

## SOME ASPECTS OF BASING THE STRATEGIC DECISIONS IN AGRICULTURE BY COMPARATIVE ASSESSMENT OF INDICATORS OF ECO-EFFICIENCY

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### Abstract

This paper aims to analyse standard gross margin to business decisions on the use of production resources in the dairy farms. The efficient running the activities in animal farms requires that the production resources, to be provided combined and allocated in such a way as to result in: full capitalization of production capacity of the unit, obtaining increased quantities of product per hectare and animal feed with minimized costs per unit, continuous increase of the efficiency of resources due to the use of modern technologies, improved technical resources and not polluting the environment with residues. For a company to be effective it must be well organized, use various computer programmes, to provide data on the evolution of its activity at any time, to use advanced software to facilitate the work on the farm and increase its productivity. For carrying out the study we used the case study as a major research strategy and for the analysis of performance level of the farm we used the model of determining the standard gross margin made in Excel worksheets. For data collection and analysis, we used techniques and instruments specific for qualitative research, analyses of internal documents, technological records and discussions with the manager of Research and Development Station for Cattle Growth (RDSCG) Dancu, Iasi County, Romania.

**Key words:** economics, gross margin, agricultural management, strategic decisions, milk-cows farm, eco-efficiency

In agriculture, the management decision is a dynamic, rational process of choosing a course of action from any number of variations, to achieve a goal whose application influences the activity of at least a person other than the decision maker (Brezuleanu S., 2013).

### MATERIAL AND METHOD

The decision making refers to less complex decision situations or when that situation is a repetitive one. In the case of the managerial act, the variables involved are well known by the governor. At the base of the decisions there are the managers' experience and intuition (Popa I., 2005). For a business to be effective it must be well organized, use the computer programmes at any time to provide data on the evolution of its activity, use advanced software to facilitate the work in the agricultural holding and increase its productivity (Stroebel H., 2009).

The efficient running of the activities in animal farms requires that the provision with the production resources, their combination and allocation to be made in such a way as to result in: full capitalization of the production capacity of the farm, obtaining

increased quantities of product per hectare and animal feed with minim costs per product, continuous increase in the efficiency of the resources used by the application of modern technologies, improved technical resources and non environmental pollution by residues.

With a view to these requirements, the specialists of agricultural farms have to deal with technical and economic problems related to foundation of business decisions on the use of production resources, namely: specification of the optimal quantities of variable resources to be allocated to the unit production (per hectare, animal feed) to achieve high and cost-effective yields, by the efficient use of all resources, both in the situation in which the resources can be produced in sufficient quantities and if there are some limitations in their purchasing, establishing the proportions for combining the resources in order to ensure either to obtain the production levels with minimal costs or to achieve a level of production that would lead to maximum profit, determining the most efficient way of allocating the multi-valent resources that are in limited quantities in the farm (Matei I.V., Ungureanu L., 2013).

In Romania and the European Union there are numerous and diversified farms, being a complex reality. To facilitate the unitary analysis of the

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characteristics related to size (economic size) and the economic results, it is necessary to use appropriate terms. This notion is the *standard gross margin (SGM)*. The principles and basic rules for calculating standard gross margins (SGM) are provided in the EEC Commission Decision of October 22<sup>nd</sup> 1999 amendment of the Decision 85/377/EEC establishing a Community typology for agricultural holdings [notified under number C (1999) 3414] (1999/725/EC) establishing a Community typology for agricultural holdings. The outline presented in the document provides an overview of the official rules for the calculation of standard gross margin and contain some additional explanations.

The standard gross margin is an economic concept of great importance and novelty, used in the structural and technical-economic analyses of the farms. The economic size of the holding shall be determined on the basis of the total standard gross margin of the holding. It shall be expressed in terms of European Size Units (ESU).

*Standard gross margin (SGM) of an agricultural activity* (animal species) means the monetary value of gross output of the activity at the *prices of delivery - loco manufacturer*, minus the corresponding specific costs. SGM is unitary (per animal) and expressed in lei or Euro. In an agricultural farm, breeding dairy cows cannot be analyzed separately from other productive activities from the economic point of view (Odening M., 2000). A dairy cow exploits the nutrients that were obtained in the forage production. In order to use the resulted organic fertilizers it is usually needed their own land, the resulting calves being eventually used on the farm, the resulting heifers being eventually used as breeding youth. The raw product for breeding dairy cows includes the following monetary values: the value of milk production, the value of calf and cull cows, the value of nutrients of the manure (as collateral natural production calculated in SGM) possible subsidies for this production activity. The forage production and livestock farming makes a unit in the agricultural farm, which is presented in the calculations of the gross margin in a disaggregated way (Reisch E. and Zeddies, J., 1992). In order to analyze the profitability of forage production and livestock that valorise this forage, it is indispensable the aggregation of income and expenditure of the two areas. The aggregation between forage and livestock production makes possible: estimating costs and necessary of factors for basic forage for a cow, absorption of expenses with basic forage in calculating gross margin for dairy cows, comparing profitability of the vegetal products sold and the ones used on their premises or their use in the various activities of cattle production (Schuh C., 2002).

