

RESEARCH ARTICLE

Impact Assessment of an Agricultural Project Financed through a Competitive Grant Scheme using Statistical Data

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Abstract

This paper studies the possibility of assessing the impact of Competitive Grant Scheme financed sub-project using data from the national statistical system of Romania. This research is of particular interest for measuring or at least identifying the existing of the economic impact of past interventions, in the conditions where data is not available from the implementing institutions for the period after the project completion. The initial method of impact assessment was based on the calculation of IRR and NPV based on the Incremental Net Benefits obtained by the participants to the project in comparison with the ones obtained by the non-participants (the control group) [1].

Keyword: *Agricultural Project, Finance, Statistical Data.*

Introduction

The World Bank approved in the year 2000 the Romanian Agricultural Support Services Project (ASSP) [2]. The main component of this project was the implementation of a Competitive Grant Scheme (CGS) to finance agricultural research and extension projects. The total value of CGS was USD14.49 million through which 154 sub-projects were financed [3] following several competitive biddings. ASSP was closed in December 31, 2005. That year an impact assessment was performed [4] using a sample of 30 sub-projects to assess the economic impact of the entire CGS. The analysis was performed based on the data reported by the implementing institutions, using the counterfactual method [5] of comparing the “before” and “after” results [6] and the “with” or “without” version of the sub-projects and computing the Internal Rate of Return and the Net Present Value of the total value of each sub-project in the sample. Since the study was done in 2005 several assumptions were made, in principle regarding the technological adoption rate and the sustainability of the yields in time. As member of the team that performed the analysis, I wanted to verify if the assumptions made in 2005 were confirmed by the real evolution of events. One of the problems that I have encountered was to have data from the implementers. As the projects had no obligation for collecting indicators once they were finalized, practically there was no consistent data available. For this reason I have tried to verify the 2005

analysis in 2015, using statistical data from the Romanian National Institute of Statistics. The case study is the sub-project: “Centres of practical training for cattle breeders”.

“Centres of Practical Training for Cattle Breeders” A Case Study

Starting date: 01.09.2002

Estimated end date: 30.06.2005

Total Project Costs: 140,180 USD

Implemented by: The Association of Cattle Breeders from Suceava County

Area of Implementation: Suceava County [7]

Background-Data Collected Between 2002 and 2005 [8]

In 2002, Suceava County had the largest number of cattle in Romania, i.e. over 170,000 heads (8% of national total). Out of this number, 110,000 were milk cows. Suceava was also the largest cow milk producer of Romania, i.e. over 3,000,000 hl, which meant 8.5% of the total national production. The cattle meat produced by the county was 25,000 tons/year. Cattle breeders from this county had a long tradition in this sector, one favouring factor being the natural conditions (165,000 hectares of grassland), which limited the extension of cereal crops in the region.

Despite these figures, the county has faced significant problems with the efficiency of the cattle breeding activities. One of the causes was

that the livestock was owned by a large number of farmers (170,000 livestock in 60,000 individual households, which means an average number of 2.8 milk cows/farm). Most of the farmers did not have enough knowledge and skills to obtain competitive yields. The average yearly milk production was 3,080 l/milk cow (in 2002-according to implementer data).

The sub-project had the following objectives:

- Improvement of the genetic potential of cattle and of the reproduction indices;
- Improvement of forage production technologies and of cattle feeding technologies;
- Improvement of cow milk production parameters as well as of productivity;
- Extension of technical actions and of obtained outputs.

The Association proposed to give more weight to practical demonstrations than to theoretical courses. The most efficient actions consisted of practical demonstrations regarding artificial inseminations and breeding technologies. Also, as one important problem regarding breeding technologies was the traditional way of cattle feeding (without a rational structure), farmers are receiving assistance in setting up the volume and structure of forage ratios.

