	Economic	Social	Technic	Economic
Financial investment			5			3			0
Road safety	0	0		1	1		5	5	
The risk that the road can become useless for o large period of time	0	0	0	1	1	1	4	4	4
The area economic evolution	0		0	1		1	3		3
Disparities with other parts of the country	0	0		1	1		3	3	
Disparities with other EU countries	0	0			1			3	
The area promotion and economic influence	0	0	0	1	1	1	3	3	3
The increasing duration of use	0	0		1	1		3	3	
The increasing of structural and functional qualities	0	0	0		1			3	
The term for the achievement	0	0	0	2	2	2	1	1	1

Version / Parameter analysis	Version zero			Version average			Version maximum		
	Social	Technic	Economic	Social	Technic	Economic	Social	Technic	Economic
The influence over area's economic growth	0	0	0	1	1	1	2	2	2
TOTAL	**0**	**0**	**5**	**9**	**10**	**9**	**24**	**27**	**13**
TOTAL OPTION	**5**			**28**			**64**		
The score was given from 0 (minimum) to 5 (maximum)									

Source: calculations made by author

Regarding the granting of scores it was taken into account statistical intervals (samples). For example, for determining the economic scores it was taken into calculation the lately number of entrepreneurs. Concerning the social version it was taken into calculation the number of tuition or employment labour. The scores vary depending on the scenario through the influence of a variable on others After analyzing these three scenarios it clearly results that the most appropriate option is the maximum one, namely the planners proposed scenario implementation: The modernization of agricultural exploitation roads, Motca village, Iasi.

The next step in the study is the projects financial analysis. For this the next elements are used:

Financial analysis objectives and purpose

The elaborated financial analysis is based mainly on the detailed cash flow analysis. We mention that the financial analysis is made at the investment level, assuming that it will be individually operated and not through an operator.

Through the financial analysis it was aimed especially:

- ✧ the investment financial profitability and its own invested contribution in the project, determined by VNAF / C indicators (updated net income calculated on the total investment value) and RIRF / C (internal rate of return calculated on the total investment value). For a project to require financial assistance from the Structural Funds, VNAF / C should be negative and RIRF / C less than the update rate (RIRF / C < 5)
- ✧ the projects financial sustainability in terms of financial assistance from the Structural Funds. The projects financial sustainability should be evaluated by checking the cumulative net cash flow (not updated). It must be positive in each year of the analysis. Another aspect followed and treated in the financial analysis is that of calculating the financial assistance degree (of the grant aid required), in other words the co-financing percentage.

Financial analysis structure

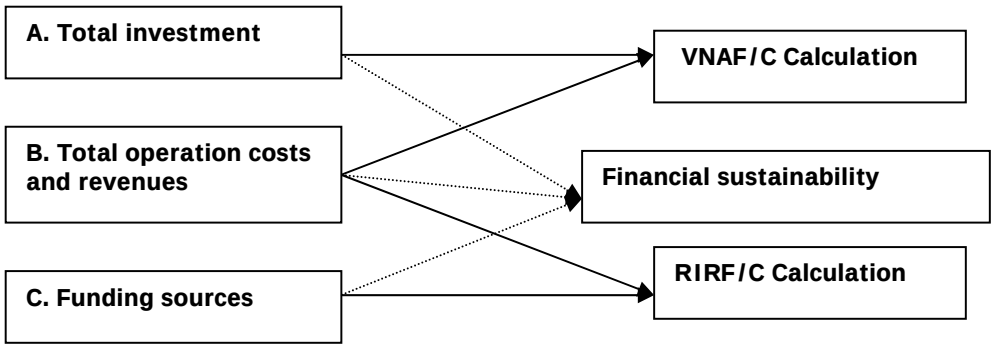

Fig. no. 1 – Financial analysis structure

a. Assumptions and methods taken into consideration for elaborating the financial analysis

The method used in the financial analysis development is " updated cash flow ". In this method, non-monetary flows such as depreciation and provisions are not taken into consideration. Unforeseen expenses from the general expenditure estimate will not be considered unless they are included in the eligible project costs. They will not be counted in determining the needs to be funded as long as they do not represent an actual expenditure, but a measure to attenuate some risks.

