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From conventional agriculture to multifunctional agriculture: Agroforestry as a driver of paradigm shift

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From conventional agriculture to multifunctional agriculture: Agroforestry as a driver of paradigm shift

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1. *Introduction*

Beyond its primary function of food production, agriculture generates several positive externalities that must be taken into account when drawing up public policies [1]. It produces ecosystem services of inestimable value. Agriculture draws the landscape, protects soil fertility, promotes water management, maintains the biodiversity levels, nutrient recycling, contributes to the fight against climate change, ensures food security, good quality of water and food, enables the economic survival of rural communities, the protection of the cultural identity of peoples and territory, makes agricultural tourism possible and strengthens rural education[2].

According to Roux and Fournell [3], the fact that the law has institutionalized multifunctionality has only registered a historical reality, since agriculture has always had multiple functions. In this sense, the report of the International Assessment of Agricultural Knowledge, Science and Technology

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[1] L. BODIGUEL, *La multifonctionnalité de l'agriculture: Un concept de l'avenir?* in *Revue de droit rural*, n° 365, étude 6 August 2008, p. 1.

[2] M. MONTEDURO, *Environmental law and agroecology: Transdisciplinary approach to Public Ecosystem Services as a new challenge for environmental legal doctrine*, in *European Energy and Environmental Law Review*, January 2013.

[3] B. ROUX - E. FOURNEL, *Multifuncionalidade e emprego nos estabelecimentos rurais franceses: um estudo nas zonas montanhosas de Languedoc Roussillon*, in M.J. CARNEIRO - R. MALUF (eds.), *Para além da produção: multifuncionalidade e agricultura familiar*, Rio de Janeiro, Mauad, 2003, pp. 169-184, (p. 169).

for Development (IAASTD) [4] conclude that « agriculture operates within complex systems and is multifunctional in its nature»[5].

Through an Issue Paper FAO also states that

«agriculture is intrinsically multifunctional in character. Furthermore all agricultural activity and related land use leads directly to other non-agricultural functions ranging over social, environmental, economic and cultural goods and services, which can result in significant benefits or costs. However, there is abundant evidence that, beyond food security, the multifunctional character of agriculture makes significant contributions to achieving rural development, energy and environmental sustainability at local, national, regional and global levels. An improved and more systematic understanding of this "multifunctional character" can lead directly to even greater benefits»[6].

Yet, the recognition of the multifunctionality concept (MFA) established a new paradigm capable of reorienting agriculture and public policies towards a sustainable development model. In addition, it enabled new forms of collaboration and organization between farms and the local environment. The emergence of the MFA concept can be considered as a critic to the conventional agricultural model derived from the Green Revolution, based on monocultures and the massive use of agrochemicals[7]. Garzon affirms that as a normative concept, MFA fulfills three functions: it justifies the

[4] The International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD) was a multidisciplinary and multi-stakeholder assessment done by 400 experts to assess the effects of sustainable development practices, agricultural knowledge, science and technology policy and institutional environments; to identify important information gaps in order to target research; to make the resulting state of the art accessible to decision makers at all levels; and to improve the capacity of developing country nationals and institutions to generate, access, and use agricultural knowledge, science and technology that promote sustainable development. International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD), volume 4 issue 2, IEG - Independent Evaluation Group, June 2010.

[5] *Ibid*.

[6] FAO, Issues Paper: *The Multifunctional Character OF Agriculture and Land.* Maastricht, 1999. *Available at http://www.fao.org/docrep/x2775e/X2775E00.htm.* Accessed on 10/02/2018.

[7] F.R. GAVIOLI - M.B.B. COSTA, *As múltiplas funções da agricultura familiar: um estudo no assentamento Monte Alegre, região de Araraquara (SP)*, in *Rev. Econ. Sociol. Rural*, vol. 49, n°2 Brasília, June, 2011. Available at *http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0103-20032011000200008.* Accessed on 30/01/2018.

existence of agricultural policy, the need for change and the need to highlight environmental and rural development concerns[8].

In this context, agroforestry could represent a delivery mechanism for multifunctionality as it promotes different aspects of agriculture[9]. It is a practice that contemplates the social, economic and environmental functions of agriculture. It enables the socio-economic reproduction of rural families and the maintenance of the social and cultural fabric, it enhances the farmers income through product diversification and it generates positive environmental externalities like the increase of biodiversity and carbon storage. Agroforestry systems have the potential to boost productivity, maintain or even increase biodiversity levels and restore and rehabilitate degraded areas[10].

According to a general definition established by the World Agroforestry Center (ICRAF), agroforestry is

«a collective name for all land-use systems and practices in which woody perennials are deliberately grown at the same land management unit as crops and/or animals. This can be either in some form of spatial arrangement or in a time sequence. To qualify as agroforestry, a given land-use system or practice must permit significant economic and ecological interactions between the woody and non-woody components»[11].

This definition is complemented by King and Chandler

[8] I. GARZON, *Multifunctionality of Agriculture in the European Union: Is there substance behind the discourse's smoke?*, in *Center on Institutions and Governance*, Presentation Paper n° 20, Institute of Governmental Studies University of California, Berkeley, 2005. Available at *http://escholarship.org/content/qt80b3v0z6/qt80b3v0z6.pdf.* Accessed on 30/01/2018.

[9] R.R.B. LEAKEY, *Agroforestry: A delivery mechanism for multi-functional agriculture*, in L.R. KELLIMORE (ed.), *Handbook on Agroforestry: Management Practices and Environmental Impact.* Nova Science Publishers. Environmental Science, Engineering and Technology Series. Nova Science Publishers, Inc, 2010, pp. 461-471. Available at: https://www.researchgate.net/publication/285642285_Agroforestry_A_delivery_mechanism_for_multi-functional_agriculture [accessed Feb 26 2018]. Available at: *https://www.researchgate.net/publication/285642285_Agroforestry_A_delivery_mechanism_for_multi-functional_agriculture.* Accessed on 08/02/2018.

[10] SEOANE ET AL., *Conservação Ambiental Forte Alcançada Através de Sistemas Agroflorestais Multiestratificados. 1 - Agroflorestas e a Restauração Ecológica de Florestas*. Paper presented at Agroecol – First Seminary of Agroecology of South America. Dourados, November, 2014.

[11] W.C. CLARKE - R.R. THAMAN, *Agroforestry in the Pacific Islands: Systems for* Sustainability, United Nations University Press, 1993, p. 9.

«agroforestry is a sustainable land management system that increases its overall yield by combining crop production (including trees) and forest and/or animal production simultaneously or sequentially in the same land unit through management practices consistent with the cultural practices of the local population»[12].

This paper aims to examine in which extent the notion of agriculture multifunctionality could represent a new paradigm essential to the agro-ecological transition and to demonstrate how agroforestry could be used as an instrument to MFA implementation. The paper also aims to set up a comparative analysis between France and Brazil.

Thus this work will be divided into four parts. First, to better assimilate the several features of MFA, the concept of multifunctionality applied to agriculture has to be proper defined (§ 2). Next, in order to elucidate how the notion of MFA emerged, it will be studied within the international context (§ 3). Than, this paper will compare the different developments of MFA notion in France and in Brazil (§ 4). Finally, the fourth part of this work will examine the agroforestry system as a tool to MFA implementation (§ 5).

2. *What does multifunctionality mean?*

It is notable that several definitions of MFA have been presented by socio-economic literature, but an unique and general concept has not yet been developed [13]. This is mainly due to the various existent expressions of multifunctionality and to the lack of indicators and the difficulty in measuring the diverse agriculture functions. They maybe considered differently according to the social, cultural, environmental and economic context, and also according to space and time. The MFA concept and strategies around the world can vary a great deal. According to Renting et al., MFA approaches could diverge concerning the role of the market and public institutions in the organization of services and goods provided by agriculture and they could also diverge

[12] K.F. KING - N.T. CHANDLER, *The wasted lands: The program of work of the International Council for Research in Agroforestry.* ICRAF, 1978, p. 2.
[13] VAN HUYLENBROECK ET AL, *Multifunctionality of Agriculture: A Review of Definitions, Evidence and Instruments.* Living Reviews in Landscape Research, 1, 2007, p. 3.

regarding their territorial scope[14]. The same author attests that MFA conceptual approaches could fit into four main categories:

1-) market regulation approaches: deals with economic aspects. These approaches also seek to improve governance of 'non-commodities outputs' or 'public goods' generated by agriculture in order to avoid market distortion, in particular, through the creation of parallel, 'decoupled' markets;

2-) land-use approaches: focused on the territorial dimension of MFA. Four different approaches can be identified: descriptive/analytical (description of historical land-use patterns founded on land-use planning), predictive or projective (based on the result of descriptive approaches and on the drivers evolution, developments that are likely to happen are predicted), explorative (concerns feasible development but not necessarily likely based on resources use efficiency founded on agronomy science and production ecology) and design-oriented approaches (selection of most desirable approaches to be implemented);

3-) actor-oriented approaches: focused on the farm level and on the decision-making processes aimed at the social construction of MFA practices. The MFA concept can be considered here as a consequence of societal demands and the failure of conventional farming methods in answering these. Public goods production, functions linked to the food markets and functions that represent non-marketable public benefits are specially taken into account. Different actors are considered the driving force of MFA;

4-) public regulation approaches: focused on institutional and policy aspects. They are aimed at assisting public institutions in promoting MFA and monitoring its social, economic and environmental impacts. Some researchers affirm that the management of public goods is under the state responsibility[15].

