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STUDY REGARDING THE STRUCTURE OF A RANCH ACCORDING TO THE CIRCULAR ECONOMY

Elena BRÎNZEA VIŞINESCU, Elena CONSTANTIN, Răzvan Ionuț TEODORESCU

University of Agronomic Sciences and Veterinary Medicine of Bucharest,
59 Marasti Blvd, District 1, Bucharest, Romania

Corresponding author email: elenavisinescu@yahoo.com

Abstract

The circular economy is the sole viable alternative of the linear economy, namely the classic model of output and input, where the raw materials are taken from nature, being used to manufacture the products, which afterwards are used and possibly eliminated as wastes - manufacture - use - throw pattern.
On the basis of this concept has been projected a logical scheme of the circular economy for the output activity developed at the farm made with European funds, fields crops farm and manufacturing industries of zootechnical by-products.
The impacts on the economic circularity are highlighted through specific indicators. For the present study it has been identified the possibility to evaluate the circular utilization rate and the material indent, considering the value of the primary materials used to get the final product.

Key words: *circular economy, logic scheme of the circular economy, circular utilization rate, material indent.*

INTRODUCTION

The circular economy is considered the single real alternative of the output and input classic model, where the raw materials are used to manufacture the products, which are exploited according to their value of utilization and further they become wastes. (Vişinescu et al., 2020).
According to the European Committee, the circular economy is *the economic space where* the value of products, materials and resources is maintained in economy as long as possible, the generation of wastes being minimized.
The concept of circularity is closely connected to that of the efficient use of natural resources during products life cycle, as well as wastes conversion into new resources for other industries (https:/ / bioeconomie.ro/2013/09/04/ primulpost/2013).
The circular economy is considered the only real alternative of the output and input classic model, where the raw materials are used to manufacture the products, which are exploited according to their value of utilization and subsequently become wastes.

MATERIALS AND METHODS

The rural economy revamping requires the organization of some complementary agricultural activities which valorise on zonal plan the raw agricultural products obtained, in order to practice a circular economy as a starting point in the practice of bioeconomy.
To exemplify a management model that applies the circular economy it has been elaborated the present study for a zootechnical farm made with European funds through the NRPD - EAFDR program, in the frame of an economic circuit which also includes an agricultural farm of field crops and different manufacturing industries of livestock by-products.
In the frame of this project, it is proposed to buy Romanian Bălţata bulls, breed which has the morpho-productive characteristics of Simmental breed, with improved peculiarities of strength and adaptation to the harsher environmental conditions of our country.
Farm's capacity will be of 100 heads. Growth and fattening period is of 12 months, the calves being purchased at a weight of at least 140 kg, the delivery being made at one year at the weight of 650 kg. The net number of bulls per

series which reach the end of growth for exploitation is of 98 (Feasibility study. Applicant: SC ECOVIT FARM INVEST SRL**)**
Study's objectives are determining the fodder need for raising bulls, the provision of fodders necessary from the agricultural farm and delivery of animal by-products to the processing industries.
The value expression of the products entering into this economic circuit makes possible the economic evaluation of the circular output activity, but also the calculation of indicators specific to the economic circularity.
The economic circularity is expressed through a set of indicators which can be determined at macroeconomic level. Among these we identified two indicators which can be determined on the basis of registering the value of circular production chain products and by-products.

RESULTS AND DISCUSSIONS

On the basis of the circular economy has been projected a logical scheme of the circular economy for the output activity developed in the ranch which includes the collaboration with field crops farm and the industries manufacturing the zootechnical by-products. (Valorificarea-subproduselor-din-industria-carnii: https://dokumen.site/,2018; https://www.scridoc.com/2021/04/deseuri-carne.html.Ce facem cu deşeurile de la carne, 2021).
Animal feed is made by manufacturing a part of the vegetal production obtained by the agricultural farm which receives in return the manure used to fertilize the arable land. (Lege nr. 22 din 17 decembrie 1971 pentru organizarea producerii şi folosirii rationale a resurselor de nutreturi. Publicat în Monitorul Oficial nr. 156 din 17 decembrie 1971) Furthermore, the field crops farm supplies also the straws necessary for animal bedding. From the ranch it is obtained the main product (carcass of the slaughtered animal), alimentary by-products, non-alimentary by-products and manure. The non-alimentary by-products are wastes, but they can be exploited according to the principles of circular economy in different industries, as it is shown in the circular economy's logical scheme (Table 1) (Visinescu, 2020).
The agricultural products quantities obtained on agricultural farm for supporting the feeding of fattened bulls have been calculated knowing the recipe for the concentrates type II and III, (Popa et al., 1980) as well as the processing yield of raw agricultural products: corn grain/corn cobs (about 75%), corn grain/corn flour (about 77%), good grain/bran (about 23%), sunflower seeds/grit (about 45%).
The recipes for the two types of concentrates used to bulls feeding contain also calcium, salt and mineral supplement (zoofort) (Popa et al., 1980).
The necessary fodder produced on the field crops farm is presented in Table 2.
From the sum of 851.790 lei being the newly created value on the ranch, a part represents the main product and the by-products exploited into the farm and another part represents the by-products value which enters into circularity.
The by-products resulted from the farm enter into circularity being taken over by other manufacturing industries. These reach the value of 50.884 lei.
To the ranch yields is added also the value of manure taken over from the ranch.
The valuation of total operating expenses is presented in Table 3 and the value of the products obtained on the circular output chain is presented in Table 4.
Setting in the economic impacts determined by the activities organisations, considering the bioeconomy principles conduct to important methodologic changes (https://agriculture.gouv.fr/ la-bioeconomie-nouvelle-vision-du-vivant, 2019).
Therefore, beside the economic efficiency set by specific indicators must be highlight the ecologic impacts materialized in decreasing wastes, diminishing the consumption of raw materials and materials by extending the life of products.