Determining the SGM levels on zones, on agricultural activities, types of holdings, it provides the analysis and effective comparability with European Union countries, regarding the SGM compatibility of the classification of the agricultural holdings, of the economic size and their technical-economic orientation. In this context, the paper elaborated an analysis of *standard gross margin (SGM)* to foundation of business decisions on the use of production resources in the dairy farms.

## RESULTS AND DISCUSSIONS

The case study was conducted at research and development Station for dairy farm in the sub-urban area of Iasi. *The Research and Development Station for Cattle Growth Dancu (RDSCG) Iasi* was founded in 1981 by Decree 170, initially as Research and Production Station for cattle, a public institution with legal and extra-budgetary funding, according to Law 290/2002, and from 12.01. 2006, according to GD no. 35, as *Station of Research - Development* in the field of animal husbandry, public institution with legal personality and financed from own revenues and extra-budgetary funds. *The livestock farm* has a total number of 1100 heads Romanian Black Spotted breed, of which 480 cows and heifers, 61 cattle of Red Holstein breed cattle and 58 heads of Grey Steppe breed. The average milk production has increased, reaching an average of 6500 kg milk / lactation with 254 kg of fat.

*The vegetal farm* unfolds the activity in order to ensure the forage base related to cows and youth within the farm. The agricultural area has 605 ha, of which 515 hectares of arable land and 90 ha pastures. The forage base ensures the maize and roughage silage to provide necessary feeding for animals for the whole year, as well as a part of concentrated feed, maize produced in the farm and for summer the full green mass requirement is ensured. The existing feed composition allows making adequate rations according to physiological states, age, production levels and breed.

We further present the calculation elements for SGM of (RDSCG) Dancu (*table 1*).

The calculation of gross product takes into consideration the value of milk production, the products resulting and the value of nutritive substances in the manure (*table 2*).

Table 1  
Technical elements to calculate SGM for the Romanian Black Spotted breed

Indicators	Milk cow 6000 l/lactation	
	Weight-alive (VA) & UNIT Large Cattle	600 kh VA
Period exploitation	4 years	3,8 lactation
Effective remont& animal loss	25.0 %/year	2.0 %/year
Period between kiddings	385 days	1.05 years
Nr. of calves/calf loss	0.948/year	6 %
Milk production	6000 kg/year	6329 kg/lact
Milk content	4.1 % fat	3.6 % protein

Table 2

Calculation of gross product						
Raw product	U.M.	Kg/UM	Quantity	€/kg	€	
Milk	kg	-	6000	0.3781	2268.60	
Calves	steers	Nr.	80	0.446	5.38	191.60
	cattle	Nr.	80	0.446	5.31	189.37
Reform	55%	nr	330	0.230	2.35	178.37
Manure pure	s.a.	UM	use	Volume	€/UM	€
N	81,4 kg/UCL	kg	55%	53.7	0.86	45.67
P <sub>2</sub> O <sub>5</sub>	33,0 kg/UCL	kg	100%	39.6	0.8	31.68
K <sub>2</sub> O	112,2 kg/UCL	kg	100%	134,6	0.45	60.59
Raw product total						2965.87

After the practical method of calculating the gross margin, there are taken into account only the costs for materials (heifers, forage, fuel, etc.) and services because they are undoubtedly variable costs. There are not included the expenditures for optional variable factors: necessary capital for current means, labour force, land, rights of production and supply as well as expenditures for fixed assets (amortization, interests etc.), general expenditures and costs with labour force for the general activities. Following this method, the marginal production adds up with the collateral yields (the value of manure) and any subsidies proportional with the marketable production (milk, calves, reformed cows).

Applying the method described above for the example of calculation of the gross margin, the following values are obtained (table 3).

Table 3

SGM Calculation for the dairy farm	
Production (main prod. + Collateral Prod. and subsidies)	2966 € / cow / year
Variable proportional costs (Materials and services)	996 € / cow / year
Standard gross margin (using practical method)	1970 € / cow / year

The gross margin shows how much money is available annually for a cow to cover the costs of production with all the factors not accounted for (unpaid) so far. If we divide the gross margin for a cow to its necessary of energy from basic forage, we obtain an insight on the capitalization of forage through the cow. Gross margin / 10 MJ NEM (net energy milk) can be used as a basis for comparison of different livestock directions of production for which the same basic forage is capitalized. In addition, we can see if the gross margin from dairy cattle is enough to cover variable costs with the basic forage. This is where SGM/10 MJ NEM is greater than the variable costs for the production of 10 MJ NEM.