Hervieu considers that multifunctionality of agriculture encompasses five dimensions: agriculture produces both food goods and non-food goods

[14] H. RENTIN ET AL., *Exploring multifunctional agriculture. A review of conceptual approaches and prospects for an integrative transitional framework.* Journal of Environmental Management 90, 2009, pp. 113-114. Available at: *https://ac.els-cdn.com/S0301479708003484/1-s2.0-S0301479708003484main.pdf?_tid=13026c640cf611e89b6b00000aab0f26&acdnat=1518111346_cb886bc8b21eaa5d6e24c70f37c4c679.* Access on 31/01/2018.
[15] *Ibid.*, pp. 113-114.

(biofuels); agriculture produces raw material and also processed products; agriculture produces material wealth (such as food and non-food goods) and immaterial wealth (such as landscape maintenance, soil management, preservation of biodiversity) and these goods may be private or public in nature; finally, agriculture produces market and non-market goods[16].

Carneiro and Maluf report four main functions of agriculture, which can vary according to socio-economic and environmental contexts:

1-) the socio-economic reproduction of rural families: income and labor (including production for self-consumption) from agriculture must be sufficient to maintain these families in the countryside, under dignified conditions;

2-) food security assurance: availability and access to food and the guarantee of their quality;

3-) maintenance of the social and cultural fabric: agriculture defines the social identity of farmers and the forms of socialization of rural families;

4-) preservation of natural resources and landscapes [17].

Van Huylenbroek et al. affirm that multifunctionality is composed by to main elements: « (i) the existence of multiple commodity and non-commodity outputs that are jointly produced by agriculture[18]; and (ii) the fact that some of the non-commodity outputs exhibit the characteristics of externalities or public goods[19], with the result that markets for these goods do not exist or function

[16] B. HERVIEU, *La multifonctionnalité de l'agriculture: genèse et fondements d'une nouvelle approche conceptuelle de l'activité agricole,* Cahiers Agricultures: 2002, p. 417. Available at: *http://revues.cirad.fr/index.php/cahiers-agricultures/article/view/30369/30129.* Access on 20/01/2018.

[17] J.M. CARNEIRO - R. MALUF, *Para além da produção: Multifuncionalidade e Agricultura Familiar*, Rio de Janeiro: Mauad, 2003.

[18] « Jointness' refers to situations in which the production of one good or service is interrelated with another, e.g. due to technical dependencies in the production process, because inputs are fixed at farm level and can be allocated to various outputs in the production process, or because multiple outputs are obtained from the same input». H. RENTING ET AL., cit., p. 114.

[19] According to Van Huylenbroeck et al., « 'Externalities' means that the one who produces the outputs is not remunerated for it (in case of positive externalities) or does not pay for it (in case of negative externalities). 'Public goods' refers to the fact that there is no or low excludability (meaning that the property holder (if any) can not exclude other people from the benefits) and no or insufficient rivalry (meaning that the good is not destroyed when others use it and is thus available for more than one beneficiary) ». VAN HUYLENBROECK ET AL, p. 7.

poorly »[20]. For them, multifunctionality translates « the fact that specific agricultural systems contribute to distinctive economic, natural, cultural and territorial subsystems»[21].

According to Maier and Shobayashi (OECD publication), the MFA englobes two approaches: the normative approach (supply side) where the MFA is considered as a set of ideas aiming to reorient agriculture and agricultural policies towards another development model; and the positive approach (demand side) where the MFA is designed as an analytical benchmark aimed at redefining agricultural externalities through a commercialization process of what is not commercial[22].

For Van Huylenbroek et al., « the supply side viewpoint defines multifunctionality mainly in terms of multiple joint outputs of an activity or of a combination of activities (…) Multifunctionality is thus understood as the production of more than one output through the use of inputs. These outputs may be complementary (this means if there is more production of one output, there is also more of the other), or competing (being substitutes) »[23]. The authors affirm that multifunctionality is interpreted through this vision as a mere « characteristic of the agricultural production process rather than a societal objective»[24].

The same authors stress that the demand side is territorially based on the social expectations on agriculture and which are mostly founded on ecological, social and economic values. For the authors, the main difference between the two approaches cited above remains on the externalities. They explain that « where the supply definition considers negative and positive externalities as good and bad outputs respectively and treats them equal, the second definition privileges the positive contributions of agriculture and speaks

[20] *Ibid.*, p. 12.
[21] *Ibid.*, p. 29.
[22] L. MAIER - M. SHOBAYASH, *Multifunctionality: Towards an Analytical Framework.*, Paris: OECD Publications Service, 2001.
[23] « Joint production is analytically also linked to the concept of non-separability (Wossink et al., 2001) that states that abatement of negative externalities or provision of positive externalities can be achieved by changing the production technology or system (…) In other words multifunctionality will be linked to farming practices, production technologies and farming systems». VAN HUYLENBROECK ET AL., pp. 9-10.
[24] *Ibid*, pp. 8-10.

rather of a potential reduction in the provision of functions when agricultural practices threaten the delivery of potential benefits.»[25].

Van Huylenbroeck et al. stress that besides these two approaches, there is a third approach, founded on rural sociology and rural geography, that considers the MFA as a different farming system territorially based where consumers and producers are related through « the rural space and the whole agro-food system in which agricultural activities take place.»[26].

Some authors distinguish 'strong multifunctionality' from 'weak multifunctionality'. According to Wilson, « strong multifunctionality is characterised by strong social, economic, cultural, moral and environmental capital»[27]. Some of the characteristics of strong multifunctionality are: strong governance structures, income and employment generation, high cooperation between stakeholder groups in the food supply chain, high environmental sustainability, territorially base agro-food chains, low farming intensity and high food quality. On the other hand, weak multifunctionality presents the inverse characteristics of the above[28]. Wilson also highlights the fact that several social actors consider the multifunctional agriculture system as the ideal type of agricultural regime. Thus, the natural development process of every farming system should be to evolve towards a strong multifunctional system[29].

It is important to elucidate, that although related concepts, the MFA should not be confused with agriculture diversification and pluri-activity. The diversification concept represents the concomitance of different economic activities within the same management unit and the pluri-activity concept means that one person or group of persons are involved in different activities at the same time, farming and non-farming[30]. The MFA concept differs from the others in the sense that one only activity (agriculture) can generate several outputs (both market and non-market goods)[31]. However, nothing prevents

[25] *Ibid*, p.10.
[26] *Ibid*, p. 7.
[27] G.A. WILSON, *From 'weak' to 'strong' multifunctionality: Conceptualising farm-level multifunctional transitional pathways*, in *Journal of Rural Studies*, 24, 2008, p. 368.
[28] *Ibid*, p. 368.
[29] *Ibid*, p. 369.
[30] VAN HUYLENBROECK ET AL., p. 7.
[31] *Ibid*, p. 7.

farmers from practicing different activities, diversified and multifunctional agriculture at the same time .[32]

Later, in order to provide a better awareness about the emergence of the MFA concept, it will be examined within the international context (3).

3. *Understanding the concept through the international context*

The international debate regarding the MFA notion is mainly led by three organizations, the Organization for Economic Co-operation and Development (OECD), the Food and Agriculture Organization of the United Nations (FAO) and the World Trade Organization (WTO). The European Union also contributes greatly to this debate through the European Common Agricultural Policy.

Although the idea of multifunctionality of agriculture was already present in the 1990 European Common Agricultural Policy, it was better developed during the United Nations Conference on Environment and Development that took place in Rio de Janeiro in 1992, based on the principles of sustainable development and eco-conditionality[33]. Thereafter, this notion has been used as an instrument of public policies.

At Community level, the notion of multifunctionality of agriculture became legal during the "Agenda 2000" reform through Regulation n° 1257/1999 on rural development[34]. However, in 1985, through Article 19 of EEC Regulation 797/85[35], the European Union had already provided for aid

[32] *Ibid*, p. 8.
[33] M. MONTEDURO, cit.
[34] L. BODIGUEL, cit., p. 1.
[35] Article 19.
1. In order to contribute towards the introduction or continued use of agricultural production practices compatible with the requirements of conserving the natural habitat and ensuring an adequate income for farmers, Member States are authorized to introduce special national schemes in environmentally sensitive areas.
2. For the purpose of this Article, 'environmentally sensitive areas' means in particular areas of recognized importance from an ecological and landscape point of view.
3. The aid may be granted to farmers who undertake to farm environmentally important areas so as to preserve or improve their environment.
The farmer's undertaking must stipulate at least that there will be no further intensification of agricultural production and that the stock density and the level of intensity of agricultural production will be compatible with the specific environmental needs of the area concerned. 4.

granted to farmers who agreed to adopt environmental friendly practices, in order to stimulate agriculture multifunctionality[36].

