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Bioenergy, Land Grabbing and Food Sovereignty: a Geographical Reflection

If the energetic transition towards new sources of renewable energy is now an obligatory and necessary process, as repeatedly recalled by European directives and international agreements, the methods of implementation and the dynamics underlying the change in the energy paradigm do not appear as sustainable.
Analysing the spread and the results produced by the processes of land acquisition for bioenergy, major economic, environmental, social and territorial imbalances emerge in relation to the diversity of regional contexts, on the cost-benefit ratio of bioenergy sources. The authors are aware of the opportunities and at the same time of the threats arising from the processes taking place in the countryside, both in European countries and in developing countries. They reflect on the need to combine the biomass energy transition with the latest agricultural revolution, aimed at safeguarding: biodiversity, food sovereignty, quality productions and rural landscapes. In order to be able to enhance the elements of positivity and reduce those of conflict, it is always useful to first consider the specific conditions of each regional agricultural reality.

Bioenergie*, land grabbing *e sovranità alimentare: una riflessione geografica

Se la transizione energetica verso le nuove fonti di energia rinnovabile è ormai un processo obbligato e necessario, come più volte richiamato dalle direttive europee e dagli accordi internazionali, non altrettanto sostenibili appaiono le modalità di attuazione e le dinamiche sottese al cambiamento del paradigma energetico. Analizzando la diffusione e gli esiti prodotti dai processi di acquisizione delle terre da destinare alle bioenergie, emergono forti squilibri di carattere economico, ambientale, sociale e territoriale che invitano a riflettere, in relazione alla diversità dei contesti regionali, sul rapporto costi-benefici delle fonti bioenergetiche. Gli autori consapevoli delle opportunità e al tempo stesso delle minacce provenienti dai processi in atto nelle campagne, sia dei Paesi europei sia nei Paesi in via di sviluppo, riflettono sulla necessità di coniugare la transizione energetica da biomassa con l'ultima rivoluzione agricola, tesa a salvaguardare: biodiversità, sovranità alimentare, produzioni di qualità e paesaggi rurali. Per riuscire a potenziare gli elementi di positività e ridurre quelli di conflittualità è sempre e preliminarmente utile considerare le condizioni peculiari di ogni realtà agricola regionale.

Bioénergie, land grabbing et souveraineté alimentaire : une réflexion géographique

Si la transition énergétique vers de nouvelles sources d'énergies renouvelables est désormais un processus obligatoire et nécessaire, comme l'ont mentionné à maintes reprises les directives européennes et les accords internationaux, les modalités de mise en œuvre et les dynamiques sous-jacentes au changement de paradigme énergétique ne semblent pas satisfaire aux exigences réelles de durabilité. En analysant la diffusion des processus d'acquisition de terres pour la bioénergie et les résultats produits, émergent de forts déséquilibres économiques, environnementaux, sociaux et territoriaux, qui invitent à s'interroger, par rapport à la diversité des contextes régionaux, sur le rapport coût / bénéfice des sources de bioénergie. Conscients des opportunités et en même temps des menaces émanant des processus en cours dans les campagnes, tant dans les pays européens que dans les pays en voie de développement, les auteurs réfléchissent à la nécessité de combiner la transition énergétique de la biomasse avec la dernière révolution agricole, visant à sauvegarder : biodiversité, souveraineté alimentaire, produits de qualité et paysages ruraux. Pour pouvoir valoriser les facteurs de positivité et réduire les éléments conflictuels, comme toujours, il est préalablement utile de considérer les conditions particulières de chaque réalité agricole régionale.

***Keywords**: renewable energy, agro-financial speculation, food security*

***Parole chiave**: energia rinnovabile, speculazione agrofinanziaria, sicurezza alimentare*

***Mots-clés** : énergies renouvelables, spéculation agrofinancière, sécurité alimentaire*

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1. Introduction: Biomass Production and Food Security

If the transition to new sources of renewable energy is now a necessary and obligatory process, as repeatedly stated and reaffirmed by international agreements[1] (European Commission, 2014 and 2018; UN, 2015) neither are as effective as the methods of implementation and the dynamics underlying the change of the energy paradigm. When, in fact, the sources to be used for the production of bioenergy are not «captured» by natural sources (sun, wind, water, geothermal) and they are neither derived from waste that would in any case be lost (foliage, undergrowth, food, sewage) but are obtained, conversely, from biomass produced in fertile farmland occupied on a large scale, it is questionable whether, when and especially where, spaces for industrial monocultures no food enter into competition with the equally necessary and urgent need to respond to the food demand (UN, 2015) of many and often of the same populations who live in those countryside and suffer from hunger[2].

