The Open Agri-Food System[1] of Ecuador: A commons-based transition towards sustainability and equity to reach a Buen Vivir for all

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1. Introduction

This policy document examines the application of social knowledge economy principles and the commons narrative to the primary sector (agriculture) of the economy. The rationale of the whole document is based on the new narrative that considers food as a commons and not purely as a commodity. A commons describe a specific resource that is owned and managed in common, shared and beneficial for all members of a community (Sandel, 2009). Commons shall not be enclosed by privatization, legislation, pricing or physical barriers. Moreover, commons can be provided by private, state means and self-regulated collective actions, and its property can be private, public or mixed. Food thus could perfectly be considered as a commons, as this paper seeks to prove.

Along those lines, food and nutrition security and food sovereignty should also be considered as Global Public Goods[2] that are beneficial to all human beings and thus we all need to be involved in their governance and maintenance. The commons-based open sustainable agri-food system Ecuador is aiming at will come at the end of long transition where industrial food systems and open food systems will co-exist, influencing each other along the transition path.

In the *Introduction* we explain the concept of the social knowledge economy with reference to the role of access to knowledge and draw a distinction between social and capitalist conceptions of the knowledge economy. Additionally, we provide a critique to the economic approach to the private-public dichotomy when applied to food and develop an alternative rationality to consider food as a commons, based on the multiple and essential dimensions of food.

The following section, *Critique of capitalist models*, looks at how the capitalist transformation of agriculture has resulted in the continued destruction of the natural environment, in the exploitation of developing world countries by rich countries and multinational corporations and in the impoverishment of small farmers around the world.

[2] Global Public Goods are everybody's resources, important for all that shall be governed in a commons-based (peer-to-peer, self-regulating, open-knowledge). Public goods are those deemed desirable by the citizens as they generate tremendous benefits to society, benefits that cannot be fully capitalize by private sector alone.

In the next section, *Alternatives to Capitalist Models*, as its title implies, we introduce the model of sustainable agriculture, which has emerged as a powerful alternative to industrial agriculture, and describe briefly its main features: (a) the application of agro-ecological principles, (b) the practice of free sharing of knowledge, skills and methods undergirding it and (c) the pervasive involvement of the surrounding community. Following this description, the model of sustainable agriculture is illustrated through two case studies. The first case study focuses on the adoption of the model in India, showing how it enabled the development of a system of agricultural production that is both environmentally and economically sustainable, especially for small farmers. The second case study, which discusses the manufacturing of open source farm machines by the Open Source Ecology community, illustrates a manufacturing model for farm machines that is adapted to the needs of small farmers and village communities and provides an example of how the agricultural sector could be transformed in the direction of a post-fossil fuel economy through the development of distributed manufacturing structures.

In the next section, *Preliminary general principles for policy making*, we sum up the conclusions drawn from the case studies in the form of general policy principles, which, as the follow-up section demonstrates, are aligned with the Ecuadorian policy framework, as reflected in the aims and policies put forward in the Constitution and in the National Plan for Good Living. In this section, the proposal to consider food as a multi-dimensional commons essential for all and not just as uni-dimensional commodity is presented as the conceptual pillar of a commons-based transition towards an open and sustainable agri-food system.

The concluding section develops these policy principles into *a set of policy recommendations* for the establishment of a commons-based food producing system that can guarantee the right to food of any person in Ecuador, a right enshrined in the Constitution (2008)[3], and the right to el Buen Vivir included in the Food Sovereignty Framework Law (2009)[4]. This new food system will also embrace a Universal Food Coverage plus the scaling up of sustainable agriculture practices with the aim of transiting towards an open, sustainable and fair food system.

This final section will also elaborate on the conclusions from the Buen Conocer Conference[5] (that was held in Quito, 27-30 May 2014) where more than 200 national and international participants gathered together to analyse the policy drafts and propose transition pathways towards a fairer and open Ecuadorian economy. The Open Agriculture working group came up with a set of concrete policy proposals and priority actions so as to transform patent-driven profit-seeking industrial food systems into open sustainable well-being seeking food systems[6].

