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Developing Georgescu- Roegen'sbioeconomicsconcept with a new smart approach, from "fiat panis" to "habemuspanis",based on a new economic theory for globalised biopower through more agrifood and seafood

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Abstract

The authors analyze, with a special topic, the very good perspectives of knowledge, development and globalized implementation of some important non-conventional economical theories, modernizing "the old" phrases, theories, concepts and paradigms elaborated by the American scientist of romanian origin Nicholas Georgescu-Roegen in the sixth and seventh decade of the past century, known under the generic denomination "bioeconomy/bioeconomics", that is unfortunately, today, only partially understood, to clearly demonstrate, with professional arguments, the fact that still, in the year 2013, when the world population exceeded 7 billion people out of which over 1.2 billion are affected by hunger of different degrees; there are sufficient *natural bio-resources* which, by primary eco-bio-geo-strategies *are able* and should provide the fundamental right to a biological, spiritual and social adequate life. In the end of this work, we suggest more realistic frame projects that are necessary for a

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sustainable improvement of people's life living on Terra. It is underlined the common effort of lucidity and flexibility, based on scientific knowledge, and also an intelligent *bio-eco-geo-diplomacy*, in order to achieve the economic and social progress, welfare and a good governance of ecosanogenesis and also a clever partnership with the eternal nature for globalised biopower through more agrifood and seafood.

*Keywords:*bioeconomy, agri-seafood, bio-eco-geo-strategies, globalised, biopower, habemus panis, fiat panis;

1. Introduction

Within National Institute of Economical Researches "Costin C. Kiritescu" there is, for many decades, a constant concern for the study and capitalization of the original scientific contributions of romanian origin american scientist Nicholas Georgescu-Roegen, demonstrated through publication, in the last 25 years of 15 volumes from the scientifical opera of the scientist, that have been edited and published under the coordination of Aurel Iancu, Romanian Academy member and professor Ion Valeriu Franc.

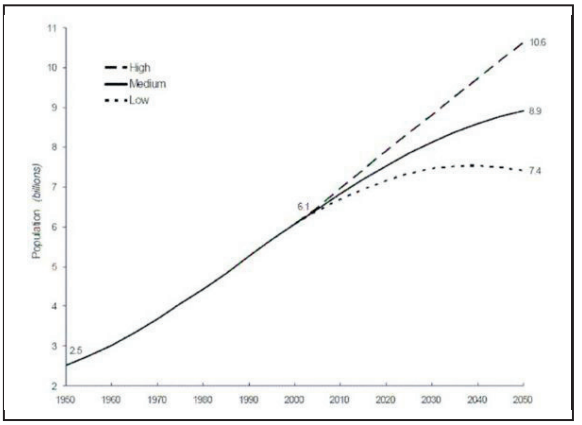


Fig. 1. Estimated world population, 1950-2000, and projections: 2000-2050; Source: World Population to 2300, Publication of United Nations, Departament of Economic and Social Affairs, Population Division, New York 2004.

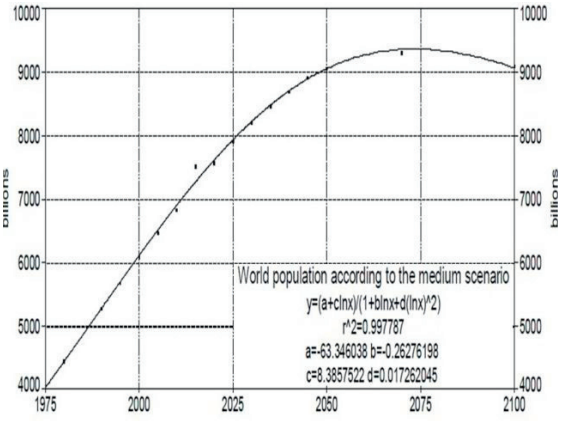


Fig. 2.Population development between 1975 and 2100 (correlation calculate by A.T. Bogdan, R. Burlacu& I. Surdu, using database on UN, 2007, World Population Prospects (2010).