A problem, the relationship between biomass production and food safety, of which the European Commission itself seems to have become aware (Directive 2015/1513)[3] and which, as now demonstrated, needs careful investigation and monitoring. The strong competition between the cultivation systems for bioenergy and production which meet the demand of the agri-food sector is, in fact, far from being evident, sometimes even deliberately disguised and in some ways ambiguous. It always plays on the availability and at the expense of the spaces usable for the agricultural productions and finds its most striking manifestation in the phenomenon of the land grabbing as the multinationals, in name and on behalf of the environmental bioenergy sustainability, for about twenty years have given rise to processes of land hoarding that in reality serve only to cover the phenomena of land speculation (Grillotti Di Giacomo and De Felice, 2019).

The contrast between food and no food farming therefore deserves to be examined also to identify, on a case-by-case basis, possible paths of convergence and/or coexistence between the two market demands which, according to Resolution 70 of the UN, are the two pillars on which sustainability is based[4].

How can we reconcile unambiguous and contradictory demands? And how can we interpret land grabbing processes that lead us to consider the use of biomass only as an impoverishment action, a threat to food security and biodiversity? There is no doubt that, rather than research for unambiguous solutions valid in every region of the planet, precise investigations need to be made on each agricultural reality accompanied by economic and social indications. It is therefore essential, as this contribution will try to demonstrate, to make use of a geographical reflection by applying, on a different territorial scale, the methodological instruments of our discipline.

2. The Complex Role of Bioenergy in the Inevitable Energy Transition

Traditional fossil energy sources (coal, oil and gas) that have affected growth in recent centuries – increase in quantity but not in quality – can no longer be considered reliable sources to ensure a secure energy supply, economically accessible and responsive to the new paradigms of sustainable development.

The high costs (in 2018 the petrol has exceeded 80 dollars per barrel) and wide instability; the limited resources, considering their non-renewable genesis in historical times; the increasing demand for energy from traditional sources, especially from Asian countries (in 2040 more than two thirds of the oil and gas trade will be registered in Asia); dependence on states, resource suppliers, politically unsafe and stable; the highly polluting effect of combustion (in 2017 the world emissions of CO2 generated by the energy sector increased by 1.6%); the genesis of new technologies that are pushing towards a new process of energy transition declined to renewable energy sources, energy efficiency and energy saving (International Energy Agency, 2019a; European Commission, 2018).

The times of change from one energy paradigm to another are long and complex. The quantitative data and projections on an international scale confirm, on one hand, the slowness of the transition process, evidenced by the persistence of the use of traditional energies, on the other hand, show the trends and the first perceptible changes. Taking as a parameter the total supply of primary energy in the world (TPSE) in 2017 renewable energies stood at only 13.6%, remaining oil (31.8%) together with coal (27.1%) and natural gas (22.2%) the primary energy source (International Energy Agency, 2019b).

Analysing in greater detail the composition of that 13.6% of renewable energies it emerges that the most widespread are biofuels and waste (9.2%) followed by water (2.5%) and solar, wind

and geothermal that together amount to only 1.8% (International Energy Agency, 2019b).

The item «biofuels and wastes» consists of 60.7% of solid biofuels[5] and coal, 4.6% of liquid biofuels[6], 1.7% of biogas and 0.9% of municipal waste. These figures, as well as giving us the quantitative dimension of the phenomenon, which is not so important as to be defined as very limited in relation to the bodies promoted by international directives, leads us to reflect in particular on the complex kaleidoscopic world of biomass in whose term lies a simplification of totally different processes, with equally different impacts, which cannot and should not be subjected to the same significance because bioenergy from municipal waste is completely different by process, outcomes and impacts from that of liquid fuels that are obtained from no food monocultures!