In the case of cow milk, in the category of expenses that are to be covered from the gross margin, the forage production is also included with its fixed and variable expenses. In table 4, respectively is shown how SGM looks like after taking into account the variable costs for basic forage:

Table 4

Value of SGM in € / cow / year		
Production (without general direct payments - subsidies on surface)	2966	€ / cow / year
Variable proportional costs (1 cow and feeding area)	1356	€ / cow / year
Gross margin (1 cow and feeding area – after the practical method)	1610	€ / cow / year

Together with the aggregation between livestock and forage production, it is also calculated the SGM /ha of the area used and thus it is possible to make a comparison between the economic efficiency and the vegetal products marketed:

Table 5

Value of SGM/ha of the area used		
Gross margin (1 cow and feeding area)	1610	€ / cow / year
Feeding area/ cow	0.40742	ha / cow
Gross margin (1 ha feeding area with 2454 cows)	3952	€ / ha

For the situations where there are variable costs for capital (current means), labour force (in production), land, etc., progressively, they can reduce from the gross margin. To differentiate the indicators obtained from the gross margin, calculated by the practical method, these will be called the gross margin I, II, III respectively. In the case of the dairy cow, all factors are deducted from the total unit consisting of the cow milk and feeding area. The indicators used arise from the aggregation between the livestock and forage production (table 6).

Both indicators are calculated by subtracting the production costs (for cow and appropriate feeding area) of raw product. Therefore, in the form (column "Total expenses"), before estimating the profit and entrepreneurial profit, all the relevant costs will be listed first (differentiated by their own and foreign factors).

Through the aggregation between cattle breeding and forage production is possible to assess the valorisation of surface, through aggregation being given the necessary of field/cow (0.407 ha). The calculation of the remuneration of the factors is performed for the factors drawn and for their own factors (family labour force, own capital, own land). In the first case they are not taken into consideration, so, the same way, both for the extraneous factors and for the opportunity

costs for their own factors and it will be divided the difference between the total production and total expenditure to the entire quantity of factors used. In the second case, there are not taken into consideration only the opportunity costs and it will

be divided to the quantity of their own used factors.

In *Table 7* it will be calculated the profit and entrepreneurial profit per unit of production (cow and year).

Table 6

Determination of total variable costs						
Raw product		U.M.	Kg/UM	Quantity	€/kg	€
Milk		kg	-	6000	0.3781	2268.60
Calves	steers	nr.	80	0.446	5.38	191.60
	catle	nr.	80	0.446	5.31	189.37
Reform	55%	nr	330	0.230	2.35	178.37
Manure s.a. pure		UM	use	Volume	€/UM	€
N	81.4 kg/UCL	kg	55%	53.7	0.86	45.67
P <sub>2</sub> O <sub>5</sub>	33.0kg/UCL	kg	100%	39.6	0.8	3.68
K <sub>2</sub> O	112.2kg/UCL	kg	100%	134.6	0.45	60.59
Raw product total						2965.87
Variable expenditure						
Effective remont		Quantity			€/UM	€
Heifer		0.250 nr/year			1.3	325
Forage	Marketable	MJ/NEM/UM	Quantity	MJ	€/UM	€
Calf	Milk replacement	- kg	60	-	1.65	99
	Forage for calves	- kg	40	-	0.27	10.64
Cow	Forage barley	72 / kg	500	35900	0.12	60
	Forage wheat	75 / kg	500	37450	0.12	60
	Soy cake	76 / kg	320	24288	0.26	81.6
	Concentrated f.	65 / kg	320	20800	0.18	57.28
	Mineral forage	-	55	-	0.41	22.5
Forage total				118438		391.02
Services		UM	Expl	Quantity	€/UM	€
Cleaning		1 animal		1.5	8.18	12.27
Forage milling and mixing		100 kg		1695	0.02	25.43
Services total						37.70
Var. Expenditure with their own mecanization						108.68
Other expenditure			Expl	Quantity	€/UM	€
Veterinary surgeon, drugs				1	40	40
Electricity, water				1	28	28
Monting				1	20	20
Insurance, control milk production				1	40	40
Others				1	5	5
Other expenditure total						133.0
Variable expenditure total						995.39
Gross margin						1940.48