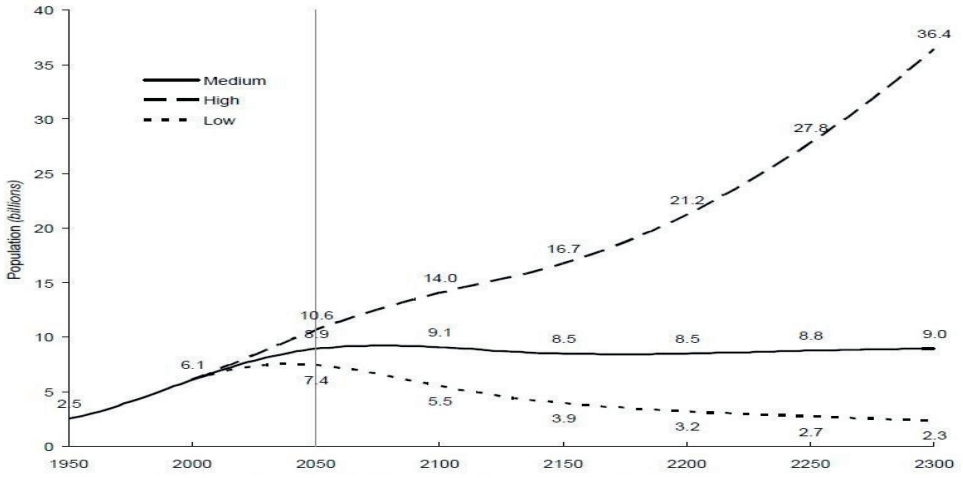


Fig. 3.Forecasting the change in world population over 50 year periods, estimates and three scenarios: 1950-2300 by United Nations, New York, 2004, Department of Economic and Social Affairs, Population Division. Note: This is the first signaling of this important study, in relation with bio-eco-economy and justifies the scientifical researches for ensuring the food of humankind on long and very long-term, ***representing stability in developing of agrifood and seafood production for globalised biopower.***

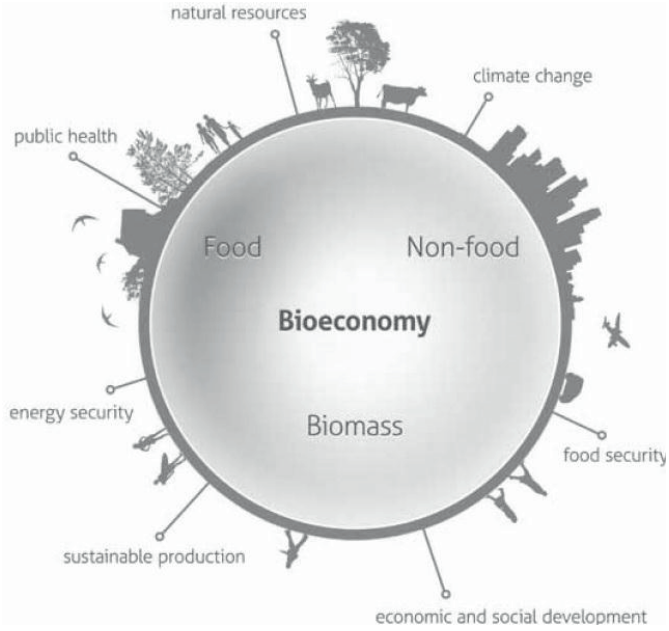


Fig. 4 The European Bioeconomy from The European Bioeconomy in 2030, p. 6.

The Bioeconomy refers to the sustainable productionand conversion of biomass into a range of food, health,fibre and industrial products and energy. Renewablebiomass encompasses any biological material(agriculture, forestry and animal-based including fish)as a product in itself or to be used as raw material.