Table 1. The logical scheme of economic circularity

Input - concentrated fodder (corn grains and cobs, wheat, barley, sunflower) - green fodder (alfalfa, other green fodder) - grain straw - solid supplements (calcium, salt, zoofort)	**The farm livestock**	Outputs - carcase - food by products (head, organs, legs, tails, bones, blood) - non by products (skins, horns, hooves bones, blood, intestines, endocrine glands) - stable man	Inputs - food industry - carcase - food by products (skins, horns, hooves bones, blood, intestines, en docrine glands) Inputs Leather industry - rough skins Inputs By products manufacturing industry - horns, hooves bones, blood, intestines, endocrine glands. Inputs The pharmaceutical industry endocrine gland, bones, tendons
Outputs - concentrated fodder: corn grains and cobs, wheat, barley, sunflower, green fodder (alfalfa, other green fodder) - grain straw	**Farm for field crops**	**Inputs** **- manure**	
Input - concentrated fodder (corn grains and cobs, wheat, barley, sunflower) - green fodder (alfalfa, other green fodder) - grain straw - solid supplements calcium, salt, zoofort)	**The farm livestock**	Outputs - carcase - food by products (head, organs, legs, tails, bones, blood) - non by products (skins, horns, hooves bones, blood, intestines, endocrine glands) - stable man	Inputs - food industry - carcase - food by products (skins, horns, hooves bones, blood, intestines, en docrine glands) Inputs Leather industry - rough skins Inputs By products manufacturing industry - horns, hooves bones, blood, intestines, endocrine glands. Inputs The pharmaceutical industry endocrine gland, bones, tendons
Outputs - concentrated fodder: corn grains and cobs, wheat, barley, sunflower, green fodder (alfalfa, other green fodder) - grain straw	**Farm for field crops**	**Inputs** **- manure**	

Source: Vișinescu (2020), Scientific report no.3, - Partial results regarding the efficiency of the bioeconomy in the sustainable development of the rural area in the study area.

Table 2. The need for concentrated fodder produced on the farm for field crops

Agricultural product fodder	Required products -tons for					
	Type II concentrate		Type III concentrate		Total	
	Product agricultural	Fodder	Product agricultural	Fodder	Product agricultural	Fodder
Corn grain	12				12	
hominy		8.70				8.70
Corn cobs			23	23	23	23.00
Wheat	7		31		38	
Bran		1.50		6.75		8.25
Barley			10	10	10	10.00
Sunflower	7		10		17	
groats		2.40		4.50		6.90
Lucerne m.v.	12				12	
Alfalfa flour		1.80				1.80
Total	38	14.4	74	44.25	112	50.65

Source: Vișinescu (2020), Scientific report no.3, - *Partial results regarding the efficiency of the bioeconomy in the sustainable development of the rural area in the study area.*

Table 3. Estimation of total operating expenses

Nr.crt	Feed type	Quantity, kg	Value, lei
1	Hay	126,000	**126,000**
2	Concentrates		**69,109**
	-from the farm	50,650	66,115
	-mineral supplement	150	834
	-calcium	300	150
	-salt	300	270
	-zoofort	300	1740
3	Succulents (potatoes)	90,000	**54,000**
4	Pickled fodder	180,000	**41,400**
5	Straw for bedding	54,000	**4,320**
	Total feed		**294,829**
6	Water for drinking	1,440,000	7,200
7	**Acquisition of bulls**	100 heads	112,000
	Total operating expenses		**41,4029**
8	Drugs		3,120
9	Diesel fuel		5,800
10	Insurance		4,000
11	Cost of living labor		55,200
	Other expenses		**68,120**
12	**Total expenses**		**482,149**
13	**Annual depreciation**		**242,958**
	Annual expenses		**725,107**