Main types of extension (data was collected from the reports of the association that implemented the project):

- Demonstration fields-a number of 9 plots were organized and a number of approximately 450 farmers visited them.
- On farm demonstration-during implementation of the sub-project, a total number of 73 demonstrations were organized with the participation of 343 producers. Demonstrations referred to artificial inseminations, importance of electrical fences, hygiene of milk and milking, analysis of milk quality.
- Training through courses-26 sessions were organized and a number of 1,262 farmers benefited from them.
- Feed rations- the team of the sub-project distributed a number of 1,500 rations.
- Leaflets – the activities of the sub-projects and related results were extended to 4,500 farmers.

The sub-project already started to produce outputs and outcomes as of 2004. Main outputs:

- Artificial inseminations realized on a number of 506 cows;
- Fecundity (conception) rate: 77%;
- Gestation losses rate: 2.5%;
- Increase in average fat content of milk with 0.3%;
- Increase in milk production with 10%.

Impact Assessment

The 10% increase in milk production according to the statistics of Association, meant a supplementary amount of 300,000 hl has been produced in 2004 compared to 2003. Total value of this production (at an average price of 5,000 ROL/litter or 0.15 USD/litter) is 150 billion ROL or about USD 4.47 million. According to the fifth progress report, the association coordinated approximately 60% of the cattle breeders from this region, which basically means that from 300,000 hl of milk, 180,000 hl were produced by the members of Association [4].

Economic Impact

This section assesses the economic impact of the sub-project based on two indicators: Internal Rate of Return (IRR) and Net Present Value (NPV). The chosen time interval is 15 years.

Based on the project progress reports, we have the following data:

- The average size of a farm considered in the model is 4 milk cows;
- In 2004, 506 farms reportedly adopted the technologies, which means a total no of 2024 milk cows;
- In 2005, 1262 was the total number of adopters, which means 5048 milk cows;
- Increase in production with 10% due to the project;
- Increase in price with 9.6% due to increase in milk quality;
- Increase in total variable costs with 5%; however, variable costs per litter are decreasing with 5%;
- Increase in total fixed costs with 81% due to overhead expenses related to the new technologies (mainly consumables and electricity).

Exchange rate: 1 USD = 33,500 ROL (taken as an average proxy pf period 2003-2004). Production and revenues for per head are given in table 1.

Table 1: Farm production and revenues per head

	Production (l/cow)	Price (ROL/l)	Revenues (Thou. ROL)	Revenues (USD)
1. Before (-)	3100	5200	16,120	481
2. After (+)	3410	5700	19,437	580

Source: Progress reports

Related costs are presented in table 2.

Table 2: Farm costs for per head

Costs	ROL/l	Thou. ROL	USD
1. Variable Costs (-)*	3900	12,090	361
2. Variable Costs (+)	3705	12,634	377
3. Fixed Costs (-)	520	1,612	48
4. Fixed Costs (+)	855	2,916	87
5. Total Costs (-)	4420	13702	409
6. Total Costs (+)	4560	15550	464

Source: Project Progress Reports

*Sign “-” stands for “before” and “+” for “after”

Incremental benefits per farm are presented in table 3. It should be mentioned that the result is not altered by subsidies and taxes [9,10].

Table 3: Benefits per farm

Gross Margin/cow (-)	72
Gross Margin/cow (+)	116
Incremental Gross Margin/cow	44
Average No. of Cows/farm	4
Incremental Gross Margin/farm	175

Source: Project Progress Reports

For computing IRR and NPV, additional assumptions are to be made:

- Adoption rate is considered to be 1. Naturally, the degree of technology implementation differs from one farmer to another.
- Time lag between “with project” and “without project” is assumed to be four years. This is based on a so-called “expert judgment”. It has been considered that without this sub-project, such a large extension of technologies could not be possible on short-run. The

delay could not be however larger than four years for the next reason: year 5 from table 5 is the year 2007, when Romania joined the European Union and therefore many changes were produced in Romanian agriculture, including in technological field irrespective of the existence of ASSP.

- Discount rate is 15%.

IRR and NPV are computed and shown in table 4.