In many congreses, symposia and round tables organised in the last years, on all continents, in all countries and well-known institutions through their researches, both fundamental and applied, the next principles and objectives have been outlined:

- *Investment in relevant research areas, both within each of the sectors and by encouraging multidisciplinaryprogrammes; Encouraging innovation to make sure that more of the knowledge developments reach the commercialisationstage;Making entrepreneurship within the Bioeconomy a desirable career option; Providing a skilled workforce by making the various sectors of the Bioeconomy attractive career options*
- *through secondary and tertiary education;A streamlined and innovation-friendly regulatory framework which balances both risks and benefits;Good two-way communication with the public embedded in R&D projects to ensure societal appreciation of research and innovation.*

The objectives of Horizon 2020 programme, as core part of Europe 2020, Innovation Union & European

Research Area are: **responding to the economic crisis** to invest in future jobs and growth; **addressing people's concerns** about their livelihoods, safety and environment; **strengthening the EU's global position** in research, innovation and technology.

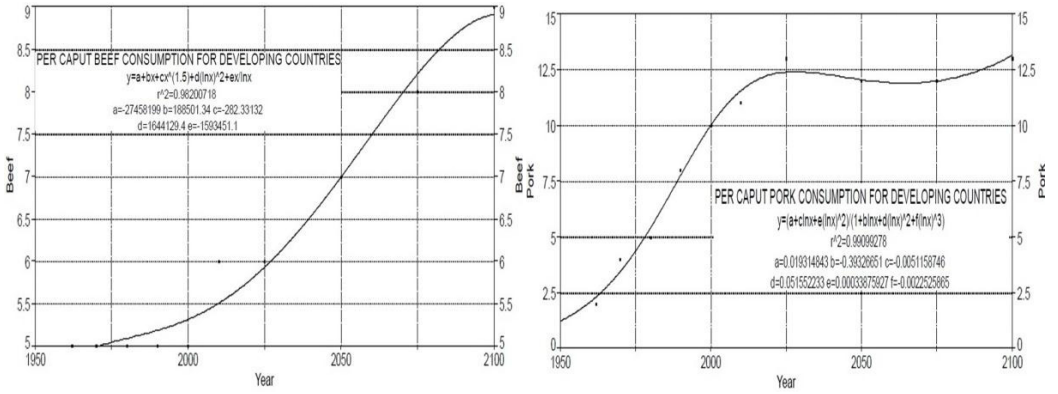
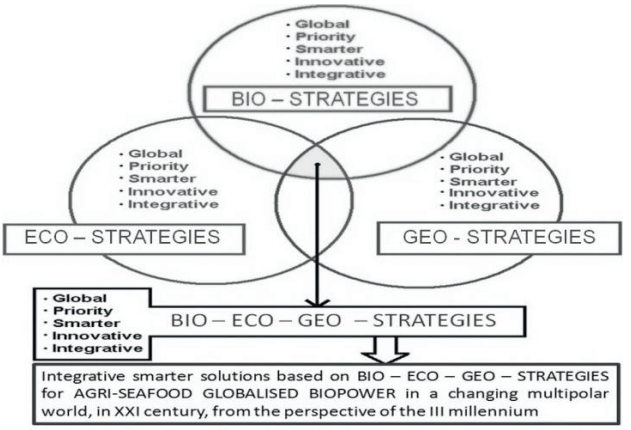


Fig. 5. Regression curve to describe the dynamic of beef and pork consumption for developing countries (correlation calculated by A.T. Bogdan, R. Burlacu, I. Surdu, using database on The State of Food Insecurity in The World, 2004).

