Abstract

Keywords: *camelina, meal, oil, carbon life cycle, emissions of greenhouse gases*

In the 21st century, climate change mitigation and energy security are important aspects of global energy policy. The potential for reducing greenhouse gas emissions greenhouse replacing fossil fuels such as oil, gas and coal, fuels derived from renewable biomass sources is an important factor in promoting bioenergy. The impact of the greenhouse gas emissions of bio-energy systems effect should be compared to that of fossil fuels systems or other renewable energy through carbon lifecycle assessment. This method assesses the environmental impact on all stages of obtaining a product, from manufacture to end use, or in part, a particular segment of technology, representing a method of quantifying the impact on the environment. Transport industry, including aeronautics, provides an indispensable link for the whole world, including both public and private transport companies and small or large. Considering our planet safety and energy security, we need to develop new sources of renewable energy with minimal emissions of greenhouse gases to limit environmental impact. This is part of an overall goal, which stimulates transport industry for searching new sources of fuels based on renewable sources with sustainable technologies for processing.

This paper evaluates and quantifies greenhouse gas emissions from agricultural technology and effect from production of Camelina seeds, which is the source of the oil will be transformed into biofuels or bio-kerosene and biodiesel.

In this paper, lifecycle assessment of the carbon in agricultural technology of cultivation of the plant Camelina sativa, was based on data recorded from four locations farming in three different areas of the country, namely Iasi, Giurgiu and Ilfov, with approaches different in terms of agricultural management and technology: intensive trade, commercial and experimental academic, compared to other energy plant, rapeseed.

In order to improve technology and therefore reduce carbon emissions, they studied the possibility of recovery of byproduct: camelina meal, generated together with oil extraction, under commercial farm test, confirmed the positive influence of camelina meal on milk production, characteristics organoleptic and physico-chemical properties of milk without affecting animal health.

The thesis is divided into five chapters, the main objectives that have guided the documentary, theoretical and practical applications of the thesis were:

- To identify fuel consumption and emissions of greenhouse gases by applying agricultural technology, product prior to obtaining primary focus, camelina oil;
- To quantify carbon dioxide emission, the gas reference greenhouse, a unit of agricultural area of one hectare of several lots that have potential impact on a period of 100 years.
- Assessing the potential for recovery of grits camelina by conducting a market survey in the largest cattle farms of milk in Romania, for quantity and quality of energy-protein supplements consumed, and practical testing camelina meal efficiency and effects when is introduced in dairy cows diet at commercial farm condition.

Chapter 1 provides a thorough documentation of assessment methods of carbon life cycle, a deepening of the structure, objectives, inventory analysis, calculation method, impact and impact category, interpretation and enhancement of agricultural technology products of Camelina. Publication of the objectives of the thesis are topical both for capitalizing produced by exemplifying several tests on the nutritional properties of camelina meal, capacity of oil to be transformer in bio-kerosene and in terms of the method of quantification of greenhouse gas emissions.

This chapter presents the latest European Commission's legislative initiatives that encourage the full exploitation of alternative energy technologies for obtaining and applying that expose assessments and environmental impact of the technology concerned. The principle of Life Cycle Assessment of carbon, which balances the energy consumed to obtain a product which also bear a footprint on the environment, are the types of possible impact allocation methods for efficient use of products and to review system data from critical point of view. Theoretical study of the latest research in this area by working references, has enabled the development of realistic and feasible, which led focus of this paper on the results that can be practically applied with positive results even in the short term, in many commercial systems.

Chapter 2 describes a holistic view, the methods and materials addressed, being correlated with practical research and partial results, the agricultural technology of camelina, methods of obtaining the final product from Camelina seeds and yields results, determining the characteristic resulting product. This was performed especially for camelina meal, chemical analysis of the nutrient content were done in order to choose the species which can test the effectiveness of nutrition and the types of technologies and systems studied in parallel, to highlight the impact of environmental and economic viability of these.