Table 4: Computed IRR and NPV-Baseline scenario

Year	Number of adopters	Benefits per adopter/yr	Benefits with project	Benefits without project	Total direct benefits	Indirect Benefits	Total Benefits	Cost	Net Benefits
1	0	0	0		0		0	35,240	-35,240
2	506	175	88,778		88,778		88,778	44,050	44,728
3	1,262	175	221,419		221,419	266,334	487,753	61,670	426,083
4	1,262	175	221,419		221,419	664,257	885,675	35,240	850,435
5	1,262	175	221,419		221,419	664,257	885,675		885,675
6	1,262	175	221,419	88,778	132,641	664,257	796,897		796,897
7	1,262	175	221,419	221,419	0	397,922	397,922		397,922
8	1,262	175	221,419	221,419	0	0	0		0
9	1,262	175	221,419	221,419	0	0	0		0
10	1,262	175	221,419	221,419	0	0	0		0
11	1,262	175	221,419	221,419	0	0	0		0
12	1,262	175	221,419	221,419	0	0	0		0
13	1,262	175	221,419	221,419	0	0	0		0
14	1,262	175	221,419	221,419	0	0	0		0
15	1,262	175	221,419	221,419	0	0	0		0

16	1,262	175	221,419	221,419	0	0	0	0
17	1,262	175	221,419	221,419	0	0	0	0
18	1,262	175	221,419	221,419	0	0	0	0
19	1,262	175	221,419	221,419	0	0	0	0
20	1,262	175	221,419	221,419	0	0	0	0

IRR = 395%
NPV = \$1,704,025

Source: Own calculations

The model generates high values of internal rate of return (395%) and net present value (1,704,025 USD). The most important factor for this is the large number of adopting farmers. Even though the efficiency increase per farm is not very high (the incremental gross margin/year/cow is only 44 USD), extension activities correlated also with a relative stronger power of the Association (compared to other Romanian associations), led to important overall economic gains.

Economic analysis of the project based on data available in 2015 from the Romanian Institute of Statistics INSSE.ro

Table 5: No of milk cow/year

No of Milk Cow/Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Suceava County	99814	107054	107514	107131	104697	101479	94297	95152	92881	92735

Table 6: Total milk production/Year

Total milk production/Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Suceava County ('000 hl)	3259	3579	3550	3302	3344	3424	3106	2952	3180	3389

Based on the data from tables 5 and 6 we compute the average milk production per milk cow. The results are presented in table 7.

Table 7: Average Yearly Milk Production (INSSE.ro)

Average Yearly Milk Production/Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Suceava County(l)	3265	3344	3302	3082	3194	3374	3294	3102	3424	3654

In the following table we factor in the assumption that the participating farmers will obtain milk productions of minimum 3410 l/milk cow and we

calculate the average production of the no participating farmers.

Table 8: Average milk production l / head / year, farms participating / non-participating (INSSE.ro)

Average Yearly Milk Production/Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Suceava County(l)	3265	3344	3302	3082	3194	3374	3294	3102	3424	3654
Suceava participating farms	3410	3410	3410	3410	3410	3410	3410	3410	3410	3410
Suceava non-participating farms (Xi)	3262	3340	3296	3066	3183	3372	3287	3085	3425	3669

From table 8 we can see that the non-participating farmers will get approximately the same results as participating farmers in 2009 (3373 l/milk cow compared to 3410 l/milk cow obtained by the participants to the project). That means with one year after the initial assumption

of 4 year time lag technology adoption between participants and non-participants.

The table 5, 6, 7 and 8 allows the calculation of the percentage influence of the participants to the total production of the county. Since the number

of participating milk cows is between 0.12% and 0.43% of the total country number, their influence to yearly average per milk cow in the county as reflected in the statistics ranges from 1 l/year to 16 l/year.

Based on these findings we adjust the initial incremental gross margin model in which we

considered the average yield for non-participants constant at 3100 l/ milk cow, and we use the actual data calculated in table 8. Thus we note X_i = the average yield calculated for non-participants, where i is the year.