Table 1. Biotechnologies with a high probability of reaching the market by 2030

Agriculture	Health	Industry
Widespread use of marker assisted selection (MAS) in plant, livestock, fish and shellfish breeding.	Many new pharmaceuticals and vaccines, based in part on biotechnological knowledge, receiving marketing approval each year.	Improved enzymes for a growing range of applications in the chemical sector.
Genetically modified (GM) varieties of major crops and trees with improved starch, oil, and lignin content to improve industrial processing and conversion yields.	Greater use of pharmacogenetics in clinical trials and in prescribing practice, with a fall in the percentage of patients eligible for treatment with a given therapeutic.	Improved micro-organisms that can produce an increasing number of chemical products in one step, some of which build on genes identified through bioprospecting.
GM plants and animals for producing pharmaceuticals and other valuable compounds.	Improved safety and efficacy of therapeutic treatments due to linking pharmacogenetic data, prescribing data, and long-term health outcomes.	Biosensors for real-time monitoring of environmental pollutants and biometrics for identifying people.
Improved varieties of major food and feed crops with higher yield, pest resistance and stress tolerance developed through GM, MAS, intragenics or cisgenesis.	Extensive screening for multiple genetic risk factors for common diseases such as arthritis where genetics is a contributing cause.	High energy-density biofuels produced from sugar cane and cellulosic sources of biomass.
More diagnostics for genetic traits and diseases of livestock, fish and shellfish.	Improved drug delivery systems from convergence between biotechnology and nanotechnology.	Greater market share for biomaterials such as bioplastics, especially in niche areas where they provide some advantage.
Cloning of high-value animal breeding stock.	New nutraceuticals, some of which will be produced by GM micro-organisms and others from plant or marine extracts.	Biotechnological bioindustry based on future GMO technology, produced in animal bioreactors.*
Major staple crops of developing countries enhanced with vitamins or trace nutrients, using GM technology.	Low-cost genetic testing of risk factors for chronic diseases such as arthritis, Type II diabetes, heart disease, and some cancers; regenerative medicine.	Applying in antreprenorial practical bioindustry of nanotechnologies and picotechnology (10^{12}) research development in academical research areas.*

*Note: This table is presented after The BIOECONOMY to 2030; Designing a Policy Agenda from OECD.



Main Findings and Policy Conclusions; Health column was modified at the penultimate section by adding "regenerative medicine", that was taken from the last section, thus being simplified. In the Industry column, in the original table the last 2 sections were uncompleted and now the text introduced with "*" was realized by A.T. Bogdan and R.S. Serea. All this aspects from table no. 1 and 2 are explicated through the content of fig. 5 and 6, that are refering to **BIO-ECO-GEO-STRATEGIES** and **BIO-ECO-GEO-ECONOMY.**

Fig. 6.Synthesis of BIO-ECO-GEO-STRATEGIES (orig. A.T. Bogdan, Carmen Pasalau& R.S. Serea, 2013).

In this context, this article's authors, in collaboration with specialists from National Institute of Economical Reserches and Center for Studies and Research of Agroforestry Biodiversity have considered that the synoptic presentation of data forecasting for trends in R&D and jobs and skills dynamic perspective is very useful.

Table 2.Indicative regulatory costs to commercialise a biotechnology product (USD thousands).

Agriculture	
Plant	
GM crop2	435–13 460
MAS crop3	5–11
Animal Vaccine4	242-469
Therapeutic5	176–329
Diagnostic4	9-189
Health	
Therapeutics6	1 300
In vitro diagnostics7	150–600
Industry	
GM open release8	1 200–3 000
GM in closed loop	Unknown

Note: Table 2 is cited from "The Bioeconomy to 2030", OECD, Paris, 2009. Notes are based on Just *et al.,* 2006. Lower estimates exclude all costs that could be associated with proving environmental or human safety, while higher estimates include such costs. All estimates exclude "facility & management overhead costs". 3. Figures from the German Bundessortenamt and converted from Euros to USD using the average of monthly exchange rates from June 2005 to September 2008 (1 EUR = USD 1.34). 4. Provided by the USDA Center for Veterinary Biologics. Estimates assume that the applicant already possesses an establishment license. 5. Fiscal year 2008 fees for the FDA from US Federal Register, 2007a. 6. Based on a new drug application requiring clinical data, product fees, and a rough estimate of the costs of production establishment inspections per drug, from US Federal Register 2007b. 7. Fiscal year 2008 fees, based on FDA, 2008.IVDs are classified as medical devices. Lower figure is for businesses with less than USD 100 million in sales. 8. Total costs to industry in first year, in 1995 USD, from EPA, 1997.