If the data taken into consideration show that we are still in a phase of transition towards renewable energy sources *in nuce*, instead, the effects and impacts seem so evident, profound, and significant that, already in this early stage of the transition, can be considered as a threat to ecosystem balances, biodiversity, food security. Fear that was perceived European Commission itself which in 2015 revised the directives on the promotion of renewable energy from biomass and on the quality of fuels from biomass in order to mitigate the negative effect on the environment that the production of biofuels can have in terms of indirect land use change with related greenhouse gas emissions (European Union, 2015).

These issues can be intensified in the light of global trends that encourage the practice of renewable energy and biomass, but without, however, dwelling on good practices, governance, and policy in these processes, certainly unavoidable but are necessarily managed not only technologically but also from an environmental, territorial, social, and cultural point of view to contrast the conflicts generated by these processes.

Bioenergy in this transition process remains an undisputed protagonist as highlighted in the latest *Renewable Energy Report* of the AIE (2018): 50% of renewable energy has been provided by so-called modern bio energies to distinguish them from traditional ones[7] (fig. 1).

The scenario on renewable energy (2018/2023) predicts an increase in the use of bioenergy worldwide both in the production of electricity (a growth of 233 TWh) and in heat (an increase of 39 Mtoe) (fig. 2).

Analysing the geography of bioenergy, it emerges that Europe holds for the years 2012-2017 a record that will also be maintained, according to forecasts, in the years 2021-2023 (tab. 1) with regards to the use of bioenergy for both the capacity and production of electricity (approximately 20% of electricity produced from renewable sources) and for the production of thermal energy (about 75% of the thermal energy produced with renewable sources).

The long-term European strategic vision on energy (European Commission, 2018) confirms the leading role of biomass to be: around 80 % by 2050 compared to today.

There are also high values of biofuel production both in Brazil – in 2019, 32 billion L of ethanol was produced – and in the USA – in 2019, 60 billion L of ethanol was produced.