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[3] In 2008, Ecuador includes the Right to Food in its Constitution (art 13) as well as the food sovereignty (art 281 and 282). Art. 13.- Las personas y colectividades tienen derecho al acceso seguro y permanente a alimentos sanos, suficientes y nutritivos; preferentemente producidos a nivel local y en correspondencia con sus diversas identidades y tradiciones culturales. El Estado ecuatoriano promoverá la soberanía alimentaria. http://www.asambleanacional.gov.ec/documentos/constitucion_de_bolsillo.pdf

[4] http://www.soberaniaalimentaria.gob.ec/?page_id=132
Amongst the important elements included in the framework law, one could mention its emphasis placed in several provisions on small-scale farmers, who in many underdeveloped countries constitute the majority of people affected by hunger and food insecurity, the calls for the largest possible participation in the development of food sovereignty activities, and the protection of indigenous people and the setting of timeframes and concurrent obligations for the government to realize the right to food (De Schutter, 2010).

[5] http://floksociety.org/2014/06/18/2601/

[6] Summary of worktable about "Open and Sustainable Agri-Food System", available http://fr.slideshare.net/joseluisviveropol/cumbre-del-buen-conocer-floksociety-quito-2730

2. The essential narrative shift: the knowledge economy and the common food transition

Food, air and water are the three essentials our human body requires to functioning. They are limited but renewable resources produced by nature but its public-private nature is however diverse. Air is still considered a Global Public Good (GPG)[7], non-excludable but rival, and yet its commodification has already started using creative accounting based on economic valuation of environmental processes (carbon trade schemes and pollution quotas are just private entitlements to pollute)[8]. Water is in the process of being rebranded from public to private good (Finger and Allouche, 2002; Kay and Franco, 2012), a process that is highly contested in many cities[9]. Food is however largely regarded as a pure private good, as it is excludable and rival, although wild foodstuff could perfectly be considered a commons.

Nowadays, the value of food is no longer based on its many dimensions that bring us security and health, values that are related to our cultural foundations (food as culture), to human rights considerations (the right to food), to the way food is produce (food as a sustainable natural resource) or to its essential nature as fuel for human body. Those multiple dimensions are superseded by the tradable features, being value and price thus mixed up.

This policy document examines the application of principles of social knowledge economy and the commons narrative to the agri-food system, a primary sector of the economy with a traditionally open collective knowledge that is being enclosed in recent decades. This document defends that a fairer and more sustainable food system shall revalue the non-monetary dimensions of food, and hence the global and local food production and distribution systems shall not be exclusively governed by supply-demand market rules[10]. Institutional arrangements based on collective actions, appropriate legal collective entitlements, adequate funding and political support shall also be given due consideration by politicians and academics. Self-regulated collective actions for food, either market-based, share-based, organic, local or fair trade-based represent the third pillar of the governance of the evolving food system. The State-Market duopoly in food provision will need to re-accommodate this mounting force of citizens´ actions to reclaim food as a commons. Food can and must be shared, given for free, guaranteed by the State, cultivated by many and also traded in the market. The purchasing power cannot exclusively determine our access to such essential.

But before we proceed to an in-depth exploration of those principles and their economic application, in this section we shall clarify two conceptual issues quite relevant in this transition: the concept of the knowledge economy with a distinction between social

[7] A Global Public Good is a good available worldwide, essential for all human beings, that cannot be excludable (either because it is very costly or because it would mean killing the excluded person) and whose production and distribution cannot be governed by one state. Global Public Goods are goods that shall be governed in a common manner as they are beneficial for every human being (Kaul, 2010; Kaul and Mendoza, 2003).

[8] Carbon trading is a market for fresh air and polluting permits emerged since the Kyoto Protocol in 1997 whereby polluters and governments exchange rights to pollute air that belongs to everybody (Bohm *et al*., 2012; Newel and Paterson, 2010).

[9] Despite privatising efforts promoted by international institutions such as the World Bank and intensively pursued by private companies such as GDF Suez or Veolia, the re-municipalisation of water services is gaining momentum in Paris, Berlin, Budapest, Barcelona, Jakarta or Dar es Salaam (http://www.remunicipalisation.org , http://www.world-psi.org/sites/default/files/documents/research/dh-remunicipalisation_presentation-ppt.pdf [Accessed January 7 2014].

[10] Moreover, following the philosopher Michael Sandel, market rules not only put prices to goods but in doing so markets corrupt their original nature (Sandel, 2012). The commodification of food crowds out non-market values worth caring about, such as recipes associated to some types of food, the conviviality of cropping, cooking or eating together, the local names of forgotten varieties and dishes or the traditional moral economy of food production and distribution, materialised in the ancient and now proscribed practices of gleaning or famine thefts.

knowledge economies and capitalist economies; and the social construct of private and public goods and its application to food-related knowledge.