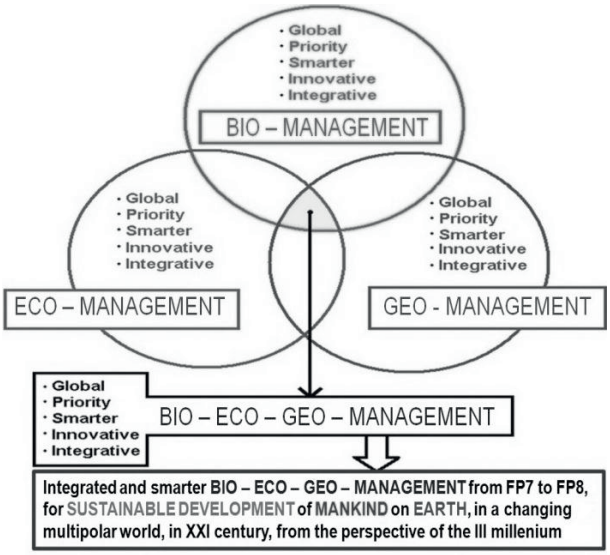


Fig. 7.New concept of Bio-Eco-Geo-Management in relation with european research programme, FP7 and FP8 (orig. A.T. Bogdan et al, 2010; actualized with R.S. Serea). The table below is from European Bioeconomy to 2030.

The European bio-economy has an a pproximate market size of over €1.5 trillion, employing more than 22 million people.

Sector	Annual turn-over (billion €)	Employment (million)
Food	800	4.1
Agriculture	210	15
Paper/Pulp	400	0.3 direct (4 ind.)
Forestry/ Wood ind.	150	2.7
Industrial Biotech.	50 (est.)	
Total	1610	22.1

*estimated to be around €100-160 million by 2010;

First author of this article that is also the corresponding author, in collaboration with the author's group and with prestige specialists from long-term experts nominee in the 2 research POSDRU projects – postdoctoral and doctoral researches (ID no. 63258, respectively ID no. 77082), funded by European Union from Romania's granted funds in post-adheration period (2007-2013).

We consider that today, in the context of **accelerated developing of bioeconomy at European and global level**, including the perspectives guaranteed by ascendant evolution, at least until 2030 (we are convinced that developing will continue until 2050 and until 2100, as we suggested in our previous papers – A.T. Bogdan et al, 2010-2013) exists numerous and varied biotechnologies that, applied correctly, with the strict following of international protection rules of consumers allow passing from "fiat panis" at "habemuspanis". So, on the basis of this scientific and technical considerations that are founding BIO-ECO-GEO-ECONOMICS, the affirmation from this article's title, is that in the present we already have the capacity to say "**HABEMUS PANIS"**, in the context of **GLOBALISED BIOPOWER*through more agrifood and seafood***, for all world population, with the condition to have the desire of political and governmental factors for bioeconomical applying of scientifical discoveries made through excellence researches, and technological transfer in developing countries that it's necessary and justified.