This information and projections confirm that

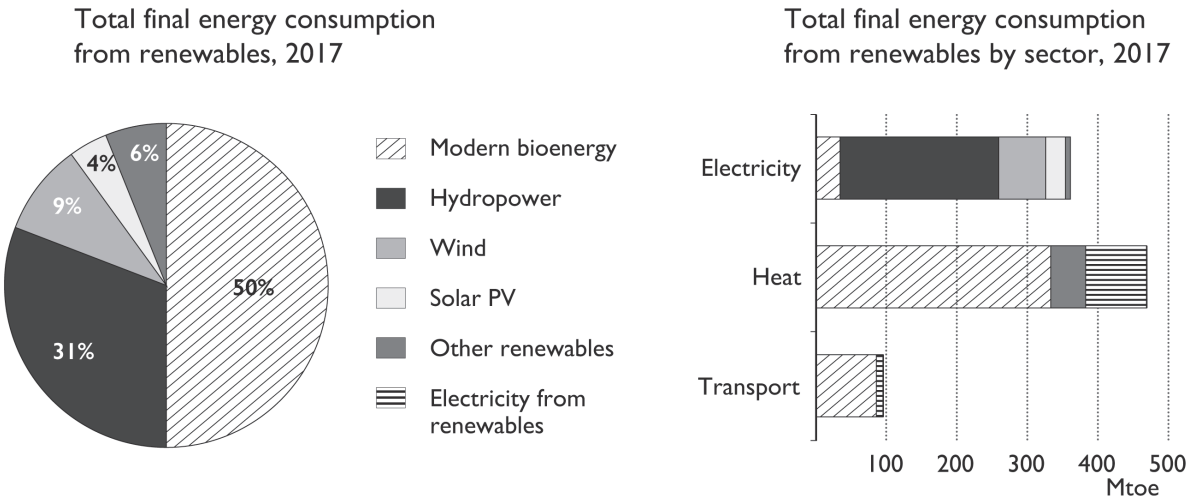

Fig. 1. The total final energy consumption from renewable sources and by sector

Source: AIE, 2018

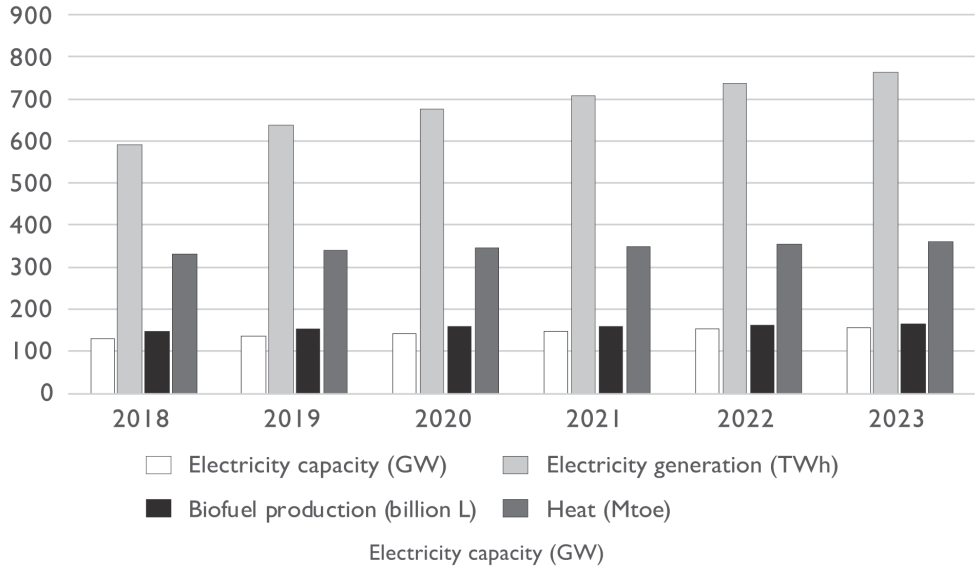

Fig. 2. Worldwide bioenergy forecast

Source: AIE, 2018

Tab.1. Bioenergy forecast

Electricity capacity (GW)

	2017	2018	2019	2020	2021	2022	2023
China	15	18	21	23	25	27	29
India	9	10	10	10	11	11	11
Brazil	15	15	15	15	15	16	16
USA	14	14	15	15	15	15	15
EU	41	43	44	45	46	47	48

Electricity generation (TWh)

	2017	2018	2019	2020	2021	2022	2023
China	79	100	124	142	153	163	174
India	49	50	52	54	56	58	60
Brazil	51	55	56	57	58	59	61
USA	69	71	71	72	73	73	74
EU	183	196	205	213	221	225	230

Biofuel production (billion L)

	2017	2018	2019	2020	2021	2022	2023
China	5	5	6	7	7	8	9
India	1	1	1	2	2	2	3
Brazil	32	37	37	39	39	41	42
USA	66	67	67	66	66	66	66
EU	20	19	20	22	19	18	18

Heat (Mtoe)

	2017	2018	2019	2020	2021	2022	2023
China	–	1	2	2	3	4	4
India	39	39	42	44	46	47	49
Brazil	38	39	40	40	40	41	41
USA	42	44	44	45	45	46	46
EU	78	80	81	81	82	83	84

Source: AIE, 2018

bioenergy plays an important role in the energy transition and therefore it is necessary to assess the conflicts that these sources may generate with environmental processes and territorial more carefully.

3. The Current Acceleration of the Land Grabbing Process Between Bioenergy Demand and Food Sovereignty

The process of transition to renewable energy sources which are found in those obtained from the cultivation of biomass (wooden, oleaginous, starches and sugars, in particular from corn, canola, sugar cane and poplar trees) a further challenge in view of the urgent need to expand the agri-food crops needed to eradicate starvation, still present today in many regions of the world and especially in those where the most would like to concentrate the production necessary for biodiesel and bioethanol can no longer be put off.

In these cases, political sovereignty and food sovereignty paradoxically come into conflict with each other through the work of few «political masters» and to the full advantage of few «lords of the earth!». Neither is the use of hoarded lands consistent with the declared purpose: areas taken from food crops are in many cases not even cultivated. Of the 2,259,462 hectares taken over for the production of no food crops only 7% is put into production (159930 ha) (fig. 3) and, when this happens, many of these crops even remain on the fields because harvesting them and turning them into bioenergy is not very profitable.

The desire to invest the huge concentration of financial capital in real estate, caused by the global economic crisis of the beginning of the millennium actually triggered the race to hoard natural resources, more than the thirst for renewable energy.