2.a.- The concept and forms of the knowledge economy

In contrast to traditional conceptions of the factors of production that are centred on land, labour and capital, the concept of the knowledge economy emphasises the role of knowledge as the key driver of economic activity (Bell, 1974; Drucker, 1969; Webster, 2006 for a critical analysis of the concept). This implies, of course, that the decisive means of production in a knowledge economy is *access to knowledge*. From this standpoint, it is precisely the question of how access to knowledge is being managed that determines the character of an economic system. Capitalist knowledge economies use the institution of intellectual property to create conditions of scarcity in knowledge: so, knowledge is privatised and locked up in property structures which limit its diffusion across the social field. A social knowledge economy, by contrast, is characterised by *open access to knowledge* (Ramirez 2014) and so reconfigures the application of intellectual property rights to prevent the monopolization and private enclosure of knowledge: "knowledge must not be seen as a means of unlimited individual accumulation, nor a treasury generating differentiation and social exclusion" but as "a *collective heritage* which is a catalyst of economic and productive transformation" (National Plan for Good Living, p. 61, italics is ours) and "a mechanism for emancipation and creativity" (Ibid, p. 41). In a nutshell, a social knowledge economy is an economy in which knowledge is seen as a public and common good; an economy which thrives on the '*open commons of knowledge*' (National Plan for Good Living, spanish version, italics ours, p. 67).

2.b.- Revisiting the excludable and rival filter for food: social constructs can be modified

Samuelson (1954) described non-rivalry as one of the two defining characteristics of a public good. Rivarly refers to the extent to which the use of a good by one person precludes its use by someone else. A good that is non-rivalrous can be used by an additional person without reducing its availability to others. Samuelson also mentioned that the marginal cost of producing one additional item is zero: it does not cost anything when, in addition, other persons consume the good. In strict economic terms, food is rivalrous: if I eat a cherry it is no longer available for others to eat. However, cherries are continuously produced by nature (wild cherries) and by human beings (cultivated cherries), so it is no longer restricted in number as there is not a limited number of cherries on Earth. As long as the replenishment rate outpaces the consumption rate, the resource is always available and food is considered a renewable resource with a never-ending stock such as air. This renewal characteristic could play against the rivalrous consideration, as there should be always food, either produced by nature or cultivated. Food produced by nature and harvested in a sustainable way seems to be unlimited, available worldwide and enough for all human beings. Therefore, the food I eat would not prevent others to eat food, although they could not eat the same piece I already ate, as there is available food for everybody at global level (although it may be scarce at local).

Excludability means that it is possible for one person to prevent someone else from using the good. Usually whether or not a person consumes the good depends on whether or not he pays for it. Excludability is usually determined by ownership or property rights (Sands, 2003), as the owner of a good can limit access to it. According to Ostrom, excludability is the ability of producers to detect and prevent uncompensated consumption of their products (Ostrom & Ostrom, 1977), but this feature cannot be applied to wild foods. In that sense, the debate on who owns nature-made wild food is rendered pivotal to understand the proprietary rights of

food. Economists also say that because their non-excludability, public goods get under-produced or under-accesed and that idea fits well with wild food and human demand. The degree of excludability and rivalry depends on the technological nature of the good and the definition and enforcement of property rights. Theoretically speaking, food is also excludable as we can prevent anyone from getting access to food, either by physical means or by pricing it at unaffordable costs. However, should that food exclusion be done in absolute terms, that person would die of starvation, and thus it would eliminate the subject to whom the good, either private or public, is related to. One could argue that currently most foods have a price in the market, and that price deters many people to freely access to food. Although true, this is a superb example of a social construction that can be modified by social norms: proprietary rights are nothing but a set of social and legal norms, whose nature and specificities are determined by each society. Many societies have considered, and still consider, food as a common good, as well as forests, fisheries, land and water, and the consideration different civilisations and human communities have assigned to natural resources is rather diverse and certainly evolving.

Therefore, the main features that traditionally have been assigned to food (excludability and rivalry) can be contested or at least revisited (see table 1). In that sense, it is worth mentioning that both properties are neither ontological to the goods nor permanent, but mostly social constructions whose nature evolves along time and depending on societal norms. The main reason is that society can modify the (non)-rivalry and (non)-excludability of goods that often become private or public as a result of deliberate policy choices (Kaul & Mendoza, 2003). That has clearly happened to food, it is currently happening to water and it will certainly occur to air. But the privatizing trend can be reversed and the rivalrous/excludable features of food can thus be modified if the society so desires.