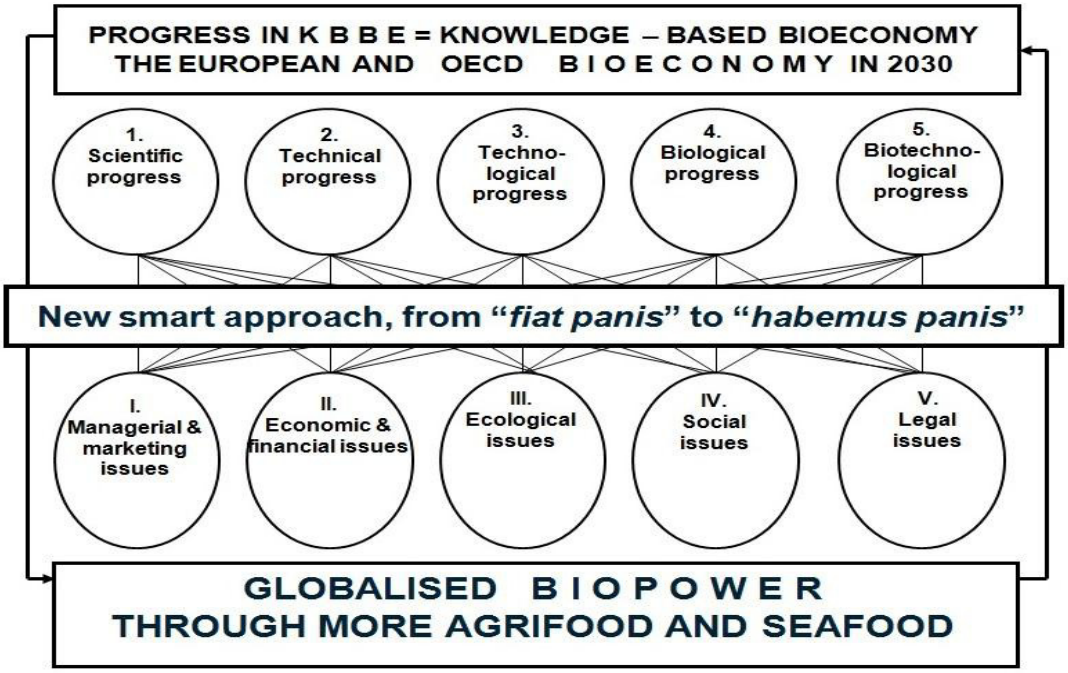


Fig. 8.Applying the principles and objectives of complexity science for resolving through KBBE (Knowledge-Based Bio-Economy) of food bioresources for humankind through innovative BIO-ECO-GEO-STRATEGIES, that will ensure passing from "***fiat panis***" to "**HABEMUS PANIS**", respectively realization of globalisedbiopower through more agrifood and seafood (orig. A. T. Bogdan, DorinaBogdan, AmaliaStrateanu, 2011, with modifications made in collaboration with Carmen Pasalau and R.S. Serea).

The **KBBE** will play an important role in a global economy, where knowledge is the best way to increase productivity and competitiveness and improve our quality of life, while protecting our environment and social model. It is a sector estimated to be worth more than € 1.5 trillion per year.KBBE addresses the following needs:growing demand for safer, healthier, higher quality food;sustainable use and production of renewable bio-resources;increasing risk of epizootic and zoonotic diseases and food related disorders;sustainability and security of agricultural, aquaculture and fisheries production;increasing demand for high quality food, taking into account animal welfare and rural and coastal contexts and response to specific dietary needs ofconsumers.