Source: Vișinescu (2020), Scientific report no.3, - *Partial results regarding the efficiency of the bioeconomy in the sustainable development of the rural area in the study area.*

Table 4. The value of the products obtained in the circular production chain

Nr. crt	Income from livestock farm	The value, lei
1	Capitalization of the main product	800,906
2	Capitalization of by-products	50,884
3	Manure	24,650
4	Total	876,440

Source: Vișinescu, (2020), Scientific report no.3, - *Partial results regarding the efficiency of the bioeconomy in the sustainable development of the rural area in the study area.*

The setting in of these impacts might be obtained by identifying some indicators which can reach the circularity in economy (https://www.statistiques.developpement-durable.gouv.f r/i 2021):

1. Household expenses for maintenance and repair of products

Household expenditure (excluding vehicle maintenance) is marked by an increasing consumption of goods that consume resources and generate CO_2 emissions for their manufacture, transport and distribution. Prioritizing repairs over renewals prolongs the life of products and thus limits their replacement.

Monitoring consumer spending on resident dedicated to the maintenance and repair of household goods makes it possible to analyse the evolution of household practices in this area. Since 1960, per capita spending on household goods has increased. The increase was more intense in new goods purchases than in maintenance and repair costs.

2. ***Evolution of the volumes of waste deposited***

According to European Directive (EU) 2018/851 of 30 May 2018, the storage or incineration of waste without energy recovery is the least convenient solution as it loses significant resources that minimize the circular economy.

3. Incorporation of recycling raw materials in production processes

Recycled raw materials (MPR) result from waste that can be introduced into the production process by totally or partially replacing virgin raw materials thus saving natural resources. The circular rate of use of materials measures the share of waste recovered in the form of materials in the manufacture of a product. The circular utilization rate is defined as the ratio between the volume of raw materials in circular recycling and the total volume of materials used.

4. Number of companies and local authorities that have benefited from a functioning economy support system by state agencies

Functional economics refers to a new business model that seeks to replace the sale of a material good or a traditional service with the sale of the use of the good and useful effects (benefits to customers). It is a more economical model in terms of resources and pollution due to the decoupling between the production of goods and income and the optimization of the use of material resources and goods.

5. Number of industrial and territorial ecological approaches

Industrial and territorial ecology is a way of organizing inter-society based on the exchange of resources or the pooling of resources and services. The economic factors involved in this process can collaborate for the shared use of infrastructure, equipment (heating networks, tools or production spaces), services (collective waste management, business travel plans, etc.), materials (waste become resources for others) or jobs.

6. The European Ecolabel

The European Eco-label reflects the environmental quality of products and services at all stages of their life (manufacturing, use, transport and disposal). Obtained on the basis of a voluntary approach, it is the only label that guarantees the ecological quality of products in all EU Member States. A manufacturer may own one or more eco-labelled products related to one or more product categories.

7. Internal consumption of materials on resident

The demand for goods and services of domestic producers of goods requires the use of raw materials from the territory and the import of raw materials that cannot be produced locally. The sum of the volumes of materials extracted from the territory and imported, minus the volume of materials exported, is the domestic consumption of materials. This indicator is part of the provisions on the 2030 Sustainable Development Goals, defined by the United Nations.

8. Material productivity

Material productivity (EUR/kg) is the ratio between Gross Domestic Product (GDP) and Domestic Material Consumption (DMC). This indicator, which characterizes a more resource-efficient economic system, is part of the UN's 2030 Sustainable Development Goals. Trend Material productivity increased by 12% between 2010 (2.63 EUR / kg) and 2018 (2.96 EUR / kg), the target for 2030 being set at 3.42 EUR / kg. In 2007, before the 2008 crisis, material productivity was 2.28 EUR / kg.

9. Material imprint

The material imprint shows the amount of primary materials used to obtain the final product and includes both direct volumes of materials (material contained in manufactured products) and indirect volumes (materials not included in those products but necessary for their manufacture). This notion is analogous to the carbon or water footprint, the material footprint (domestic consumption in raw material equivalent) being an indicator established according to the methodology recommended by Eurostat.

10. Real estate repair and recycling

The indicator aims to identify the number of jobs associated with economic activities related to the circular economy. This includes activities related to "extension of use" and "recycling", ie reuse of goods, repair, waste collection and recovery of materials. These activities, on the whole, require more jobs per unit produced than in the economy (https://www.statistiques. developpement-durable.gouv.f r/i 2021).