The reference period is the number of years for which are provided forecasts in cost-benefit analysis. Reference intervals by sector - based on internationally accepted practices and recommended by the European Commission - are provided below:

Sector	Interval de referință	Sector	Interval de referință
Energie	15-25	Drumuri	25-30
Apa şi mediul	30	Industrie	10
Căi ferate	30	Alte servicii	15
Porturi şi aeroporturi	25		

Table no.2 - Recommended times forecast

In this analysis it was used the differential method, the project being evaluated based on the differences of costs and benefits. The concerned project is not an income generating project. As defined by the European Commission – Revenue generating project means any operation involving investments in infrastructure, whose use is subject to taxes which are directly sustained by users, or any transaction involving the sale or rental of lands or buildings or services fee. Thus, the proposed project is not a revenue-generating project.

The financial flows calculation

The financial flows involved in the project are those on which the financial and economic analysis is made. Basically, the flows are generated by cash inflows and outflows.

Identifying and quantifying the elements of cost and revenues generated by the project

Given the specific of the project, the bridge modernization and rehabilitation, there were identified only these types of expenses:

- The investment costs - are found in the project investment value
- The maintenance and current and periodical repairing costs - are divided into:
  - material expenses - materials used for repairs and regular maintenance works
  - labour costs for maintenance and regular repair works
  - sums of money for the aggravation, diversion, restrictioned traffic during maintenance works. It mainly refers to the labour cost charged with these tasks.
  - financial cost - generated by maintenance operations
- Costs for signage, advertising - costs needed for proper marking of work (during maintenance works), investment advertising (because is financed by European funds), proper signalling of the infrastructure depending on the season, traffic conditions etc.
- Other operating expenses – a share of general administrative expenses

Road maintenance costs. According to technical rules and standards in the field, in normal exploitation condition (as specified in the traffic study and in the maximum load for which the road was designed), the following maintenance costs are necessary:

Table no. 3 - Physical and value graphic of repair works maintenance after commissioning (example)

Crt. No.	Maintenance works	Intervention period	The description and nature of the intervention	Unit value (lei)	Total value (lei)	Material value (lei)	Labor value (lei)
1	Isolated repair of hard bituminous	Annual	- locking - warping cracks and crevices Routine maintenance during the summer	9625/km road	34842,5	22647,625	12194,875
2	Ensurance of water running	Annual	- cleaning ditches - support walls maintenance Routine maintenance during the summer	2500/km road	9050	5882,5	3167,5
3	Prevention for effects of floods	Monthly	Routine maintenance during the summer	50/km road	181	117,65	63,35
4	Facilities maintenance for road safety	Annual	- repairing the parapets - markings and signs Routine maintenance during the summer	800/km road	2896	1882,4	1013,6

Source: Author own calculations

All these costs were valued at current prices. For their proper evaluation it was taken into consideration the inflation forecasts and it was done the updating.

Regard in the inflation evolution it was taken as reference the existing public situation to www.cnp.ro.

Proiecția dinamicii inflației (rata de creștere anuală %)

2006*	2007	2008	2009	2010	2011	2012	2013	2014
6.56	4.84	7.5	4.5	3.6	3.2	2.8	2.5	2.3
2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021 şi următorii ani**		
2.0	2.0	2.0	2.0	2.0	2.0	2.0		

Table no. 4 - The inflation rate evolution

For the assessing of the financial costs (bank fees, etc.) it was considered that their value is 0.2% of the involved costs value. The signage and advertising costs value were evaluated according to the history and the parallel between current investment and other similar investments, namely at the amount of 750 ron / year. The amount of general administrative expenses was established by applying a maximum of 0.5% of all costs involved

For the projection it has been applied the maximising of the expenses (payments) and minimizing revenue (collections) principle to ensure safety margin needed in achieving the project objective analysis. Also the sizing cost was done by taking into account the operation costs under normal conditions and depending on the traffic study segment.