Table 7

The profit and entrepreneurial profit per Milk cow 6000 l/lactation						
Basic data		Used factors			Foreign %	Owner %
Main production	6000 kg	Current means	6555.51 €		10 %	90 %
Price	0.3781 €/kg	Fix means	32744.13 €		40 %	60 %
Secondary production	697.27 €/anim	Labour- production	134.29 h		20 %	80 %
Variable proportional expenditures	14715.63 €/anim	Labour -general	3 h		70 %	30 %
Direct payments	3534.6 €/anim	Arable Land	9.192 ha		60 %	40 %
		Non arable Land	8.832 ha		20 %	80 %
Raw Product		Expenditure	Entrepreneurial Profit	Profit		
			2965.87	2965.87		
Variable proportional expenditure		14715.63	14715.63	14715.63		
Gross Margin		14715.63	17681.51	17681.51		
Expenditure capital current means						
Foreign	655.55 €	7.0%	45.89	45.89	45.89	
Owner	5899.96 €	5.0%	295	295		
Variable expenditure I / Gross Margin I			15056.52	18022.39	17727.4	
Expenditure Labour Production						
Foreign	26.86 h	12 €/h	322.29	322.29	322.29	
Owner	107.43 h	10 €/h	1074.3	1074.3		
Expenditure II/ Gross Margin II			16453.11	19418.99	18049.69	

Table 8

**Agregation of forage production and animal breeding**

Activities	Forage		Production		Variable Expend €	Gross Margin €	Neces of		Fix cost for sell	
	Necess Energy MJ NEM	Prod t	Main €	Sec €			Curr Mens €	Labour Prod €	Machines €	Buildings €
Milk cow 6000l/ lact	1135541	-	2268.6	687.27	995.39	1970.48	1300	48.12	2800	3600
Silage maize 60 %	90000	46.8			1050	-1050	525	9	1750	5000
Clover hay 5%	35000	8.4			620	-620	310	16	2300	2500
Meadow sillage 35%	45000	22			765	-765	38.5	10	1900	2750
Total					2435	-2435	1217.5	35	5950	10250

The difference between the entrepreneurial profit and profit is that in the calculation of the profit there are not included the opportunity costs for their own factors (capital, labour and land). In the case in which, for the goods from the category of fixed assets there is another possibility to use, the more relevant are the fixed and opportunity costs for the calculation of the entrepreneurial profit. A positive value of the entrepreneurial profit indicates that the production factors (even their own) are paid; for their own factors it means a better remuneration than in the case of their use as an alternative activity. If the profit has a positive value, and the entrepreneurial profit is negative, then the means of production including wages, interest and leases may be paid, but there is not enough money left to pay their own used factors.

Based on the profit and the entrepreneurial profit we can see if it is possible to pay the working, capital, etc factors and not how much to pay. To express as accurately as possible the efficiency of factors used to choose among several options, it is calculated the difference between the total production and total expenditure (minus expenses for the analysed factor) for one unit of analysed factor (difference between their own factors and total quantity of factors).

The payment of factors is calculated and presented in the following *table 9*:

Table 9

**The payment of factors**

Total production (quantity of products × price, proportional subsidies)	3154.92 €/animal
All expenses other than expenses for the analysed factor *)	2611.84 €/animal
Payment of factor / ha	543.09 €/animal
The amount of factor used / ha)	55.24 working hours/animal
Payment of factor / unit of factor used	9.83 €/ working hours

Proving the economic efficiency of production, the direction can be made by comparing the price and the respective product

(calculated for the primary production) and production costs per unit. Costs per cow and feeding area (average expenses) are obtained by dividing the production costs to the amount produced. If it's not just about the costs required for obtaining a product but also for other crops, then the value for collateral products (calves, reform, fertilizers, slaughter subsidies, subsidies for the corn silage) must be added to the production costs, in order to be able to get a comparative size with the price for the primary product. A size of comparison for threshold-prices issued it is used the milk price, which is 0.378 € / kg.

The calculation of production costs (total costs in the long run) per piece of product results in the lower limit of the long-term price. If the product price is equal to the lower limit, the operating profit will be zero (= 0) (and so all factors are paid accordingly). In the example of calculation, the lower limit of the price serves to cover the total costs of production (breakeven) presented in *table 10*:

Table 10

**Determing of production costs for main product**

Total production costs	€/Animal	3189.36
Value of collateral productions	€/Animal	697.27
Production costs for main product	€/Animal	2492.09
Quantity produced (main product: milk)	kg/Animal	6500.00
Threshold - price for the main product	€/kg	0.3834

So the price should increase by 0.0053 € / kg above the price set of 0.3834 € / kg for breakeven. This price difference is ultimately reflected in the operating profit. The various indicators of economic efficiency for milk production are closely connected and cannot be analyzed separately. Taking into consideration each indicator in part, it can be said that the production is economically efficient (long or short-term). In the example of calculation, these connections between indicators may be proved

easily. Particularly clear is the connection in *table II*, because there are shown (simplified) all the indicators, side by side.