In the present study has been identified the possibility to calculate the circular utilization rate (RUC) on the basis of the knowledge the value of raw recycling materials (VRC) and the total amount of the materials consumed in the production process (VMC):

$$\text{RUC} = \frac{VRC}{VMC} \text{ x } 100 \text{ (\%)}$$

It has been considered the raw recycling circular materials are the by-products taken over to be used in other production sectors, as well as the manure taken from the agricultural farm, whose value is of 75,534 lei (Table 4).

The total value of the materials consumed in the output process results from the total exploitation expenses and from the medicines cost, being of 417,149 lei (Table 3).

On the basis of the above-mentioned data has been calculated the circular using rate for the ranch:

$$RUC = \frac{75534}{417149} * 100 = 18\ \%$$

The circular using rate for the ranch provides the value share for the circular raw materials, included into the output processes of other economic sectors.

Another possibility to express the economic circularity is the material mark determination, considering the value of the primary materials used to obtain the final product. This includes both the value of the materials used in the output process, as the non-included materials into the final product, but which are necessary.

The value of the primary materials used to obtain the final product (Vm) are: bulls' cost, fodder, water for animals, medicines.

For a case study, according to data from Table 3, the value of those materials is, at follows:

- bulls cost 112,000 lei
- fodder cost 294,829 lei
- water for animals 7,200 lei
- medicines 3,120 lei

Sum : 417,149 lei

The total value of the product obtained (Vp) (main product and by-products) is of 876,440 lei.

Material print (Am) determined by the value expression of its components is:

$$\text{Am} = \frac{\text{Vm}}{\text{Vp}} = \frac{417149}{876440} * 100 = 47.6\ \%$$

The material print in value expression shows that the primary materials from the output process lend 47.6 % to obtain a new product and 52.4 % represents the new created value in the output process, in this case meaning the raising and fattening bulls.

CONCLUSIONS

The circular economy is the sole alternative of the classic model of output and consumption, where the raw materials are used to manufacture products which are used according to their value and, at the end, become wastes.

The circular economy means to recycle the materials in order to extend products life cycle.

Putting in practice the circular economy based on setting up a ranch made with European funds and on economic relations between this and the economic agents specific for a complete output circuit.

The highlighting of the economic circularity has been made by elaborating a logic scheme including the activities of the ranch, of the field crops farm and from specific technical industries.

The output process of the ranch has been set up according to the special recommendations and to the economic circularity principles.

Objectives of study: to determinate fodder need for raising bulls, to provide the necessary fodder from the agricultural farm and to develop the zootechnical by-products from the manufacturing industries.

The economic circularity is appraised through specific indicators in order to highlight the ecologic input materialized by prolonging the products life.

On a local economic scale, this study could calculate two indicators of the economic circularity.

The circular utilization rate of 18 % represents the value share of the recycled raw materials included into the output processes from other economic sectors.

The material mark in value expression shows that the output raw materials bring a contribution of 47.6 % to obtain the new product and 52.4 % represents the new created value through the output process.

REFERENCES

Popa O, Milos M. & Bunicelu Elena (1980) - A*limentatia animalelor domestice,* Editura Didactică şi Pedagogică, Bucureşti

Vişinescu Brînzea Elena & Constantin Elena (2020) - *New concepts in sustainable development management.* Agricultura - Revistă de ştiinţă şi practică agricolă – vol.113 nr.1–2/2020, ISSN 1221 – 5317. Ed.Academic Press, https://journals.usamvcluj.ro/index.php/agricultura/article/view/13793

Brînzea Elena Vişinescu, Scientific report no.3, (2020) - *Partial results regarding the efficiency of the bioeconomy in the sustainable development of the rural area in the study area*, USAMV Bucharest

Lege nr.22 din 17 decembrie 1971, pentru organizarea producerii şi folosirii rationale a resurselor de nutreturi. Publicat în Monitorul Oficial nr. 156 din 17 decembrie 1971

Studiu de fezabilitate. Solicitant: SC ECOVIT FARM INVEST SRL. Înfiintare fermă îngrăşare taurine în comuna Dumbraveşti, judeţul Prahova.

https://bioeconomie.ro/2013/09/04/primul-post/2013 *C.E. propune o strategie pentru o bioeconomie durabilă în Europa*
https://www.scridoc.com/2021/04/deseuri-carne.html. Ce facem cu deşeurile de la carne
https://www.statistiques.developpement-durable.gouv.fr/i 2021
https://agriculture.gouv.fr/la-bioeconomie-nouvelle-vision-du-vivant - 2019
Valorificarea subproduselor din industria carnii, (2018), https://dokumen.site/queue/valorificarea-subproduselor-din-industria-carnii