Table1: Food-related elements and its excludable-rivalry features

<table>
<tr><td></td><td></td><td colspan="2">Rivalry
the property of a good whereby one person's use diminishes other people's use</td></tr>
<tr><td></td><td></td><td>Low</td><td>High</td></tr>
<tr><td rowspan="2">Excludability

the property of a good whereby a person can be prevented from using it</td><td>Difficult</td><td>PUBLIC GOODS

Free-to-air television, air, street lighting, national defence, scenic view, universal health system
1. Emergency management for zoonotic diseases
2. Cooking recipes
3. Gastronomy knowledge
4. Safe food supply system
5. Traditional agricultural knowledge
6. Genetic resources for food and agriculture
7. Regulation of extreme food price fluctuations</td><td>COMMON POOL RESOURCES

Timber, coal, oil fields
1. Ocean fish stocks,
2. Edible wild fruits and animals</td></tr>
<tr><td>Easy</td><td>CLUB GOODS

Cinemas, private parks, satellite television,
1. Patented agricultural knowledge
2. Hunting in game reserves
3. Fishing and hunting licenses</td><td>PRIVATE GOODS

Clothing, cars, personal electronics
1. Cultivated food,
2. Privately owned agricultural land
3. Genetically modified organisms</td></tr>
</table>

			4. Patented improved seeds

Adapted from Hess & Ostrom (2007)

Nevertheless, most goods do not exhibit these two characteristics in pure form and a significant number of global public goods are non-excludable or non-rival only to a degree (Hampson & Hay, 2004). They have mixed features and are referred to as "impure or near-public goods". The impure goods can either be "club goods", excludable but non-rival (Buchanan, 1965) or "common-pool goods", rival but non-excludable. The private market incentive to provide public and near-public goods is weak, meaning they will only be supplied at sub-optimal levels from society's perspective. Hence, in the case of public and near-public goods the market fails to provide an adequate supply and thus governments shall intervene to guarantee food for all. Adam Smith already observed that some goods are regularly underprovided simply because profits cannot be recaptured by the suppliers of those goods. And when markets cannot provide such advantageous goods, governments should.

Common pool goods apply well to wild edible plants and animals, and they suffer from depletion through over-use and free-riding (Sands, 2003). Club goods are those whose costs and benefits are shared among and limited to a specific group of individuals, the club, and they may be funded through a blend of taxpayer subsidy and user fees. Hunting or fishing licenses or game reserves are food-related examples. Club goods can be either publicly or privately provided and often result in the creation of monopoly power. Sometimes club goods are provided by the public sector and funded either entirely through user fees or through a combination of user fees and taxpayer subsidization (e.g. public buses). Alternatively, private firms may provide the good or service with regulatory oversight to regulate the price as it has been the case of the price of staple food.

Box 1: The tragedy of the Commons: Hardin vs Ostrom

According to the classic economic theory, the most usual problem created by common-property resources is the tendency for them to be overexploited to the point of exhaustion or extinction, if there is free and open access to them in which people not paying for the good may continue to access it (Hardin, 1968). Throughout the world, natural fisheries, common grazing pastures, forest resources and bio-piracy are also examples of open-access resources prone to the tragedy of the commons. In North America, recent problems with salmon and lobster fishing illustrate situations in which common-property resources in food production are involved (Rocha, 2007).

Some public goods may be subject to excessive use resulting in negative externalities affecting all users. Fish in the oceans and mushrooms in the forests are renewable resources in that their stocks can be replenished as long as the rate at which they are harvested is lower than the rate at which they can reproduce themselves. The problem with free, open-access common resources is that they tend to be harvested at a faster rate than they can naturally replenish themselves. Without controls, each resource taker has an incentive to take as much and as fast of this common resource as it can.

Up to recent times, the debate on the best governance of common goods was circumscribed to the state or the market. The Hobbesian solution portrayed in the Leviathan (Hobbes, 1651) acknowledges human selfishness and the subsequent trend to free-riding and thus the only possible solution to govern the commons and avoid its tragedy is through a centralised state and its regulatory force of public ownership. On the contrary, the Lockean solution assumes that common property prevents the optimal use of a good as no incentives are provided to

keep and care for it and only fully privatised ownership can work. However, private property is not the only (or the most practical, or fair, or effective) way of dealing with this externality problem. The merit of Elinor Ostrom's theoretical and practical research was to offer a convincing experience-based third model: one of emergent localised polycentric governance of complex economic systems (Ostrom, 2009), where self-motivated collective actions by local groups had also an important role to play in governing natural resources.