Table no. 5. Projections of cash outflows for 1-5 years of operation (example)

Calculation elements	Investment Implementation	Year 1	Year 2	Year 3	Year 4	Year 5
Expected Inflation Index		3,6	3,2	2,8	2,5	2,3
Raw materials						
Utilities / Energy						
Maintenance and repairs (current and periodicals) - material		51.017	52.650	54.124	55.477	56.753
Salaries - regular costs associated		28.471	29.382	30.205	30.960	31.672
Fees and taxes related to salaries		8.826	9.108	9.363	9.598	9.818
Fees and taxes						
Loan Cost						
Other operating costs, signage, advertising etc.		750	774	796	816	834
Financial expenses		178	184	189	194	198
Other operating costs		446	460	473	485	496
Investment costs	4.107.120	0	0	0	0	0
Total payments	**4.107.120**	**89.688**	**92.558**	**95.150**	**97.529**	**99.772**

Cash-inflows projections

The targeted project is not an income generating project. As defined by the European Commission – Revenue generating project means any operation involving investments in infrastructure, whose use is subject to taxes which are directly sustained by users, or any transaction involving the sale or rental of lands or buildings or services fee. Thus, the proposed project is not revenue-generating project. Therefore, cash-inflows are limited to the deductions from the budget for necessary maintenance work and interventions financing.

Table no.6. Projections of cash-inflows for 1-5 of years operation (simplified duration)

Calculation elements	Investment Implementation	Year 1	Year 2	Year 3	Year 4	Year 5
Necessary funded						
Grant/Not callable financing	4.107.120					
Budget Breakdown / Budget funds		89.688	92.558	95.150	97.529	99.772
TOTAL INCOME	**4.107.120**	**89.688**	**92.558**	**95.150**	**97.529**	**99.772**

The projections analysis - supportability analysis of the overall sustainability
The supportability, in general, is a characteristic of revenue generating projects whose inputs consist in fees, charges or other payments made by a particular target group. Thus, through supportability analysis is tracked if those who pay taxes, fees on which project inputs are supported by the target group and if it can easily be paid according to group incomes. ***Since the present project it is not an income generating project and it does not directly provide the cash in of taxes and tariffs, the supportability analysis is not calculated.***

The project sustainability refers to whether the beneficiary of the project has the capacity to maintain the investment exploitation and after grant funding source cease. In our case, the beneficiary of the investment is Motca village, public institution, whose resources are provided by public funds. As seen from the projections of the financial analysis, the annual operating costs are not large, which ensures an extra element of sustainability. Given the above, we can say that the project has provided all prerequisites of sustainability.

Update Rate Calculation
For the financial flows update and for calculating the net present value (VNAF), we must update the appropriate rate. There are several theoretical and practical ways to estimate the reference rate to be used for update the financial analysis.

Update rate. The discount rate used in financial analysis should reflect the opportunity capital cost for the investor. This can be considered a prepayment for the best alternative project. The Commission suggests the application of a financial rate discount of 5% in real terms as indicative value for public investment projects cofinanced by funds.

3. The calculation and analysis of financial performance indicators which are specific to investment

Table no.7

Calculation elements	Investment Implementation	Year 1	Year 2	Year 3	Year 4	Year 5
TOTAL PAYMENTS	4.107.120	89.688	92.558	95.150	97.529	99.772
TOTAL INCOME	4.107.120	89.688	92.558	95.150	97.529	99.772
Cash flow	0	0	0	0	0	0
Discount factor	1,00	0,95	0,91	0,86	0,82	0,78
Discounted financial cash flow	0	0	0	0	0	0

VANF/C	**-4.107.120**
RIRF/C	**Negative, intangible**
Cash flow	**>= 0**
C/B Report	**< = 1**

Conclusion
The project sustainability : the project is sustainable because:
1 the cash-flow is positive in all forecast years.
Even if is zero, the project is still financially sustainable.
2 the financing of activities from state budget.
The project sustainability is also given by the fact that the investment which makes the subject of the project is public, and in Romania public sector is financed by the budget.

VANF / C RIRF / C-negative values: is clearly that the project needs financial assistance grant.
In presented calculations the period was reduced to 5 years, in the initial project this being for 30 years.

Conclusions

After CBA performing we want to example (simplify) the work method in terms of European funded projects which are lately considered positively influencing instruments of economic activity in our country. The chosen project is an example, but the dates and figures are real. It is clear that the implementation of the CBA provides the contribution of the creative character of the authors but also the selection of optimal calculation and work methods. For the effectuated calculations i have used specialized financial analysis software tools and my own methods of analysis. Resulted values from the proposed analysis are in accordance with the standards set by the Commission and verification bodies and skill evaluation. The project sustainability is also given by the fact that the investment which makes the subject of the project is public. In conclusion the project needs financial assistance grant. We hope that the material made available will be a foothold in developing projects to those who are interested.

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