One can observe that the reform of agricultural policy in the European Community is made at three levels, national, European and international. Thus, negotiations and debates are not linear, being simultaneously produced and reverberated at all levels[37]. Garzon argues that in the case of multifunctionality, the different debates are interdependent and interconnected, being part of a process of political reform within the EU[38]. The same author attests that, in this context, the concept of MFA was born from the European Union debate aiming to promote economic and social cohesion at the regional level and sustainable development at the European level[39]. Still according to Garzon, the notion of MFA was one of the solutions found by European policy makers to renew the social contract on agriculture and to place the objective of sustainable development in the core of public policies[40].

It is important to emphasize that the notion of MFA has evolved within the European Community mainly through the development of the Regulation on European Rural Development (RDR) put in place by each country in the form of a National Rural Development Plan (NRDP) within the Common Agricultural Policy (CAP) context. The CAP regulations on rural development provide that farmers may subscribe to agri-environment measures[41], in the form

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Member States shall forward to the Commission all such prospective schemes, together with a list of areas qualifying for aid under those schemes.
Articles 92 to 94 of the Treaty shall apply. The Commission shall decide on the whole aid system planned, including the application areas, within three months following its notification, after consulting the Standing Committee on Agricultural Structures. Article 29 shall apply to the special schemes referred to in this Article.

[36] SERENA - *Services environnementaux et usages de l'espace rural*, Fiche 7: *Mesure Agro-Environnementales et paiements pour services environnementaux*, 2013. Available at: *http://www.serena-anr.org/PDF/FICHE_7BD.PDF.* Access on 15/01/2018.

[37] I. GARZON, cit.

[38] *Ibid*.

[39] *Ibid*.

[40] *Ibid*.

[41] « The agri-environment measures were created in 1985 by European Union Regulation 797, under the heading of localized ad hoc actions. The concern with the environment has arisen through Article 19 which pays on national aid to sensitive areas "having a recognized interest from the point of view of ecology and landscape". Article 19 was taken over and clarified, without any change of substance, in 1991 by Articles 21 to 24 of Regulation 2328. With the advent of Regulation 2078/1992, the implementation of the agri-environment measures becomes mandatory and the content of the Article 19 is expanded and clarified». N. PELLEGRINI. *Les*

of contracts generally concluded between a farmer and the State, with a duration of 5 years, binding the farmer to follow a series of specifications for an annual remuneration, aimed at meeting the priority environmental issues defined by each member state [42]. These measures are guided by the principles of contracting, zoning and subsidiarity.

As regards to the MFA debate within the OECD, in 1998, the principle of « preserving and strengthening the multifunctional role of agriculture in combating territorial imbalances, promoting the sustainable management of natural resources and promoting the diversity of farm development patterns » was adopted[43]. At the occasion, the MFA was described as

«Beyond its primary function of producing food and fibre, agricultural activity can also shape the landscape, provide environmental benefits such as land conservation, the sustainable management of renewable natural resources and the preservation of biodiversity, and contribute to the socio-economic viability of many rural areas. Agriculture is multifunctional when it has one or several functions in addition to its primary role of producing food and fibre».[44]

Within FAO, the subject of MFA is approached from a different perspective. At the center of the organization, the notion of MFA was perceived in a contradictory way, supporters emphasized its importance in the challenge of sustainable development and the opponents claimed that the MFA was only a justification for the continuation of the subsidy scheme [45]. In 2000, FAO established the Roa Project - Roles of Agriculture, focused on the study of agriculture externalities in developing countries and their impacts on public policies[46]. The project identified as main roles of agriculture:

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mesures agri-environnementales, in *Courrier de l'Environnement de l'INRA*, n° 25. Available at: *https://hal.archives-ouvertes.fr/hal-01206148/file/C25biblio.pdf* Access on 20/01/2018.

[42] L. BODIGUEL, cit., 7.

[43] OCDE. Ministry Communication of 1998. Available at *http://www.oecd.org/fr/tad/politiques-agricoles/communiquesministerielssurlespolitiquesagricoles.htm.* Access on 20/01/2018.

[44] *Ibid*.

[45] F. DEVE, *Les approches de la multifonctionnalité agricole par la FAO dans le contexte des négociations à l'OMC. 1999-2004*. Séminaire AGTER 17. October, 2008. Available at http://www.agter.org/bdf/_docs/deve_2008_10_multifonctionnalite_roa_fao.pdf. Access on 30/01/2018.

[46] *Ibid*.

«the effects of agricultural growth on poverty reduction and access to food; the role of agriculture in urban rural migration; the role of agriculture as a resilience factor for the national economy, and as an informal insurance and social protection system; and finally the environmental externalities of agriculture».[47]

According to a FAO report, Roa stands out from the OECD's MFA as it is oriented towards developing countries and MFA towards developed countries; the Roa aims to provide policy guidance for the implementation of development strategies while the MFA aims to establish policy principles to harmonize MFA's objectives with trade liberalization; Roa is defined as the indirect functions or externalities that agriculture has or should have in society while that MFA is defined as non-market products with externalities and characteristics of public goods that are produced together with commodities; Roa is based on the ideas of indirect links and externalities while the MFA is based on ideas of joint production, externalities and public goods[48].

In the context of the Agreement on Agriculture - GATT, the final agreement of the Uruguay Round recognized the need to take into account 'non-trade concerns'[49], specific to each state[50]. Nevertheless, once again the idea of MFA is controversial. Although most countries in the WTO recognize that agriculture provides other valuable functions besides the production of food and fiber, there is no consensus on the consequences for the agricultural negotiations on trade liberalization within the organization[51]. The European

[47] *Ibid*.
[48] FAO, *Socio-Economic Analysis and Policy Implications of the Roles of Agriculture in Developing Countries*. *The Roles of Agriculture in Development: Policy Implications and Guidance*, Research Programme Summary Report 2007. FAO: Rome, 2007. Available at: *ftp://ftp.fao.org/docrep/fao/010/a1067e/a1067e.pdf*. Access on 30/01/2018.
[49] The WTO glossary considers 'non-trade concerns' similar to multifunctionality, some examples are food security, environmental protection, rural development, employment, and poverty alleviation. WORLD TRADE ORGANIZATION. Glossary. Available at: *https://www.wto.org/english/thewto_e/glossary_e/non_trade_concerns_e.htm.* Access on 20/02/2018.
[50] A. AUMAND, *La dynamique des négociations sur la multifonctionnalité à l'OMC.*, Iddri, N° 20/2004, Libéralisation du Commerce, Paris, 2004. Available at: *http://www.iddri.org/Publications/Collections/Idees-pour-le-debat/id_0420_aumand.pdf*. Access on 01/02/2018.
[51] M.E. BREDAHL - S.S. PRESTEGARD - N.K. NERSTEN, *Multifunctionality: Concepts and Applications to the WTO Negotiations on Agriculture*. Paper prepared for presentation at the Xth EAAE Congress 'Exploring Diversity in the European Agri-Food System', Zaragoza, August

Union, as a bloc of developed countries, considers the MFA as an opportunity for sustainable agricultural and territorial development. On the other hand, Brazil, being a very heterogeneous developing country and focused on large-scale agriculture, and also part of the Cairns Group[52], considers the MFA notion as a possible subterfuge to the maintenance of agricultural subsidies[53].

Brazil and France are inserted into diverse economic, social and environmental contexts. Both countries may express contrasting understandings and diverse priorities. Hence, next part will be devoted to the study of France's and Brazil's different pathways regarding MFA (4).

4. *The various expressions of MFA: France and Brazil different pathways*

France is considered to be the leading agricultural power in Europe. Agri-food products (raw and processed) represent the country's second largest trade surplus after transport equipment[54]. The evolution of French and European rural legislation (notably through the new CAP) is moving towards triple efficiency, responding to new social expectations, especially in terms of preserving the environment and sustainable occupation of rural areas[55].

The country was one of the precursors in the MFA discussion. A public debate was organized in the years 1998-1999 in order to inquire the population about the functions of agriculture. The common understanding was that agriculture was an important economic sector that justified public policies but

2002, pp. 28-31. Available at: *http://ageconsearch.umn.edu/bitstream/24970/1/cp02br97.pdf.* Access on 01/02/2018.