The tragedy of the commons in economic terms is rebranded as social dilemmas in the political sphere (Kaul et al., 2003), since all those who benefit from the provision of a local public good find it costly to contribute and would prefer others to pay for the good instead. If everyone follows the selfish dominant strategy, then the good is not provided or is underprovided. Yet, everyone would be better off if everyone contributed. In those situations of social dilemmas, institutions introduce a certain level of collective constraint, whether through formal or informal rules (such as social norms and intrinsic preferences), with the aim to produce better outcomes (Ostrom, 2005). Another political dilemma rather relevant these days is that "public" no longer means the communities that manage their local resources, but the central governing authority that controls these resources. In theory, public still means people; in practice, public often means government decoupled from the people's social/ecological rights to their common goods (Quilligan, 2012).

3. The agony of industrial agriculture and the need for a transition

3.a.- The "old" XX century paradigm: more and cheaper food by the industrial food system

The industrial technology-dominated food system has achieved remarkable outputs during the second half of the 20th century by increasing food production and facilitating food access to millions of urban and rural consumers. Tripling global crop production, increasing yields, lowering food prices and moving away from habits and skills to more systematically organized and controlled ways of production are all commendable achievements for human kind (Bindraban and Rabbinge, 2012). As a matter of fact, between 1960 and 1990, the share of undernourished people in the world fell significantly since improved availability and decreased staple food prices dramatically improved energy and protein consumption of the poor (Hazell, 2010; FAO, 2013a). FAO reports a reduction of 173 million hungry people from 1015 million (19%) in 1990 to 848 (12%) in 2013, representing 7.5 million less per year (FAO, 2013b). And the UN also confirms that 700 million fewer people lived in conditions of extreme poverty in 2010 than in 1990 (UN, 2013a). This linear increase in food production has outpaced the population growth benefiting virtually most consumers in the world and the poor relatively more because they spend a greater share of their income on food[11].

Agricultural mechanisation and better agronomic knowledge are responsible for the synergistic effects of the many interacting, innovative technologies that have contributed to past yield increases. The improved high-yielding varieties developed by international and national research centres have largely contributed to that increase (Evans, 1998). These varieties were supplemented with the development of better and cheaper fossil fuel-based agro-chemicals to fight plagues and diseases and increase growth. The expansion of arable

[11] Although consumers generally benefited from declines in food prices, farmers benefited only where cost reductions exceeded price reductions (Evenson and Gollin, 2003).

land and irrigation schemes, and greater crop intensification have also contributed to food production (FAO, 2013c; UNEP, 2009).

Productivity gains, however, have been uneven across crops and regions (Evenson and Gollin, 2003) and global increases in production have been confined to a limited range of cereal crops (rice, maize, and wheat) with smaller increases in crops such as potato and soybean (Godfray *et al*., 2010). Increased cereal production has supported the increase in chicken and pig production, but also led to concerns that human diets are becoming less diverse and more meat-based, with the subsequent increase in the ecological footprint. We produce 4600 kcal per person of edible food harvest, enough to feed a global population of 12-14 billion (UNCTAD, 2013), but after waste, animal feed and biofuels, we end up with no more than 2000 Kcal per person (Lundqvist *et al.*, 2008). And it seems that yield improvements are already reaching a plateau in the most productive areas of the world (Cassman *et al.*, 2010; Lobell *et al*., 2009), rendering almost impossible to double food production by 2050 with the current trends (Ray *et al*., 2013). That explains why many scientists and agri-food corporations are calling for a Greener Revolution or Green Revolution 2.0 (Pingali, 2012).

3.b.- The failure of the industrial food system to feed us sustainably and with equity

However, this mechanisation and commodification of the industrial food system did not come for free and many undesirable externalities and consequences are evident nowadays (see Box 1). Moreover, in the last decade it seems to have gone too far in the radical consideration of food as a pure commodity that can be speculated with, diverted from human consumption to biofuel production and used as a justification for unethical land grabbing in the poorest but land-rich countries by the richest but land-poor ones.