If the price of the product is equal to the lower limit of the long-term price (breakeven) we get the entrepreneurial profit zero (achievements = total expenses) and just the payment for the expenses necessary with the work, land and capital

(on average). If we set the expenses for one of the factors, capital, work or land to the amount of payment issued, the entrepreneurial profit is zero (achievements = total expenses), to pay the factors is exactly the cost obtained (on average) and the lower limit of the exact price for the current price product.

Table 11

## Connections between indicators

Basic data	Nr/quantity	Expenditure/unit	Expenditure	Gross Margin /Entrepren. profit
Main production	6000 kg	0.38 € / kg	-	2268.6
Secondary prod. With direct prop. payments		697.27 €	-	697.27 €
Variable expenditure without interest		14715.63€	14715.63€	14715.63€
Gross Margin (without interest, wage, lease)				17681.51
Imposed cost	6555 €	5.2%	340.89 €	340.89 €
Level of production I			15056.52 €	18022.39 €
Imposed cost for labour force	134.29 h	10.4 €	1396.59 €	1396.59 €
Level of production II			16453.11 €	19418.99 €
Imposed cost for land use	18.024 ha	173.36 € / ha	3124.72 €	3124.72 €
Expend. for Amortiz.	2520 €	12.5 %	315 €	315 €
Milk share interest	1260 €	5.8%	73.08 €	73.08 €
Level of production III			19189.75 €	22155.63 €
Techniques amortize.	21672 €	8 %	1733.75 €	1733.75 €
Buildings maintenance	43816 €	4 %	1752.66 €	1752.66 €
Imposed cost for fix assets	32744 €	5.8%	1899.16 €	1899.16 €
Imposed cost for labour	3 h	11.4 € / h	34.2 €	34.2 €
Other special fix expend		23 €	23 €	23 €
Other common expend		15 €	15 €	15 €
Breakeven			24503.12 €	27468.99 €

As regards the necessary of capital for the current means and animals, working time for production, land, rights of production and delivery if anything changes (which in any case arises from the gross margin), we have to prove that for these changes there appeared possible additional costs or savings. It should be noted that, at SCDB Dancu, this increase of production was done with an unchanged necessary of basic feed. So from the forage production there do not appear marginal expenditures (or savings). If something would have been significantly changed in the necessary of basic feeding, and also the necessary surface for it, for Intensity II it would have been necessary a new calculated aggregation and all the changes of the expenditure and productions would have passed in this calculation. Simplified, the value of cost factors was considered as the weighted average of cost of the own and foreign factor. The expenses for the milk share include the pay off and interest.

## CONCLUSIONS

To enhance the management practices which ensure high quality products and competitive abilities, the dairy farms will have to adopt methods to assist the decision and proper management, which is why they need adequate

quality resources: financial, material, energy, human and not least information resources.

The development of dairy farms, with a view to the increase of production under high economic efficiency raise a wide range of economic and organizational problems which require use of appropriate methods for their solving. To make a profit on the farm the sum gross margin on the activities must be greater than the fixed costs.

To prove the economic efficiency of changing the intensity of the farm analysed, we must include all the changes of the achievements and production costs. A change of the technique of production is efficient if the marginal achievements are higher than the marginal costs (that are at least equal). Usually, the marginal production and costs are visible in the calculation of gross margin, because the fixed costs do not undergo changes as a consequence of the measures of modifying the technology of production.

Following the study and interpretation of specialized data of the dairy farm we can conclude that the strategic management is a complex process carried out by all decisional department for procurement, allocation, combination and rational use of resources and production factors (land, labour, capital, information) to achieve goals,

increase productivity and efficiency on the basis of overall economic growth.

The current efficiency criteria require the use of modern management in combining innovations in the domain of growth and exploitation of milk cows, production factors and production technologies.

In order to achieve the objectives, development activities and to increase the economic efficiency there are required several recommendations: further improvement of farm management by adopting the most effective methods and management tools, fundamental requirement for achieving economic performance proposed, consisting of possession of real information on specific conditions of development of the activity of the company; increasing the importance of using software for agriculture in decision making, and in designing alternatives for management processes. For future they have in view to preserve the economic and financial balance by increasing revenues and reducing costs through better management in the market economy requirements and regulations set by the European Union.

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