Table 9: Production value per cow in the version with and without project

Exchange Rate: 1 USD =	33,500	ROL		
	Production	Price (ROL / l)	Revenue	Revenue
			(Thousands ROL)	(USD)
1. Before (-)	X_i	5200	$X_i * 5200$	$X_i * 5200/33500$
2. After (+)	3410	5700	19437	580

* Sign "-" stands for "before" and "+" for "after"

Table 10: Gross margin per farm with 4 milk cows "with"/"without project"

Costs	ROL / l	thousands ROL	USD
1. Variable Costs (-)	3900	$3900 * X_i/1000$	$3900 * X_i/33500$
2. Variable Costs (+)	3705	12634	377
3. Fixed Costs (-)	520	1908	57
4. Fixed Costs (+)	855	2916	87
5. Total Costs (-)	4420	$3900 * X_i/1000+1908$	$=3900 * X_i/33500+57$
6. Total Costs (+)	4560	15550	464
Gross margin (-)	$X_i * 5200/33500 - 3900 * X_i/33500+57$		
Gross margin (+)	116		
Gross margin incremental	$116 - X_i * 5200/33500 - 3900 * X_i/33500+57$		
Average no of milk cows/farm	4		
Gross margin on incremental farm	$4*(116-X_i * 5200/33500 - 3900 * X_i/33500+57)$		

Table 11: Incremental gross margin per farm

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Gross margin on incremental farm (USD)	160	153	157	179	168	150	158	177	145	122

Based on the updated values, the internal rate of return (IRR) and net present value (NPV) are recalculated. For the period 2014 - 2022 we assume incremental gross margin equal to the value of 2013, the last one for which statistical data is currently

available. Also, the gap between the version with the project and the one without project was adjusted to 5 years, which means that the non-participants will obtain the same results as the participants in 2009 as indicated by the statistical data.

Table 12: IRR and NPV on statistical data

Year	Number of adopters	Benefits per adopter/yr	Benefits with project	Benefits without project	Total direct benefits	Indirect Benefits	Total Benefits	Cost	Net Benefits
2003	0	0	0		0		0	35,240	35,240
2004	506	160	80,960		80,960		80,960	44,050	36,910
2005	1,262	153	193086		193086	266334	459420	61,670	397750
2006	1,262	157	198134		198134	664334	862468	35,240	827228
2007	1,262	179	225898		225898	664334	890232		890232
2008	1,262	168	212016		212016	664334	876350		876350
2009	1,262	150	189300	80,960	108340	397922	506262		506262
2010	1,262	158	199396	193086	6310	0	6310		6310
2011	1,262	177	223374	198134	25,240	0	25,240		25,240
2012	1,262	145	182990	225898	42,908	0	42,908		42,908
2013	1,262	122	153964	212016	58,052	0	58,052		58,052
2014	1,262	122	154591	189300	34,709	0	34,709		34,709
2015	1,262	122	154591	199396	44,805	0	44,805		44,805
2016	1,262	122	154591	223374	68,783	0	68,783		68,783
2017	1,262	122	154591	182990	28,399	0	28,399		28,399
2018	1,262	122	154591	153964	627	0	627		627
2019	1,262	122	154591	154591	0	0	0		0
2020	1,262	122	154591	154591	0	0	0		0
2021	1,262	122	154591	154591	0	0	0		0
2022	1,262	122	154591	154591	0	0	0		0
								IRR =	375%
								NPV = \$	1,702,799

The calculations in Table 12, based on the statistical data, confirms the high values of the internal rate of return (375%) and the net present value (USD 1,596,115).

Conclusion

We can conclude that the initial analysis is confirmed by the calculation made on the actual

data of average milk production/cow in Suceava County. Furthermore, statistical data may, under some assumptions can be used to verify the effects of past interventions. The statistical data showed that the time lag on the adoption of new technologies was in fact 5 years, confirming thus the opportunity of the project: the farmers that adopted the technologies obtained results at a level that the non-participants have obtained only 5 years later.

References

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7. The term “county” will be used in this appendix as a synonym for Romanian term “judet.
8. Source: the project files of ASSP CGS.
9. Even though, currently the state pays 1,400 RL/litter as subsidy, it was preferred not to include this amount in calculations in order to obtain only farm efficiency.
10. According to Romanian policy, small agricultural farms that are not legal entities are exempted from taxes.