How to reconcile the need to produce biomass for renewable energy with the need to reduce the number of the hungry in the world that according to FAO (2019) in 2018 even increased to 821 million.

In fact, all the organic plant and animal material present in an ecosystem (firewood, agricultural residues such as straw and pruning products, pomace, shells, rice husks, animal waste etc.) can and should be used to produce biomass and bioenergy, while land grabbing for no food crops for «environmental purposes» has had effects that were anything but ecologically and socially useful.

Some scholars claim that land grabbing has aggravated hunger mortality and other observers interpret the instability of food prices (cereal market value doubled in 2007-2008) and the consequent impossibility, for the poor to have access to the essential goods for survival as a function of the expansion of the production of plant biomass for biofuels.

Fig. 3. Ratio between total hectares hoarded to cultivate biomass and hectares actually cultivated with biomass (percentages)
Source: data processing by the authors from the land matrix observatory, 2019

According to the estimates of the International Energy Agency (IEA) in fact, already in 2008, 10% of the total energy produced in the world (equal to 12,267 Mtep) was obtained from agricultural biomass and in Europe alone the impact of these on the total renewable energy produced (147.7 Mtep) amounted, again in the same year, to as much as 60% against only 5% of solar energy; a weight certainly destined to increase thanks to the incentives of the European Union «Climate Energy Package 20.20.20». Instead, the *Declaration on Food Safety* signed in the same year by the G8 countries, at the conclusion of the Hokkaido Toyako Summit (Japan), denounced the negative effects of the food crisis on the living conditions of millions of people in various parts of the world and called for short, medium, and long-term measures to address food insecurity and poverty.

Many humanitarian organizations therefore denounce the subtraction of land from food crops and the poorest populations although, while for some land grabbing contributed more than 75% to the increase in cereal prices, other observers attribute a maximum of 15% to bioenergy, recognising greater responsibility for other phenomena (climate change and speculative financial manoeuvres on food markets). This interpretation is supported by the fact that, with a progressive increase in both total production and yields per hectare of wheat, the cereal price index has more than doubled and fluctuated in the years 2007-2011.

To help us resolve the conflict between food and no food agriculture, it is useful to clarify the very concept of food sovereignty. It is to be understood that it is a fundamental right to have access to food and the subject of various cooperation interventions[8]. According to FAO, food security is achieved when all the members of a population have the possibility of continuous access to sufficient and healthy food to satisfy their needs and preferences, so that they can carry out their vital activities[9]. A definition that, moreover, denounces that no country in the world, even the richest economically, can be considered completely free from the problem of malnutrition and hunger. Even more explicit is the *Statement of Nyéléni* (named after a legendary farmer of Mali), signed by 500 representatives of more than 80 countries of the world on 4 March 2007 in Selingué (Mali), marks a real turning point towards the definitive awareness, from civil society, of the complexity and the way in which it is necessary to tackle the problem of hunger and the protection of the environment. The document represents a true international manifesto for the definition and the protection of a balanced Food-Agriculture-Environment relationship, whichever geographic scale is used to interpret it. This is a declaration in which the right to food is combined with the duty to safeguard natural resources and the freedom for everyone on earth to produce. A program of action elaborated and thought at an international scale, in which the «local perspective» is explicitly privileged (Grillotti Di Giacomo, 2019)[10].

The concern of the bodies and agencies involved in reducing hunger in the world is based on the fact that the spread of *no food* crops has undoubtedly weighed, and aggravated, the availability of food. On the other hand, the massive use of biofuels highlights the real «original sin» of the speculative agriculture that, in whatever form it is practiced (food or no food crops), tends