Box 2: A world of growing hunger and obesity spurred by profit-seeking food industries
Globally speaking, we have a troublesome relationship with food, as more than half the world eats in ways that damage their health. Eating is not a source of pleasure for billions but a compulsory habit and certainly a cause of concern. Obesity and undernutrition affect an estimated 2.3 billion people globally, about one third of the world's population (GAIN, 2013), and food and nutrition security is at the forefront of contemporary political debates. Hunger is the largest single contributor to maternal and child mortality worldwide, with 3.1 million children dying every year of hunger-related causes (Black *et al*., 2013). Additionally, overweight and obesity cause 2.8 million deaths (WHO, 2012). Despite years of international anti-hunger efforts, rising gross national incomes and per capita food availability, the number of hungry people has been reduced at a very slow pace since 2000 and we have 848 million undernourished people in the world (FAO, 2013a). Obesity is rapidly mounting and 1120 million obese people are expected by 2030 (Kelly *et al*., 2008). The ironic paradoxes of the globalised industrial food system are that half of those who grow 70% of the world's food are hungry (ETC Group, 2013), food kills people, food is increasingly not for humans (a great share is diverted to biofuel production and livestock feeding) and 1/3 of global food production ends up in the garbage every year, enough to feed 600 million hungry people (FAO, 2011).

The side-effects of the industrial food system can be illustrated by the fact that 70% of hungry people are themselves small farmers or agricultural labourers (UNCTAD, 2013), agriculture is highly demanding of water[12] and it makes a poorly use of that scarce public good, the

[12] 96% of world non-marine water is used for food production (Marsily, 2007).

industrial system diminishes the nutritious properties of some foods, by storing in cold rooms, peeling, boiling and the transformation processes (Sablani *et al*., 2006; Toor and Savage, 2005), an overemphasis on production of empty and cheap calories renders obesity a growing global pandemic, food production is highly energy inefficient as we need 10 kcal to produce 1 kcal of food (Pimental and Pimental, 2008), soil degradation and biodiversity loss amongst others. With the current levels of food production and consumption, if we all were a standard US citizen, we would need 5.2 planets to cover our needs (WWF, 2012). And nevertheless the 1.2 billion poorest people account for only 1 per cent of world consumption while the billion richest consume 72 per cent (UN, 2013b).

There is ample evidence to the effect that the high application rates of chemical pesticides, synthetic fertilisers and defoliants characteristic of modern monoculture (i.e. one-crop farming) result not only in the desertification of the land (e.g. UNESCO 2003), but also in unhealthy agri-food products (e.g. Cheng 2012) and in a mushrooming of pesticide-induced diseases (e.g. GTZ Sustainet 2006; Sherwood et al. 2005; Venkateswarlu, Balloli & Ramakrishna 2008)[13]. At the same time, the dependence of farmers on such agrochemicals undermines not only their autonomy, rendering them dependent on the agri-food businesses that produce and supply them, but also their livelihood, as the purchase of these industrial inputs often constitutes the greatest part of small farmers' total operating costs (Lewontin 1998; Raidu & Ramanjaneyulu 2008).

What distinguishes industrial agriculture from previous modes of agricultural production is not the absence of petty producers and small-scale farm production, but the domination of profit-seeking corporations over them through their control of the inputs and outputs of the farming process (Lenin 1977; Lewontin 1998; Venkateswarlu, Balloli & Ramakrishna 2008). Until mid-20th century, it was a common practice among farmers to produce inputs such as seed and fertiliser themselves, which meant that the choice of what inputs were to be used in the process of farm production rested ultimately with them. All that changed with the introduction of GM seeds and synthetic chemical treatments, inaugurating a new era in agriculture in which inputs that were hitherto produced directly on the farm by the farmers themselves were to be purchased from agrochemical companies.

3.c.- The seed oligopoly

The importance of who is in control of these inputs should not be underestimated. Take seeds for example: every cycle of farm production begins with seeds, making them the central input into farming. Furthermore, seeds have a very peculiar characteristic: when planted by the farmer, seeds produce plants that themselves produce yet more seed. For that reason, they constitute an input that can be reproduced by the farmers themselves. Though this is undoubtedly a useful property of seeds for the farmers, the opposite goes for agri-food businesses which have long looked upon the ability of farmers to reproduce this input over and over again in the farming process as a barrier to their profitability[14]. It is therefore little suprise that over the past 100 years massive investments from the private sector have been

[13] Indicatively, pesticide poisonings and deaths in Ecuadorian farmer communities are among the highest recorded in the world. For a study focused on potato growers in the Andean highlands throughout Northern Ecuador, see Sherwood et al. (2005).