[52] The Cairns groups is a « group of agricultural exporting nations lobbying for agricultural trade liberalization. It was formed in 1986 in Cairns, Australia just before the beginning of the Uruguay Round ». WORLD TRADE ORGANIZATION, *supra* n. 49.

[53] According to Aumand, the European Union affirms the importance of the MFA, particularly as regards to product quality, environment, rural landscapes, socio-economic development of rural areas and cultural heritage. On the other hand, Brazil argues that « multifunctionality is only a pretext for maintaining support for agriculture, since the increased liberalization of trade is not incompatible with the pursuit of objectives related to multifunctionality, in particular by reducing the negative effects caused by excessive levels of agricultural production. Policies associated with multifunctionality are likely to be used to maintain high levels of protection and subsidy. They then serve the interests of those who benefit from existing support policies rather than social expectations». A. AUMAND, cit., p. 9.

[54] French Embassy Website. França, a primeira potência agrícola da Europa. 2014.Available at *https://br.ambafrance.org/Um-numero-Um-fato-Franca-a.* Access on 02/02/2018.

[55] *Ibid*.

whose role was questioned by society[56]. The result has been a call for a reorientation of agricultural policy towards decreasing production and increasing attention to the environment, food security and animal welfare. This led the socialist government to propose in 1998 a new Agricultural Orientation Act based on the notion of multifunctionality[57].

Consequently, the concept became one of the foundations of the National Agricultural Policy through the Agricultural Orientation Act n ° 99-574 (applicable during the period from 1999 to 2002). The new act established that « agricultural policy takes into account the economic, environmental and social functions of agriculture and plays a role in regional planning with a view to sustainable development » (Article 1). The act disposed that rural development should be territorially based, in order to contemplate the specificities of the social, economic and ecological dimensions of the area into consideration[58].

In addition, the act also established the Territorial farm contracts (CTE) aimed at making environmental improvements and enhancing the farmer's economic stability at the same time. According to Daniel, F. J. and Perraud, D. the implementation of these contracts was meaningful because

«first, it corresponded to the implementation of an EU measure, the European Rural Development Regulation No. 1257/1999. Second, it defined and supported a change in production methods that put agriculture at the heart of environmental and rural management. And third, the intervention directly funded farms and thus explicitly gave them the financial support needed to enable their long term continuity».[59]

Since then, MFA has been understood as a concept of transformation aimed at adapting agricultural policy to new social demands and thus restoring its legitimacy. It justified the introduction of new conditionality rules for direct

[56] I. GARZON, cit.
[57] *Ibid*.
[58] *Ibid*.
[59] F.J. DANIEL - D. PERRAUD, *The multifunctionality of agriculture and contractual policies. A comparative analysis of France and the Netherlands*. Journal of Environmental Management 90, 2009, p. 134. Available at *https://ac.els-cdn.com/S0301479708003496/1-s2.0-S0301479708003496main.pdf?_tid=1a53512c0cf611e8831e00000aacb35e&acdnat=1518111358_11cab9fa9d7240e8de2d682cae69422a.* Access on 02/02/2018.

payments based on economic, social and environmental criteria, as a means of redistributing direct payments between French farmers[60].

The diverse agricultural functions were acknowledged by distinct legal instruments. Articles L. 111-1 and 2 of the Rural Code disposes that « the enhancement of the protection of the agricultural and forest areas take into account its economic, environmental and social functions »[61]. Article L311-1 of the Rural Code and Sea Fishery defines agricultural activity as

«All activities corresponding to the control and exploitation of a plant or animal life cycle and constituting one or more stages necessary for the conduct of this cycle as well as the activities carried out by a farmer that are in extension of the act of production or which are supported by exploitation. Marine farming activities are considered agricultural, notwithstanding the social status of those who practice them. The same is true for the activities of preparation and training of domestic equids for the purpose of their exploitation, excluding entertainment activities. The same applies to the production and, where appropriate, the marketing, by one or more farmers, of biogas, electricity and heat by anaerobic digestion, where this production originates for at least 50% of raw materials from agricultural holdings. Revenues from marketing are considered farm income, pro rata to the farmer's participation in the operating structure and marketing the energy produced. The manner of application of this section shall be determined by order».

At the European level, there are incentives to develop the environmental function of agriculture. In France, this incentive is made through contractual means, mainly in the context of rural leases[62]. French agricultural law is therefore a mixture of private and public law. Private law contracts, such as rural and environmental lease contracts and the administrative contracts of rural development aid may serve public purposes in agriculture organization and in agricultural goods produtcion[63]. Since the 1980s, several contractual mechanisms for agri-environmental sustainability have been introduced in France. Among the most important are[64] :

[60] I. GARZON, cit.
[61] L. BODIGUEL, cit., p. 3.
[62] *Ibid*, p. 5.
[63] *Ibid*, p. 4.
[64] Some instruments deal with MAEs, others with local versions of MAEs and others with national arrangements articulated with European policy.

- The Group Land and Environment Development Organization (Organisation Groupée d'Aménagement Foncier Environnement - OGAF), set up by Article 19 of the EEC Regulation n° 797/85. It was aimed at the adoption of environmental friendly agricultural practices, divided into four priority areas: reducing water pollution, protecting rare and sensitive areas of biotopes, combating agricultural abandonment and controlling forest fire[65];

- Conversion to Organic Farming (Conversion à l'Agriculture Biologique - CAB) : established by EU Regulation 2078/1992. It aims to encourage and support the process of conversion and maintenance of organic farming [66];

- The Local Agri-Environmental Operation (Opération Locale Agri-Environnementale - OLAE), more extensive than the OGAF, set up by Article 19 of the European Regulation n ° 797/85. It is the result of an agri-environmental project developed by local stakeholders, which together defined the issues, the area of application and the recommended practices[67]. It envisaged two categories of environmentally sensitive rural areas, namely, rare and sensitive biotope areas and highly extensive areas, threatened and/or weakened by agricultural abandonment[68];

- The Premium for the Maintenance of Extensive Farming Systems (La prime au maintient des systèmes d'élevage extensif - PMSEE) established

[65] A. CAPILLON - G. DAVID, *Gestion agricole de l'espace et environnement: OGAF-Environnement et types d'exploitation en Marais poitevin de Deux-Sèvres*, Cahiers Agricultures, 1993, p. 118. Available at: *http://revues.cirad.fr/index.php/cahiers-agricultures/article/view/29780/29540.* Access on 05/02/2018.

[66] FRENCH MINISTRY OF AGRICULTURE AND FISHERIE. *Conversion à l'agriculture biologique (CAB) et maintien de l'agriculture biologique (MAB)*. Available at: *http://agriculture.gouv.fr/sites/minagri/files/documents/ab.pdf%20.* Access on 05/02/2018.

[67] M. VAULEON, *Les Mesures Agro-Environnementales territorialisées: Un levier pour une gestion durable et concertée des espaces agricoles ? Cas du Département de la Loire*. Mémoire de fin d'Etudes. Diplôme d'Ingénieur de l'Institut Supérieur des Sciences Agronomiques. Rennes, 2013 Available at: *https://dumas.ccsd.cnrs.fr/dumas-00921019/file/2013_VaulA_on_Mathilde.pdf.* Access on 05/02/2018.

[68] LES VERTS, COMMISSION AGRICULTURE. *Des Mesures Agri-Environnementales plus efficaces pour aller vers le projet HPE*. Available at: à *http://www.lesverts.fr/IMG/pdf/cagr0703_mae.pdf.* Access on 05/02/2018.

by EU Regulation 2078/1992. It aimed to maintain extensive livestock systems, limiting forage intensification and adverse environmental consequences[69];

- The Agri-environmental Grassland Premium (la prime herbagère agro-environnementale - PHAE), established by EU Regulation 2078/1992, replaces the premium for the maintenance of extensive livestock farming systems (PMSEE). It aimed to preserve meadows and grasslands and to encourage animal 'deintensification' with environmental friendly practices[70];

- Sustainable Development Plans (Plans de Développement Durable - PDD) - established by EU Regulation 2078/1992. Exploitation is at the heart of the contract. PDDs aim at integrating environmental information into the farm's production system, based on the specific objectives of each farmer, in order to ensure farm continuity in accordance with sustainable development principles and to ensure the role of the farmer as an independent manager of the non-forested rural area[71];

- The Territorial Farm Contracts (Contrat territorial d'exploitation - CTE) framed in the sustainable development plans and set up by the same Agricultural Orientation Act which formalized the notion of MFA[72]. The CTEs were a set of commitments between the farmer and the administrative authority. After a diagnosis made by the own farmer, he chose from a rank of pre-established actions at local, regional or national level, the practices to be implemented, whose viability was later examined by a group of technicians[73]. Contracts necessarily included two components: a socio-economic component regarding the investments and expenses for the adaptability of the operation; and a territorial and environmental component on the implementation of agricultural practices adapted to the environment[74]. Farmers received a bonus for the actions implemented and an annual remuneration for the additional costs