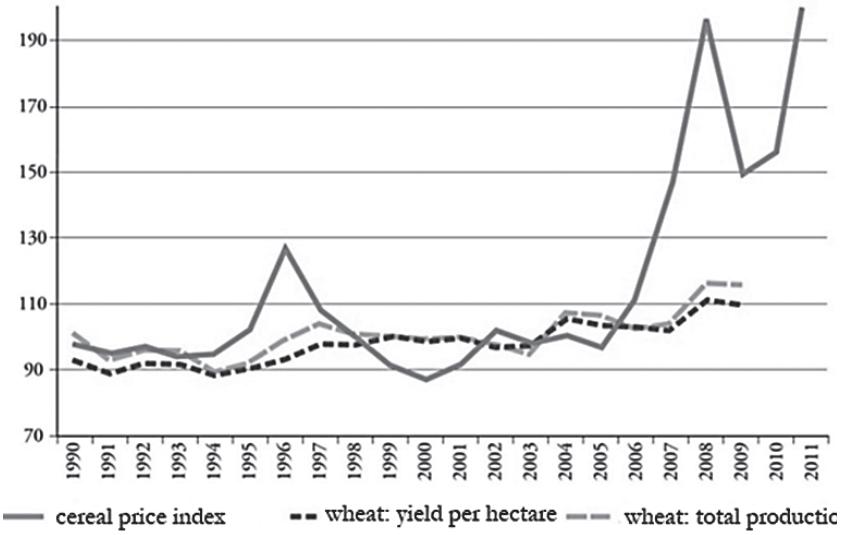

Fig. 4. The volatility of cereal prices and the fluctuation of yields and wheat production
Source: Grillotti Di Giacomo, 2018

always and everywhere to swallow the whole primary sector, aiming to obtain the maximum profit with the minimum of investments. To deprive family farming of cultivable spaces, on which the lives of millions of people depend, especially in the poorest countries, is to condemn them to starvation, expatriation, and death. Land grabbing is in fact being consumed at the expense of the weaker populations by the stronger ones[11]. It extends from Africa to Mexico, from Australia to Indonesia and Laos, from Argentina to Madagascar to Malaysia. It is not only the Western countries that invest in cheap agricultural land; also the rich states of the Middle East (Qatar, Bahrain, Kuwait, United Arab Emirates and, of course, Saudi Arabia) find it very convenient and strategically valid to invest their petrodollars in fertile lands; some emerging states such as China, India, Russia and South Korea were among the most solicitous buyers. Countries «sellers» of fertile lands are almost always states characterized by undemocratic governments and weak local institutions with high levels of corruption. They are the same countries that need international aid mostly to combat hunger and malnutrition, tragedies that can never be traced back only to environmental and/or technological factors, because more often they depend on wrong political and economic choices which are both local and international.

The increase in the crops needed to produce bioenergy is now cloaked in hypocritical aspirations for «environmental sustainability» by the same interests of the economic and financial groups which increase land concentrations and cancel traditional polyculture and family businesses. There is only one route to follow in order that biomass that is reserved for agricultural spaces suitable for its production, without exasperation in use, exploitation and hoarding and that is to start from every single territory. The regional analysis is therefore the only thing that can help us to reconcile the competitiveness between increasing productivity and respect for the landscape and the environment, between *food* and *no food* crops.

4. Is it Possible to combine Energy Transition with Food Sovereignty?

By analysing the spread and outcomes of land acquisition processes for bioenergy, major economic, environmental, social, and territorial imbalances are emerging, calling for a case-by-case approach, in relation to the diversity of regional contexts, as well as the desirability of choice and the cost-benefit ratio of bioenergy sources. There is therefore a way to combine the energy transition from biomass with the last agricultural revolution that aims to safeguard: biodiversity, food sovereignty, quality production and rural landscapes. It is the local territorial analysis that becomes the guarantor of actions that respect the correct bioenergy agricultural landscape, agri-food production relationship. For this reason, it is necessary to carefully evaluate, on a case-by-case basis, the relationship between local resources, protection, safeguard and development, innovation, and conservation. The same relationship between energy and the agricultural landscape assumes different values and arises from an exchange; in fact, if the territory is shaped by the activity of the farms – which use the energy (direct) for irrigation, for the preparation of the land, for the collection and energy (indirect) for the various supplies they need (pesticides, etc.) – the same agricultural land is in turn supplying energy through the production, collection and transformation of biomass. On both fronts it is therefore possible and necessary to take action to steer an energy transition that becomes at the same time agricultural. A first action to be taken is certainly the one aimed at modifying the structures and infrastructures present in the agricultural landscape in trying to make them more efficient, less energy-intensive and dependent on traditional sources which are generally more polluting and far removed from rural contexts.