[14] Consider, for example, the advertisements placed by Monsanto in magazines: 'When a farmer saves and replants Monsanto patented biotech seed, he understands that what he is doing is wrong. And that...he is *committing an act of piracy*. Furthermore, seed piracy could cost a farmer hundreds of dollars per acre in cash settlements and legal fees, plus multiple years of on-farm and business records inspection' (quoted in Lewontin 1998, italics by authors).

directed to R&D projects aimed at developing solutions to problems of that nature (Vanloqueren & Baret 2009). By taking into account the decisive influence of the business sector over the direction of research in agricultural science and technology (Alston et al. 1998a, 1998b; Aoki 2009, p. 2298; Kloppenburg 2010, p.372; Russell 1999; Vanloqueren & Baret 2009)[15], it is easy to understand how the development of the hybrid method of breeding, for example, emerged in the 1930s as a historical solution to the obstacles that stood in the way of the development of capitalist agriculture. What this method accomplished was to evolve hybrid seeds that produced increased crop yields but which could not be reproduced in the farming process, thereby forcing farmers to go back to the seed company every year to buy new ones (Busch et al. 2004, p. 105; Kloppenburg 1988; Lewontin 1998). So, very soon control over this crucial input passed from the hands of farmers into the commercial seed companies and the agri-food industry. In more recent years, huge investments have flown into biotechnology R&D for the purpose of extending Capital's control over the process of agricultural production, resulting in methods of genetic manipulation that allow plants to set seed and make a crop but which render those seeds unable to germinate; and in DNA fingerprinting, genome control and so-called Genetic Use Restriction Technologies (GURTs), which allow seed companies to control how their seeds are being used by farmers (Drahos & Braithwaiter 2002; Kloppenburg 2010; Lewontin 1998; Srinivasan & Thirtle 2002). The relationship of dependence of the farmers on agribusiness companies is consummated in the legal agreements they must sign to buy seeds, which force them to give away all property rights in the next generation of seed produced by the crop (Lewontin 1998).

3.d.- The agro-chemical dependence

In much the same way that in the space of the last century farmers became dependent on agribusiness companies for seeds, they also became dependent on them for several critical inputs such as pesticides and fertilisers. Like GM seeds, chemical pesticides and fertilisers held the promise of raising farm productivity and were aggressively promoted by the industry. As a result, they spread fast, extending the domain of manufactured inputs into farming. Most importantly, the control of agrochemical firms over all crucial inputs in farming allowed them over time to take control over farm outputs. This transformation was made possible not only through technological innovations such as GM seeds and chemical pesticides, but also through the predatory business and legal practices which the purchasers of farm outputs employed to take control of the entire production process, as epitomised in full swing in the contract farming system. An example of the nature of this system in which a company provides the inputs into the farming process and collects the products, while the farmer provides the labour and the land, is Tyson Foods, a major supplier of chickens to fast food restaurants and supermarkets in the US. The company owns no farms. Instead, Tyson Foods chickens are produced by an army of small farmers who are obliged by the legal contract they have signed to procure all inputs (the chicks, the feed, the medication, the pesticides, the rodenticides, the insecticides and so on) exclusively from the company, which then collects the mature chickens at a date and time of its own choice. Thus, although the farmers retain ownership of the land and the buildings in which the chicks are raised, it is the company, rather than the farmers, that controls the inputs and farming practices. Through the system of contract farming, therefore, the farmers cease to be independent artisans, being no longer in control of the nature and tempo of the production process in which they are engaged. And so,

[15] The private sector accounts for one-third of global agricultural research spending. Its share corresponds to 10-15% of total agricultural R&D in developing countries, but rises to 50% in OECD countries (Alston et al. 1998a, pp.1066-7; Pardey & Beintema 2001).

they are transformed into mere operatives in an assembly line production process. In short, they are *proletarianised* (Lewontin 1998).