[69] C. BRAU-NOUGUE ET AL., *Impact de la prime au maintien des systèmes d'élevage extensif sur les exploitations et les pratiques fourragères,* Fourrages, 2001.
[70] Tarn Website. *La prime herbagère agro-environnementale PHAE 2*. 2013. Available at: *http://www.agritarn.com/page_site/La-prime-herbagere-agro-environnementale-PHAE-2.php.* Access on 05/02/2018.
[71] N. PELLEGRINI, cit.
[72] Article 4, current Article L311-3 of the Rural Code and Sea Fisheries.
[73] L.C.P. CANDIOTTO, *Aspectos historicos e conceituais da multifuncionalidade da agricultura*. XIX Encontro Nacional de Geografia Agraria, São Paulo, 2009, pp. 1-16, p. 6.
[74] Contrats Territoriaux d'exploitation - Contrats d'Agriculture Durable: Bilans et Perspectives. Observatoire Savoyard de l'environnement, n° 10, December, 2003, p. 40.

generated by the new farming practices. The contract was valid for five years[75]. The CTEs were abolished in 2002 by the right-wing government and the CAD's were implemented based on the CAP reform[76];

- Sustainable Agriculture Contracts (Contrats d'Agriculture Durable - CAD), established by Decree n° 2003-675 of 22 July 2003. CAD's are targeted at priority environmental issues and the former socio-economic component became optional[77]. The contract became simpler and better regulated at the budget level[78];

- Territorial Agri-environment Measures (Mesures Agroenvironnementales Territorialisées - MAET), set up in 2007 to replace the CAD's and have been redefined under the framework of the French rural development program (programme de développement rural hexagonal - PDRH) repercussion of the European rural development regulation for the period 2007-2013. They were MAEs located on agricultural parcels belonging to priority areas for the protection of biodiversity, water quality or other environmental issues. The priority areas are divided into three categories: Natura 2000 areas[79]; areas under the Water Framework Directive (Directive Cadre sur L'eau - DCE)[80] and Areas « with other issues »[81]. The specifications are defined according to the territory's environmental stakes established through a list of unitary commitments at national level[82];

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[75] *Ibid,* p. 40.
[76] L.C.P. CANDIOTTO, cit., p. 6.
[77] Contrats Territoriaux d'exploitation, *supra* n. 74, 40.
[78] M. VAULEON, cit.
[79] "The Natura 2000 network is a set of natural, terrestrial and marine sites, whose objective is to contribute to preserving biological diversity in the territory of the European Union". This network was set up by the 1979 Bird Directive and the 1992 Habitats Directive. DREAL. Centre Val de Loire. *Réseau Natura 2000*. Available at: *http://www.centre.developpement-durable.gouv.fr/reseau-natura-2000-r726.html.* Access on 06/02/2018.
[80] « The WFD sets objectives for the preservation and restoration of the state of surface water (fresh and coastal waters) and groundwater. » EAUFRANCE. *La directive cadre sur l'eau.* Available at: *http://www.eaufrance.fr/comprendre/la-politique-publique-de-l-eau/la-directive-cadre-sur-l-eau.* Access on 06/02/2018.
[81] Biodiversity outside Natura 2000, erosion, landscape, fire protection. MINISTRY OF AGRICULTURE AND FISHERIE AND THE UE. *Mesures agroenvironnementales territorialisées*. Available at: *http://agriculture.gouv.fr/sites/minagri/files/documents//maet.pdf%20.* Access on 06/02/2018.
[82] *Ibid*.

- Agri-environment Climate Measures (Mesures Agroenvironnementales et Climatiques - MAEC) put in place by CAP 2015 to replace MAETs. The MAECs are divided into three categories, namely: system MAECs concerns the hole farm, not only the parcels on which there is an environmental issue; the MAEC « responding to localized issues, based on the combination of unitary commitments, founded on the existent commitments »[83]; and the MAEC « meeting the goal of preserving genetic resources: devices for endangered animal and plant breeds and apiculture device »[84].

As stressed previously, some researchers consider the MFA concept as a protectionist strategy of the EU, in order to pursue agricultural subsidies.[85] Others affirm that the MFA no longer exists, giving place to the triple agricultural performance - social, economic and environmental.[86] In France's case, this assertion may be considered appropriate, based on the significant legal evolution concerning agriculture. To exemplify, Article L. 1.-I of the Act for Future of Agriculture, Food and Forestry 2014 states that

«The policy in favor of agriculture and food (...) aims to (...) develop production and processing sectors that combine economic and social performance, particularly through a high level of social protection, environmental and health, able to meet the dual challenge of competitiveness and ecological transition, in a context of international competition».

Unlike Brazil, in the course of its history, France has developed mainly a family-style agriculture. The principle of 'transmission', intrinsic to family agriculture, engages the farmer into natural resources management, stimulating more sustainable practices. The French main rural policy is directed towards the modernization of family agriculture and the limitation of the development of large farms.[87] Brazil's rural development, on the other hand, has been mainly

[83] MINISTRY OF FOOD AND AGRICULTURE. *Mesures agro-environnementales et climatique (MAEC) et aides pour l'agriculture biologique*. 31/03/2017. Available at: *http://agriculture.gouv.fr/mesures-agro-environnementales-et-climatique-maec-et-aides-pour-lagriculture-biologique.* Access on 06/02/2018.
[84] *Ibid.*
[85] L.C.P. CANDIOTTO, cit., p. 6.
[86] L. BODIGUEL, cit.
[87] FAO, *Family Farming Knowledge Platform*, France, 2017, Available at: *http://www.fao.org/family-farming/countries/fra/en/.* Access on 08/02/2018.

concentrated in export agriculture since the Portuguese colonization period. The growing need to 'open' more land for cultivation led to the expansion of agriculture and consequent soil degradation and biodiversity loss[88].

It is noteworthy that the notion of MFA appeared as a criticism of the productivist model, born in Europe, based on the European social context. Maluf states that currently in Europe, there is a movement to support sustainable agriculture ways of production, instead of pure productivism[89]. Brazil faces a different reality. The country encounters a heterogeneous context of flagrant social inequality where few people own large parcels of land[90]. Some authors consider that the notion of MFA can be considered as inappropriate for the Brazilian reality[91]. One of the main challenges faced by the Brazilian government in the agricultural policy reform is to promote and implement more sustainable practices. In this sense, Roa, FAO's perspective on multifunctionality, would be a more coherent concept with the country's reality, once it is better adapted to developing countries.

Carneiro and Maluf argue that for historical reasons, Brazilian society has difficulty in recognizing the immaterial dimensions of agricultural activity[92]. Although agriculture is considered a public good, its multifunctional dimension continues to be restricted to the production process and economic return[93].

Some researchers emphasize the key role of small farmers in rural development and their ability to « be highly productive on a per-hectare basis»[94]. Despite the devastation caused by large-scale agroindustry in Brazil, sustainable agricultural practices have been disseminated among small farmers, also called family farmers[95]. According to the Agricultural Census conducted in

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[88] A.G. ARAUJO ET AL, *Conservation Agriculture in Brazil* In *Conservation Agriculture: Global Prospects and Challenges*, JAT, RAM A. ET AL., Cab International, 2014, pp. 54-88, p. 55.
[89] R. MALUF, *A multifuncionalidade da agricultura na realidade rural brasileira*, in J.M. CARNEIRO - R. MALUF (eds.), *Para além da produção: multifuncionalidade e agricultura familiar*, Rio de Janeiro: Mauad, 2003. pp. 135-154.
[90] *Ibid*, p. 136.
[91] J.M. CARNEIRO - R. MALUF, cit.
[92] *Ibid*, p. 14.
[93] L.C.P. CANDIOTTO, cit., p. 11.
[94] S. SNAPP - B. POUND, *Agricultural Systems: Agroecology and Rural Innovation for Developpement*, Elsevier, 2008, p. 22.
[95] According to Article 3 of Act 11.326 / 2006, which establishes the guidelines for the formulation of the National Policy on Family Farming and Rural Family Enterprises, the family farmer is the one who owns a small property (smaller than 4 tax modules); who primarily uses the

2006, 84.4% of the Brazilian farms fit into the family agriculture profile and occupied 24.3% of the country's territory. The Census equally revealed that 70% of food consumed in Brazil was produced by family farming, making small farmers the main actors responsible for guaranteeing food security in the country[96].

In this context, the recognition of the multifunctional nature of agriculture is mainly part of the legitimation movement of family farming[97]. Some authors consider the MFA as an instrument of public policy to support and promote family farming[98]. Despite the adversities found by Brazilian family farming, it has a strong capacity for adaptability, especially due to its multifunctional nature. Bonnal, Cazella and Maluf state that

«The role played by MFA notion in agriculture, especially in agri-food production, rural construction and the reproduction of rural families, is one of the distinctive features of its application in Europe and Brazil. In Brazil, family farming, considered in its social diversity, represents the form that best expresses, effectively or potentially, what the notion means as a public policy goal to promote socially equitable, ecologically sustainable,valuing cultural diversity and biomes»[99].