Considering the new strategies of rural development aimed at strengthening a multifunctional agriculture (protection and safeguard of the environment, enhancement of the landscape, offer of eco-tourism services, promotion of organic, and quality products) bioenergy is also an important development element in Rural Planning. If carefully planned and combined with the value frameworks of the environment and the landscape, it can, in fact, guarantee a greater economic competitiveness of the agricultural territory as well as a better sustainable development. The Leader Community Programmes, the aforementioned rural development plans and the territorial pacts, the regional territorial plans, the provincial and municipal landscape plans and the regional environmental energy plans all tend to combine the different production needs in the common goal of achieving sustainable development.

If bioenergy has, by its nature, an inseparable relationship with the territory, because the resource that supports it comes from the environ-

ment itself, it is certainly not enough to assess the potential of the resource from biomass, which alone is already a complex operation (Reho, 2009) and therefore it is essential to consider a series of geographical variables that can help us to combine them with the agri-food production present in the agricultural area[12].

Geographical science with its specific methodological devices (GECOAGRI LANDITALY Methodology) allows us, through a series of variables, to evaluate the different territorial effects of the conflict between bioenergy and agri-food production, from the environmental to the economic and social ones in order to mitigate possible impacts, to increase the opportunities, to prevent and control the risks so as to safeguard the interest of both the energy and food policies, and to strengthen local development measures and the protection of the environment and the landscape[13].

In 2014 FAO launched a programme combining food security and bioenergy known as BEFS (Bioenergy and Food Security Project). The goal of the BEFS project is to achieve an environmentally, socially, and economically sustainable bioenergy production, and at the same time promoting and preserving food safety through a multidisciplinary analysis taking into account a number of key variables. The territorial context, the enhancement of its potential, social considerations, the economic and technological aspects of the final use of energy become necessary considerations in order to exploit regional agricultural systems and to implement a sustainable bioenergy action (fig. 5).

It will therefore be necessary to start from the specific features of each territory in order to understand to which type of energy and agri-food transition it is «suited» to.

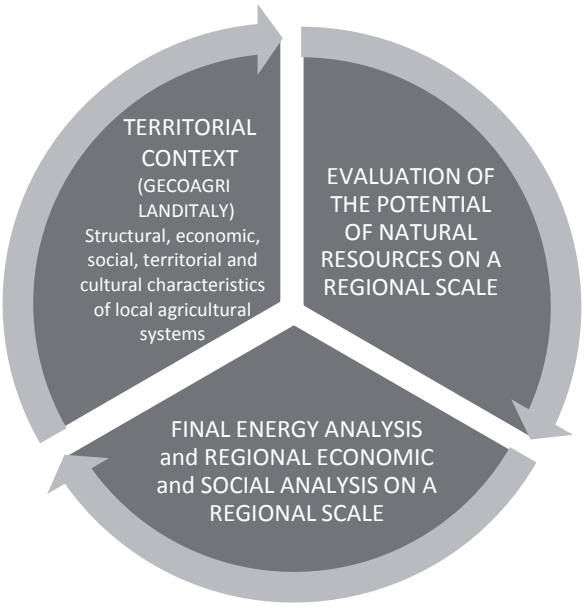

Fig. 5. Example diagram of a territorial analysis in relation to bioenergy
Source: reworking of the authors in light of the FAO BEFS project (2011) and the GECOAGRI-LANDITALY methodology, patented in 2007

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Notes

[1] The EU has repeatedly restated on several times the strategic role those renewable energies have for the transition towards a sustainable, secure and competitive energy system (European Commission, 2014) and the United Nations has indicated in «economic, reliable, sustainable, and modern energy systems» the seventh of the goals to be achieved for Sustainable Development (UN, 2015).

[2] Problem far from being solved to the point that it is considered a priority among the UN Sustainable Development Goals (2015): «Objective 2 - Ending hunger, achieving food security, improving nutrition and promoting sustainable agriculture».

[3] To amend previous Directives (98/70/EC on the quality of petrol and diesel fuels and 2009/28/EC on the promotion of renewable energy sources), Directive 2015/1513 seeks to reduce the problem of conflict between bioenergy crops and agri-food production by promoting intensification of production and «exploiting non-agricultural land located elsewhere».

[4] UN Resolution 70: «Transforming our World: the 2030 Agenda for Sustainable Development» among the 17 objectives includes both food security (Objective 2) and sustainable energy (Objective 7).