In this thesis was evaluated greenhouse gas emissions for three Camelina cultivation systems and one reference system, namely: camelina with minimal soil preparation in a commercial system with modern equipments in Giurgiu County; Camelina with minimal soil preparation in academic experimental system, with equipment dedicated to academic activities similar to those used by farms with less modern equipment, Ilfov County; Camelina soil with specific training in intensive commercial system, having access to modern equipment in Iasi; rape, reference system, with specific preparation of soil in intensive commercial system, having access to modern equipment, in Iași.

The experimental results are described in Chapter 3, which is divided into three parts. The first part shows the results on the physical production of Camelina for each batch, followed by the yields obtained by physical extraction of the oil.

The best production of Camelina seed was recorded for the group Iasi grown commercially intensive, specific training ground, which is 1670 kg / ha. As opposed to batch Giurgiu which was 1500 kg / ha and lot Ilfov achieved a production of 1,000 kg / ha. Because the method of allocation final products of the most suitable technologies requires reporting of environmental impacts to physical quantities of them , also extraction systems have been studied and, one in Iasi, where he used a crushing machine adapted camelina, yield extraction of oil was 25.5%; a system in Bucharest, which had a yield of 31.4%; and the third system used in Giurgiu, a private, had the best yield of 32.2%. Reported to agricultural production, with an average of 38% oil in seeds, after the allocation of products, Giurgiu field had the best productivity segment field-extraction, yielding 484 kg oil, surpassing lot Iași, who had an oil production of 426 kg / ha. At the opposite pole lies Ilfov group, and obtained a quantity of 314 kg oil for the same unit area.

The second part shows the results for the possibility of using camelina meal in animal feeding, after centralization by types and consumption of energy-protein used in animal nutrition, for all main agricultural areas of the country.

After getting the harvest and pressing of seeds of Camelina, camelina meal was included into dairy cows ratio, on a commercial farm, with measurement of performance indicators from farm over a period of three weeks. The test results demonstrate that camelina meal can be administered in dairy cows ratio with positive results on the production and quality of milk at an inclusion rate of 1-2% of daily intake, and in terms of economic return on investment shows a return of least 1:2.

In the third part, results of the evaluation life cycle carbon, as green house gas emission, for all three fields are highlighted, with the following key findings:

- emissions of greenhouse gases reported the area under cultivation of camelina loads are up to 32% lower than emissions from rapeseed field.
- because of the agricultural equipment performance, loads of Giurgiu and Iasi have realized productions approximately equal (between 1500 and 2000kg / ha gross), with little difference in emissions of greenhouse gases, unlike group Ilfov, which had the low seed production (about 1000kg / ha gross) and the highest emissions of greenhouse gases between the 3 groups camelina: 905.4 Giurgiu, Iasi 1044.66 and Ilfov 1104.6 (kg CO2 eq / ha annually).
- The biggest impact on the environment, regardless of the performance of the agricultural and land management, generates applying nitrogen-based fertilizers, which totaled approx. 75% of GHG emissions.
- Chemical fertilizers, if we refer to the resources used only for their production, they generate the most complex life cycle, with correlations globally in the evaluation of LCA were identified at least 97 processes these raw materials, prior to final use by the farmer.

In Chapter 4 of the thesis, presents a series of original contributions, such as:

- In this thesis greenhouse gas emissions were measured from each stage agricultural technology for four fields, one rape, taken as a reference
- Camelina technology was compared with rapeseed, camelina resulting lower emissions of greenhouse gases up to 32% for the same unit area.
- A market survey was performed in most of the national cattle breeding farms with large livestock to record the consumption share of protein supplements and their nutritional profile, as an opportunity for camelina.
- Camelina was fed to dairy cows in a commercial farm, the measurement of key performance indicators of the farm over a period of three weeks showed an positive influence over milk production, organoleptic and physical-chemical properties of milk, without affecting animal health

In terms of capitalization products by demonstrating the nutritional value for camelina meal, will increase the value of the entire technological flow, direct capitalization as a co-product has an important role in this technology. Critical analysis of the data obtained, which include recommendations on further development of this technology and feasible to eliminate the co-product obtained are useful to farmers in the agricultural, seed processors, producers of biofuels and livestock farmers in the area.