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family's own labor in the economic activities of his establishment or business; whose family income is derived primarily from economic activities related to the establishment or enterprise; who has a minimum percentage of family income (as defined by the executive power) from the economic activities of his establishment or business; and who manages his establishment with his family.
On the other hand, the INCRA (National Institute of Colonization and Agrarian Reform), define family farming from three central characteristics: a) the management of the productive unit and the investments made are carried out by individuals who maintain blood or marriage ties; (b) most of the work is also provided by family members; and (c) the ownership of the means of production (although not always of the land) belongs to the family and it is within the family that its transmission takes place in the event of the death or retirement. L.C.P. CANDIOTTO, cit., p. 11.

[96] MPA. *Censo Agropecuário confirma: agricultura camponesa é a principal produtora de alimentos do país.* 2010. Available at: *https://mpabrasiles.wordpress.com/2010/02/18/censo-agropecuario-confirma-agricultura-camponesa-e-a-principal-produtora-de-alimentos-do-pais/.* Access on 07/02/2018.

[97] J. J.M. CARNEIRO - R. MALUF, cit., p. 9.

[98] R.L. CAMARAGO - J.T.A. OLIVEIRA, *Agricultura familiar, multifuncionalidade da agricultura e ruralidade: interfaces de uma realidade complexa*, Ciência Rural Santa Maria, v. 42, n. 9, 2012, pp. 1707-1714. Available at: *http://www.scielo.br/pdf/cr/v42n9/a26712cr3475.pdf.* Access on 08/02/2018.

[99] P. BONNAL - A.A. CAZELLA - R. MALUF, *Multifuncionalidade da agricultura e desenvolvimento territorial: avanços e desafios para a conjunção de enfoques*, Estudos sociais agricolas, Rio de Janeiro, vol. 16, no. 2, 2008, 185-227, p. 187-188. Available at: *https://www.researchgate.net/profile/Renato_Maluf/publication/262555468_Multifunctionality_of*

Tonneau and Sabourin, attest the existence of a variety of family farming systems in Brazil, which can be divided into three categories:

1-) the survival system: the production capacity is low and below the need of the family, which makes the investment more difficult. Lack of available means of production, mainly access to land and capital;

2-) the agricultural surplus system: the production is mainly for self-consumption and the surplus is sold on the market or accumulated. Difficulties in access to land and markets;

3-) the commercial farming system: most of the production is for sale. Difficulty in maintaining competitiveness with agribusiness[100].

According to Bonnal, Cazella and Maluf, the notion of MFA in Brazil has four levels of analysis: rural families, territory, society, and public policies. The object of analysis is no longer agriculture, but the rural family as a social entity and not just a productive entreprise[101]. In addition, the economic reproduction of a large proportion of rural families does not necessarily have a connection with the agricultural activity carried out within these families, which poses specific challenges for the correlation between agricultural activity and promotion of other agriculture functions[102].

The circumstances that affect the effectiveness of MFA within rural families relate with the reproductive dynamics of these families, which are very localized and inserted in a specific territory. According to the MFA logic, the territory can be considered as a place of expression and treatment of agricultural externalities; as a result of collective projects target at the development of specific resources; as a result of collective projects not exclusively economic

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_agriculture_and_territorial_development_implications_and_challenges_in_combining_the_approaches/links/56165e6708ae37cfe409068e.pdf. Access on 10/02/2018.

[100] The authors point out that this classification corresponds to the Lamarche family farming classification (1998), divided into: the peasant agriculture model, the modern family farming model and the family business model. J.P. TONNEAU - E. SABOURIN, *Elementos de sintese e persepectivas* In *Agricultura Familiar: Interação entre Politicas Publicas e Dinâmicas Locais.* J.P. TONNEAU - E. SABOURIN (eds.), Porto Alegre: Editora da UFRGS, 2007. pp. 289- 317

[101] P. BONNAL - A.A. CAZELLA - R. MALUF, cit., p. 188.

[102] *Ibid*, pp. 187-188.

and; as a fundamental component of territorial societies[103]. The analysis of public policies, in turn, makes it possible to verify the legitimacy granted to the MFA. Non-agricultural public policies directed at the socio-economic reproduction of rural families are also considerable in the framework of the MFA[104].

It is important to highlight that even if MFA has not been explicitly recognized by these policies yet, they acknowledge it implicitly through the appreciation of other agriculture functions besides the production of food, such as the protection of the environment, customs and culture[105]. In this context, several current Brazilian public policies, including rural development policies, have incorporated sustainable development among its objectives[106].

Recent agroecological practices integrate social, cultural and environmental issues. In addition, the requirements of the Forest Code for the establishment of protected areas such as Legal Reserves (percentage of the forest mass within a rural property that cannot be deforested) and Permanent Protection Zones (banks of streams, lakes and ponds, as well as mountain peaks) also acknowledge the multifunctional nature of agriculture [107]. Nevertheless, according to Candiotto, the achievement of agricultural multifunctionality remains linked to the economic objective of capital accumulation[108].

Still, one can observe that the mere incorporation of broader objectives into rural development policies does not necessarily includes more farmers or generates a real change in practice. The implementation of Brazilian rural development policies is deficient, especially concerning the incentives focused on further agriculture functions other than commodities production. For the majority of farmers, production continues to be the most important function,

[103] *Ibid*, p. 190.
[104] *Ibid*.
[105] SOUZA - BAGOLIN - CORONA, *As multiplas funções do espaço rural e as politicas de desenvolvimento no Brasil: Reflexões através de um rural metropolitano,* Pontificia Universidade Católica do Rio Grande do Sul, Porto Alegre, 2007.
[106] However, the OECD points out that « multifunctionality is a feature of the production process that may have implications for the achievement of the multiple objectives of society, but unlike sustainability, it is not a goal in itself. » Although sustainability is seen as a broader, longer-term, resource-based goal, sustainability and MFA envisage the adoption of similar behaviors that need to be coordinated. L. MAIER - M. SHOBAYASH, cit.
[107] L.C.P. CANDIOTTO, cit.
[108] *Ibid*, p. 11.

which can lead to conflicts with other functions. Among these farmers are those who receive subsidies from public policies and those who do not receive them. In the first case, public policy[109] is frequently not capable of introducing new production practices compatible with other agriculture functions[110]. Other farmers are in such a precarious situation that not even the food production function is guaranteed. In this case, the inability to access public policies shows that those are not adapted to the reality of a certain agricultural practice or rural space[111].

In parallel with the emergence of the MFA concept in Europe, family farming in Brazil occurs as a response to the "green revolution", as an alternative to monoculture and latifundium[112]. In France, the MFA has been implemented by the government on the form of incentives. In Brazil, the concept of MFA is mainly related to family farming and deeply linked with agriculture diversification and pluri-activity. Candiotto argues that the French experience demonstrate the importance of political will to the implementation of a sustainable development project[113].

According to Renting et al. classification of MFA[114], France promotes MFA mostly through public regulation approaches, since the political will can be considered as the main driving force to MFA, but also through actor oriented approaches and market regulation approaches. Brazil, on the other hand, encourages MFA practices mainly through actor oriented approaches, assisting in the legitimation movement of family farming.

Surpassed the study of the divergences between French and Brazilian MFA notions, next, this paper will analyze agroforestry's role in promoting different agriculture functions. As discussed previously, agroforestry is a sustainable land management system that combine forest and crop or/and livestock simultaneously at the same land unit. Barbieri, C. and Valdivia, C.

[109] An example is the National Program for Strengthening Family Farming (Programa Nacional de Fortalecimento da Agricultura Familiar - PRONAF) established in 1996 to promote family farming sustainable development, providing technical and financial support. However, for the farmer to be able to benefit from it, he must be able to step into the competitive market with the use of modern technologies, demonstrating the economic viability of his business. J. J.M. CARNEIRO - R. MALUF, cit.
[110] SOUZA - BAGOLIN - CORONA, cit.
[111] *Ibid*.
[112] L.C.P. CANDIOTTO, cit.
[113] L.C.P. CANDIOTTO, cit., p. 7.
[114] H. RENTING ET AL., cit., pp. 113-114.

assert that « the biophysical interactions between the trees and crops or livestock optimize the physical, biological, ecological, economic, and social benefits derived from farmland. »[115] Agroforestry systems enable agriculture multifunctionality and could represent a valuable tool to the implementation of MFA approaches. Besides providing economic, social and environmental functions, agroforestry practices could « foster multiple synergies with other farm functions, »[116] as it will be examined at the last part of this work.