[5] Includes charcoal, fuelwood, dung, agricultural residues, wood waste, and other solid wastes.

[6] Refers to the combined use of oil and biofuels (expressed in energy-equivalent volumes of gasoline and diesel).

[7] The AIE Report (2018) makes it clear that the traditional use of biomass refers to the use of local solid biomass resources by low-income households that do not have access to modern fuels or cooking and heating technologies. Solid biomass, such as wood, coal, agricultural waste, and animal dung, is converted into energy through fire for heating and cooking in the residential sector. This consumption occurs mainly in emerging economies and developing countries. The term «modern bioenergy» means the use of biomass resources for electricity generation, industry, and the production of biofuels for transportation.

[8] Already in the year 2000 the International Committee for Food Sovereignty (CISA accepted by FAO in 2006) was born, involving more than 270 organizations, associations, NGOs, environmental movements, and trade unions; among all the International Volunteer Lay Association (LVIA) active in Africa since 1966, and the Federation of Christian Organisms Volunteer International Service (FOCSIV), which has 60,000 supporters, more than 7,600 members and more than 6,000 operators involved in the numerous projects in developing countries.

[9] Food security is defined by the FAO in four parameters: 1. food availability adapted to the nutritional needs of the population in terms of quantity and quality; 2. access to food guaranteed both economically and socially; 3. stability of food availability; 4. possibility of using available food (preparation equipment, cooking energy, quality water etc.).

[10] It states: «Food sovereignty is the right for the population to food that is appropriate from a cultural and health point of view and produced through ecologically sound and sustainable methods, as well as their right to define their own agricultural and food systems. This places those who produce, distribute, and consume food at the centre of food policies and systems more than market surveys and corporations defending the interests and integration of future generations. It offers a strategy to resist and dismantle neoliberal trade and the current food regime, and indications for food systems, agriculture, farming and fishing established by local producers. Food sovereignty gives priority to local and national economies by encouraging the development of agriculture led by families of farmers, artisanal fishing and grazing farms as well as the production, distribution and consumption of food based on environmental, social and economic sustainability. It offers a strategy to resist and dismantle neoliberal trade and the current food regime, and indications for food systems, agriculture, farming and fishing established by local producers. Food sovereignty promotes transparent trade which guarantees a fair income for all people and the right of consumers to control their food and nutrition. It ensures that the rights to use and exploit our lands, our waters, our seeds, our livestock and biodiversity are in the hands of those who produce food. Food sovereignty implies new social relations free from oppressions and inequalities between men and women, peoples, uracial groups, social classes and generations» (see: http://www.foodsovereignty.org, last accessed: 09.II.2022) See: Grillotti Di Giacomo, 2018, p. 117.

[11] Although there is disagreement, it is estimated that the negotiations involve some 60 countries with hundreds of investment groups and a dozen governments. According to World Bank, approximately 56 million hectares of arable land were leased or sold between 2008 and 2009, while the International Law Commission (ILC) estimates that land grabbing took about 80 million hectares from the poorest countries between 2001 and 2010. The Land Matrix estimate is even more pessimistic which already in 2012 accounts for 227 million hectares of land traded (Land grabbing and the global Food Crisis Grain, 11, 2011). For further reference, see: Grillotti Di Giacomo, 2018.

[12] An analysis of the proximity between source and distribution must be added to the search for the best location of biomass. The desirable form of distribution of renewable energy from biomass would be that of an energy source directly connected to the distribution network through a short supply chain, on a regional basis (Puttilli, 2014), provincial or even inter-municipal (De Felice, Forni and Regina, 2014). On the other hand, it is not sufficient to know the biomass potential of the territory to define this latter functional to the production of RES the organizational structures of the place and the infrastructures to ensure that the transformation is economically advantageous and sustainable must also be taken into account. (Stephen, 2010; FAO, 2012).

[13] In the biomass energy analysis the integrated approach appears to be, as amply confirmed by the literature (Rettenmaier, Schorb and Köppen, 2010), a winning strategy. Understanding the correlations and interdependencies between socioeconomic factors and energy use, combining different information from a number of different sectors (economic, energy, environmental, territorial) becomes a necessary exercise in order to deal with the organic and coherent analysis of the various bioenergetics potentials.