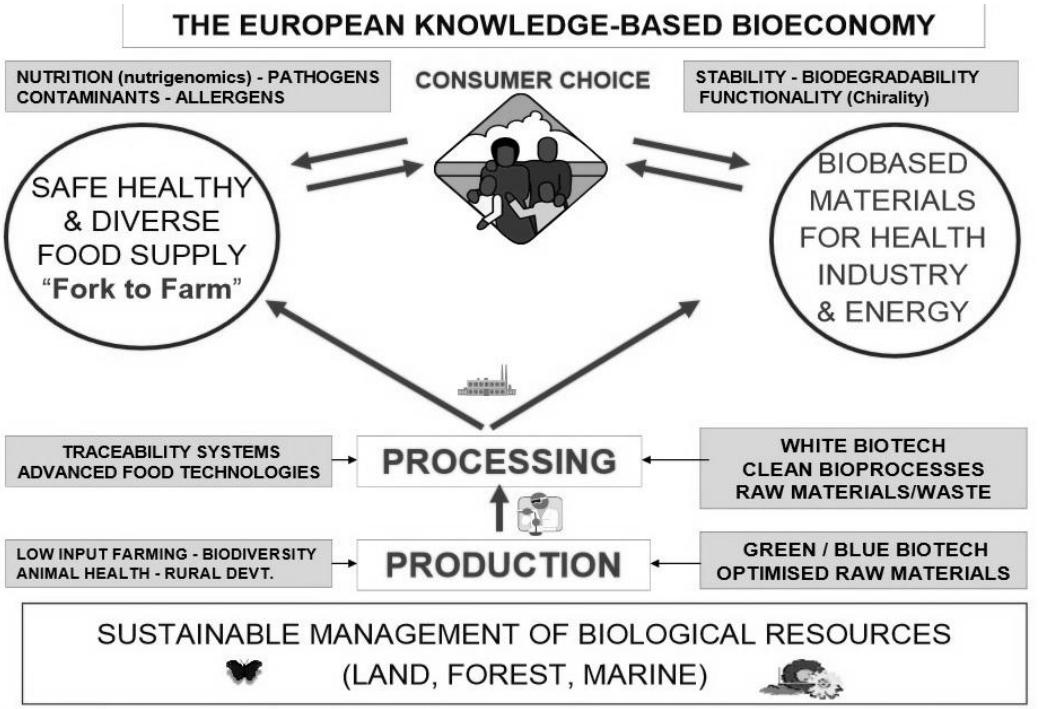


Fig. 9.Very important scheme realised by prestige specialists from European Comission and released in 2008. Note: In this scheme, that became a symbol for European KBBE, we consider that Complex relantionships between sustainable management of biological resources (land, forest, marine), on the basis of biodiversity and especially of agricultural, forestry, zootechnical and medical biotechnologies, with a major role in ensuring food bioresources for mankind, only in conditions of consumers protection and feed-back control on traceability of food and feed in anthropic ecosystems (actual aspects, especially after different alerts with problems in food chain; These possible frauds are today verified through molecular genetics methods, as specialists from N.I.E.R. / C.R.S.A.B. study from many years the traceability of food and feed through the method G. Brem and analysed with the support of AgriLab from Germany).

Conclusions

1.World bioeconomy, European and National bioeconomy makes real progresses under technical, scientific and socio-economic aspects, already existing at European level, from official statistics of European Comission a total market of 1.610 billion euro/annually and over 22 milions employees, from which, the agrifood sector and industrial biotechnologies goes over 1 trillion euro, this justifying our optimism that humankind has today the possibility of passing from "***fiat panis***" at "HABEMUS PANIS".

On the basis of our own researches made within the scientific thematic approved by Romanian Academy for the National Institute of Economical Researches "Costin C. Kiritescu", through the specialists and collaborators from the Center for Studies and Researches of Agroforestry Biodiversity, the authors of this article propose the understanding of actual and perspective situation, when we entered into a new economy that represents **GLOBALISED BIOPOWER** through smart and innovative agrifood and seafood, in the context of the new concept of BIO-ECO-GEO-DIPLOMACY, necessary for the protection, capitalization and development of world natural and cultural heritage of humankind.

3.The authors of this article propose that this new economy to include also the capitalization, under dry state, of animal and vegetal food, because when there are periods with rich crops and the market request is low and offer very abundant, the producers from agriculture and aquaculture have a huge loss. If deposits will be made, at regional, national or international level for dry food, that can be utilised in emergency situations, including the years with very low crop production, the loss of producers will be diminished and food security will be ensured for at least a year, based on risk management and biosecurity actions.

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