5. *Agroforestry as a mechanism of MFA dissemination*

Agroforestry is a system of high productivity created through the appreciation of nature, with similar characteristics to those of a natural forest. Most of agroforestry systems aim to establish productive systems rather than to increase the productivity of isolated species. It is founded on the optimization of benefits generated by the different interactions that occur between trees, crops and animals. While it enables higher product diversity, it reduces the demand for 'external inputs' and consequently the occurrence of environmental impacts[117].

The agroforestry practice is built on a dialectical relationship of continuity, integration and support between humans and nature. Instead of using technology to reach specialized production and maximum output, as in conventional agriculture, agroforestry seeks to optimize production to meet a wide range of economic and social demands, always in respect of nature's dynamics[118]. This makes sustainability an intrinsic feature of any agroforestry system.

Vivan affirms that each agroforestry model is generated both by accumulated ecological knowledge and by present and past cultural and

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[115] C. BARBIERI - C. VALDIVIA, *Recreation and agroforestry: Examining new dimensions of multifunctionality in family farms*. Journal of Rural Studies 26, 2010, pp. 465-473, p. 467. Available at: *https://ac.els-cdn.com/S0743016710000380/1-s2.0-S0743016710000380-main.pdf?_tid=829ce8600cf611e8835700000aacb360&acdnat=1518111533_ee0564ec2d4ad7fdd71be0b6797e6d9e.* Access on 12/02/2018.
[116] *Ibid*, p. 467.
[117] A.A. PRESSISLER, *Sistemas Agroflorestais: planejamento, práticas de manejo e legislação*, Dissertation Universidade do Norte do Parana, 2013.
[118] M. EWERT, *Incentivos e limites da legislação ambiental brasileira para os sistemas agroflorestais: o caso cooperafloresta,* Masters Dissertation, Universidade Federal de Santa Catarina, 2014.

economic interactions. Each model represents the management of particularities of the ecosystem, aiming at the fulfillment of socioeconomic and cultural demands[119].Agroforestry practices are adaptable to the size of the property and to the scale of the economic investment, being suitable for both small farmers and large enterprises[120].

There are several classifications of agroforestry systems depending on the agricultural elements used in the consortium. They can be grouped into three categories: 1) agrosilviculture systems that are a combination of agricultural and/or forestry trees and shrubs with semi-agricultural and/or annual crops; 2) silvipastoral systems that combine trees and shrubs (timber and non-timber) with pasture and animal husbandry; and (3) agrosilvipastoral systems that are the combination of animal breeding, crops and trees[121].

They can also be differentiated according to the arrangement of crops. For instance, trees can be dispersed irregularly where planting of agricultural species is done among forest species (of economic value); intercalated trees; trees for artificial and perennial shading; planting in lines; trees in sequential cultivation; alley crops (a mixture of small trees or bushes frequently pruned); and trees with live tutors, once some agricultural crops require ecosystem services provided by other species[122].

Additionally, agroforestry practices can be based on both the modern or institutional approach which relies on modern agronomic science; and on the traditional or indigenous approach which emerged from 'cultural geography and ecological anthropology'[123]. Vivan asserts that

«traditional and indigenous SAFs are universal in principles, since, in any part of the planet, their design presupposes the establishment of ecological zoning criteria; the production and constant update of lists of preferred species for the various vegetation strata; and the creation of arrangements and consortium that mimic or inspire

[119] J.L. VIVIAN, *Diversificação e manejo em sistemas agroflorestais.* III Congresso Brasileiro de Sistemas Agroflorestais, Embrapa 2011.
[120] *Ibid*.
[121] T. MOREIRA (ed.), *Promessas de Sustentabilidade: Sistemas Agroflorestais de Varzea e de Terra Firme na Calha do Rio Madeira, Sul do Amazonas*. Humaita: Amazonas, 2013, p. 18.
[122] *Ibid*., pp. 18-21.
[123] W.C. CLARKE - R.R. THAMAN, cit., p. 9.

local plant succession patterns according to soil, climate cycles and patterns in order to optimize or surpass environmental boundaries».[124]

Agroforestry practices may provide different environmental, economic and social functions. Among its environmental functions, agroforestry practices provide various environmental services such as erosion control, retention of organic matter, improvement of soil physical and chemical structure, increase of nitrogen fixation and promotion of efficient cycles of nutrients, reduction of greenhouse gas emission and the capacity to recover and rehabilitate degraded areas.[125] Agroforestry promotes maintenance of biodiversity at levels similar to those of natural ecosystems or even improves planned and unplanned biodiversity.[126] According to Posey

«Tropical agro-ecosystems consisting of agricultural fields and fallow land, complex home gardens and agroforestry plots commonly contain well over 100 plant species per field and provide construction materials, firewood, tools, medicines, livestock feed and human food»[127].

Through its system, the trees create conditions in the deep layers of the soil that favor water and nutrients supply to the surface crops. Trees are managed not to compete, but to maximize surface cultivation. Trees allow diversification of production and they limit nitrate escape to the deeper layers of the soil, reducing water table pollution. The leaves and wood from tree cutting and pruning is an important source of biomass that guarantees more fertility to the soil. Trees increase the diversity of animals and habitats, which favors the

[124] J.L. VIVIAN, cit.
[125] M.W. MULLER, *Importância dos Sistemas Agroflorestais para a sustentabilidade dos biomas tropicais.* 28 Semana do Fazendeiro, Caderno I, Uruçuca: Ministério da Agricultura, 2006, pp. 64-73.
[126] Although agroforestry systems contain more planned diversity of selected species (trees and crops), they also increase unplanned diversity, such as plants and animals that colonize and use the structure formed by plant species, providing more niches for native flora, fauna and microflora. See further: G. SCHROTH ET AL. *Agroforestry and Biodiversity Conservation in Tropical Landscapes*, Island Press 2004, p. 8.
[127] A.D. POSEY. *Cultural and Spiritual Values of Biodiversity.* UNEP, Intermediate Technology Publications, 1999, p. 291. Available at: *http://staging.unep.org/pdf/Cultural_Spiritual_thebible.pdf.* Access on 13/02/2018.

proliferation of pollinating insects. In their growth phase, they also store carbon, contributing to the mitigation of climate change effects[128].

Moreover, the integration of animals in agricultural systems makes the system even more complex, adding a trophic level[129]. Animals transform the nutritive content of plants into fertilizer. The crop is expanded to include valuable plant species for soil and water conservation that supply their food needs. Leguminous are often planted to provide quality fodder, but also to improve the soil nitrogen content[130].

Along the economic functions provided by agroforestry, the rotation of production during the year assures higher profits per unit of cultivated area and greater economic stability, since the gains of certain seasonal products are balanced by others, reducing market risks for the farmer[131]. Agroforestry consortium may include trees with high economic value. In addition, in most cases, the agricultural products issued from agroforestry systems are organic, fact that ensures them an added value.

As for the social functions, agroforestry systems can be considered as the result of a historical, individual and collective trajectory of relationship between humans and the environment. Through the interpretation of ecosystems and plants information obtained along this trajectory, techniques and practices of environment intervention were assembled, knowledge that had been culturally transmitted[132]. Agroforestry emerged from traditional and cultural practices that have the power to bond humans and nature. By changing farmer's relation with natural resources, it also changes the farmer's behavior towards more sustainable practices. Agroforestry practices are able to maintain the population in rural areas, since it requires a constant workforce throughout the year[133]. Furthermore, it also answers societal demand for food security and food quality.

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[128] FRENCH MINISTRY OF FOOD AND AGRICULTURE. *L'agrforesterie: comment ça marche?* Dcember, 2015. Available at: *http://agriculture.gouv.fr/lagroforesterie-comment-ca-marche.* Access on 13/02/2018.
[129] A.D. POSEY, cit., p. 293.
[130] *Ibid*, p. 293.
[131] M.W. MULLER, cit.
[132] J.L. VIVIAN, cit.
[133] Memorandum of Understanding between Biodiversity International, CIAT, CIFOR, ICRAF as partners in the CGIAR Research Program on Forests, Trees and Agroforestry and the Secretariat of the CBD (CGIAR and CBD 2012-2016). Available at:

Hence, agroforestry practices may be considered consistent with the strong multifunctionality concept. Barbieri and Valdivia affirm that agroforestry « fits in the strong end of the multifunctionality spectrum » as it provides several services and economic and environmental benefits, being perceived by many professionals « as a sustainable land use management strategy»[134]. Along these lines, the practice could equally fit into the strong sustainability concept [135], which is based on the ecological economics theory that acknowledges the existence of environmental limits restricting the expansion of economic activity and that natural capital stock must be maintained over time, once it cannot be interchangeable. Strong sustainability refers to the maintenance or improvement of natural capital quality[136].

Concerning the French legal framework regarding agroforestry systems, for many years, the status of the agroforestry parcel was uncertain. The tree was seen as a hindrance in the agricultural fields, and farmers were encouraged to deforest[137]. The situation has changed and currently, subsidy policies are already in place to implement agroforestry systems. However, given the over-restricted definition of agroforestry[138], farmers may feel discouraged, opting for traditional agriculture, subject of several subsidies.

Moreover, the status of forest resources may be uncertain, which may also discourage the deployment of such systems. Agroforestry parcels have a status of public agricultural order, so the farmer need an authorization to plant trees accorded by the owner of the land. An authorization is also necessary for cutting trees, which also discourages agroforestry implementation, since forest management (including cutting) is one of the fundamental practices for a successful agroforestry system[139].

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https://www.cbd.int/doc/agreements/agmt-cifor-icraf-ciat-bioversity-2012-10-11-mou-web-en.pdf. Access on 14/02/2018.

[134] C. BARBIERI - C. VALDIVIA, cit., p. 467.

[135] SEOANE ET AL., *supra* n. 10.

[136] F. TAYRA, *Capital natural e graus de sustentabilidade: visões só mundo e objetivos conflituantes*, Pensamento e Realidade, n. 19, 2006, pp. 100-118.

[137] C. ETRILLARD, *Des arbres dans les parcelles agricoles : vers un renouveau de l'agroforesterie en France?*, Revue de Droit Rural. n° 429, January, 2015.

[138] For the parcel to be considered as an agroforestry system, tree density should be between 30 and 200 trees/hectare. FRENCH AGRICULTURE CHAMBER. *Guide L'agroforesterie dans les réglementations agricoles: Etat de lieu en juin 2010*. 2010. Available at: *http://www.agroforesterie.fr/documents/guide_reglementations_agroforesterie_juin2010.pdf.* Access on 20/02/2018.

[139] *Ibid*.

Nevertheless, the French Government has already expressed its interest in encouraging agroforestry systems through the Agroforestry Development Plan, launched in 2015. French rural policies are evolving towards a triple efficient agriculture (economically, socially and environmentally) built on the respect of environmental standards [140]. Finally, the country's legislation promotes agriculture multifunctionality and sustainability, a framework that is promising for agroforestry practices.

In Brazil, the main relevant acts regarding agroforestry, which are the Brazilian Constitution and the Forest Code, support the implementation of agroforestry systems. The Forest Code emphasizes the importance of different agroforestry functions and encourages their implementation for forest restoration, environmental conservation, sustainable management and environmental services provision[141]. The country has several public policies and programs aimed at promoting sustainable agricultural practices that could be used to promote both agriculture multifunctionality and agroforestry. However, the main political trend is dictated by conventional agriculture and most of the subsidies are focused on export-oriented agriculture, such as monocultures[142].

It is observed that the legislation of both countries has been evolving to encourage agroecological practices, notably agroforestry practices. Additionally, agroforestry practice goes hand-in-hand with both the French notion of MFA and the Brazilian notion, since it ensures food security, the diversification of agricultural activity, environmental protection, the preservation of natural resources and landscapes, the socio-economic reproduction of rural families and the maintenance of the social and cultural fabric. Thus, agroforestry systems could be considered as an instrument capable of actually implementing agriculture multifunctionality.

6. *Conclusions*

[140] FRENCH MINISTRY OF AGRICULTURE AGRIFOOD AND FOREST, *Le Projet Agro-écologique en France*, 2015. Available at: *http://agriculture.gouv.fr/sites/minagri/files/1509-ae-final-fr.pdf*. Access on 20/02/2018.
[141] M.F.C. ALBUQUERQUE, *The sustainable use of biodiversity and its implication in agriculture: The agroforestry case in the Brazilian legal framework* In *Legal aspects of sustainable development: Horizontal and sectorial policy issues*. V. MAUERHOFER (ed.), Springer, 2016, pp. 585-606.
[142] *Ibid*.

The institutionalization of the MFA notion has only recognized a reality forged by history and society. Nevertheless, its official recognition expresses a desire to sustainably associate all these functions and since than, new economic strategies have been put in place for agriculture through the remuneration of these activities. The MFA notion acknowledges not only the economic role of agriculture, but also its social and environmental role, capable of changing agricultural policy around the world.

The adoption of the MFA notion could represent a paradigm shift, from a simplistic monofunctional perspective, focused on the production of goods to private use, to a complex multifunctional perspective, through which agriculture is recognized as a supplier of several ecosystem services to the community[143]. It could symbolize a step forward an agroecological transition towards more sustainable agricultural practices. Furthermore, as examined before, the multifunctional agriculture system is considered by many social actors as the ideal type of agricultural regime. Thus, every farming system should evolve towards a strong multifunctional system[144].

France was one of the precursors in the MFA debate. The country have incorporated agriculture multifunctionality and agriculture triple efficiency notions into the main public policies. MFA practices are mostly encouraged through public regulation approaches, represented essentially by eco-conditionality measures. The French political will to operate an agroecological transition is flagrant.

In Brazil, on the other hand, the notion of multifunctionality is mainly based on actor-oriented approaches, contributing to family farming legitimation. MFA is mostly encouraged through agroecological policies aimed at the rural sustainable development. Nevertheless, Brazil faces a very heterogeneous social context and some scientists argue that the MFA concept is not adapted to the country's reality. Perhaps FAO's definition of the Roles of Agriculture would be more suitable to Brazil's current context.

Although the concept of MFA can be considered as a new paradigm essential to ensure agriculture sustainability and to promote an agroecological transition, it can be difficult to implement, given the existence of very heterogeneous regional contexts. Moreover, the concept can often be

[143] M. MONTEDURO, cit.
[144] G.A. WILSON, cit., p. 369.

ambiguous in relation to its goal - protectionism or appreciation of different roles of agriculture? - in relation to its object - multifunctionality of agriculture, of the farmer or of the rural area? - and in relation to its implementation - contractualization, decoupled financial incentive or non-decoupled?

The agroforestry system could represent a solution for the above questionings and may serve as a tool of MFA implementation. It is a system founded on the appreciation of the different roles of agriculture and not only on the multifunctionality of agriculture itself, but also on the multifunctionality of the farmer and the territory. It fits into both the strong multifunctionality concept and the strong sustainability concept. And, once incentives are granted to agroforestry practices, agriculture multi functionality is also been encouraged.

ABSTRACT

Marcia Fajardo Cavalcanti de Albuquerque - *From conventional agriculture to multifunctional agriculture: Agroforestry as a driver of paradigm shift*

Agriculture provides several social, environmental and economic functions that the market alone is not capable to manage. The consecration of the multifunctionality of agriculture notion (MFA), recognized a historical reality and encouraged the adoption of new political, economic, social and environmental strategies towards more sustainable agriculture practices. In this sense, agroforestry practice could assist in MFA implementation, since it provides several agriculture functions, other than commodities production. This paper aims to disclose the basics of MFA notion, analyzing how the concept emerged within the international scene. This paper also intends to examine the development of the MFA notion in France and in Brazil, countries that face very different social, economic and environmental contexts, in order to set up a comparative analysis. Finally, this work wish to demonstrate that agroforestry systems could represent a tool to encourage agriculture multifunctionality and the adoption of ecological based farming practices.

KEYWORDS: *agriculture multifunctionality*; *agriculture functions*; *agroforestry system*; *family farming*; *agroecology*; *sustainable development*; *France*; *Brazil*.

Marcia Fajardo Cavalcanti de Albuquerque - *Dall'agricoltura convenzionale all'agricoltura multifunzionale: l'agroforestazione come motore del cambio di paradigma*

L'agricoltura offre diverse funzioni sociali, ambientali ed economiche che il mercato da solo non è in grado di gestire. La consacrazione della multifunzionalità della nozione di agricoltura (AMF), ha riconosciuto una realtà storica e ha incoraggiato l'adozione di nuove strategie politiche, economiche, sociali e ambientali verso pratiche agricole più sostenibili. In questo senso, la pratica agroforestale potrebbe essere d'ausilio nell'attuazione della AMF, poiché riguarda diverse funzioni agricole, non riconducibili alla mera produzione di merci. L'articolo si propone di divulgare le basi della nozione di AMF, analizzando come il concetto è emerso all'interno della scena internazionale. Il *paper* intende inoltre esaminare, in una prospettiva comparata, lo sviluppo del concetto di AMF in Francia e in Brasile, Paesi che affrontano contesti sociali, economici e ambientali molto diversi tra loro. Infine, il lavoro vuole dimostrare che i sistemi agroforestali potrebbero rappresentare uno strumento per incoraggiare la multifunzionalità dell'agricoltura e l'adozione di pratiche agricole basate sull'ecologia.

PAROLE-CHIAVE: *multifunzionalità dell'agricoltura*; *funzioni agricole*; *sistema agroforestale*; *agricoltura familiare*; *agroecologia*; *sviluppo sostenibile*; *Francia*; *Brasile*.