3.e.- The patented agricultural science and the enclosure of traditional knowledge

What is more, the enclosure of farmers' practices and of the agricultural commons has been reinforced by the ever more restrictive IP regimes which developed in the post-WWII era[16]. The construction of these legal edifices at both national and international levels, through the expansion of patentability and of the spectrum of legal mechanisms (such as utility patents and plant variety protection [PVP] certificates) that can be used to secure IP rights, resulted in the enclosure of resources like seeds that were hitherto considered the common heritage of humankind and, by extension, of the farming practices that were predicated on open access to such common resources, thus eliminating farmers' right to save, replant and exchange seeds (Aoki 2009, pp. 2279-96; Kloppenburg 2010, pp. 370-372)[17]. More alarmingly, these legislative frameworks strengthened the existing patterns of exploitation of the developing world by rich countries and capitalist firms[18]: by instituting stricter and broader IP protection for new bio-products developed from biogenetic resources, *while* excluding the very same biogenetic resources (that is, the raw material for the development of those products) from such protection eligibility, their effect has been to promote the commercial exploitation of those resources without any compensation to the indigenous communities and countries in whose territory they are collected from[19].[8] Unsurprisingly, such exploitative appropriation of the developing world's biogenetic resources and of indigenous forms of traditional knowledge by technologically advanced countries and corporations has been recognised as a form of *biopiracy* (Aoki 2009; Cluis 2013; Kloppenburg 2010; Russell 1999; Wikipedia 2014a)[20]. Yet, though developing world countries are fully aware of how these regulatory frameworks serve to exploit them, they have been forced to comply with them under the threat of trade sanctions by rich countries: the US, in particular, has used this 'trade pressure strategy' time and again to blackmail developing countries like Ecuador, India and Pakistan into signing international IP agreements (Russell 1999, p. 249; van de Wateringen 1997).

3.f.- Subsidized Industrial Agriculture

[16] A detailed analysis of the historical transformation of agriculture in the 20th century is unfortunately beyond the scope of the present policy paper. For a brief history of the application of IP rights to agriculture, see Bent (2003) and Aoki (2009). For a study of the (decisive role of both technology and IP legislation in the) capitalist capture of seeds and the enclosure of farming practices, see Kloppenburg (1988). For a critical study of the historical expansion of restrictive IP regimes, see Drahos and Braithwaiter (2002).

[17] As a result of aggressive lobbying by the seed industry, farmers' right to save, replant and exchange seed was eliminated at the 1991 meeting of the UPOV (International Union for the Protection of New Varieties of Plants), while the 'International Treaty on Plant Genetic Resources' (ITPGR) signed in 2001 by 101 countries restricted IP protection to institutional public and private plant breeders, thereby excluding individual farmers from such protection eligibility (Aoki 2009, pp. 2279-87).

[18] Even after former colonies gained independence, the patterns of germplasm flow ran from the former colonies into the laboratories, genebanks, and testing fields of the developed countries. Within developed countries, farmer landraces and germplasm emerged protected by intellectual property laws (Aoki 2009, p. 2278).

[19] Third world nations are asked to supply plant genetic resources – the raw material of the new genetic technologies – as common heritage. In return, they are offered the opportunity to purchase the products of biotechnology' (Kloppenburg quoted in Aoki 2009, p. 2281). Developing countries will have to pay fees for genetic resources, modified in the North and returned to markets of the South' (Russell 1999, p. 250).

[20] For a discussion of the problem of biopiracy centred on Ecuador, see the FLOK Society Project policy paper on biodiversity by Golinelli et al. (2014).

Moreover, the industrial food system is not even more efficient or cost-benefit than the more sustainable food systems (either modern organic or customary) as it is heavily subsidized and amply favoured by tax exemptions[21]. The great bulk of national agricultural subsidies in OECD countries are mostly geared towards supporting this large-scale industrial agriculture[22] that makes intensive use of chemical inputs and energy (Nemes, 2013), and that helps corporations lower the price of processed food compared to fresh fruits and vegetables. The alternative organic systems are more productive, both agronomically and economically, more energy efficient and they have a lower year-to-year variability (Smolik *et al*., 1995) and they depend less on government payments for their profitability (Diebel *et al*., 1995).

Anyhow, it is not about "organic" vs. "industrial" agriculture, it is about valuing the multiple dimensions of food to human beings other than its artificially-low price in the market. For instance, dimensions related to fair production and nutritional and enjoyable consumption, compared to the mono-dimensional approach to food as a commodity, where the major driver for agri-businesses is to maximize profit by producing and delivering cheap food with low nutritional value and high-energy demanding.

3.g.- The enclosure of food by the industrial model

And yet food was not always regarded in such a way and as it was cultivated for centuries in common and considered a mythological or sacred item[23]. But during the 19th and 20th centuries, food evolved from a common local resource to a private transnational commodity, becoming an industry and a market of mass consumption in the 21st century globalized world (Fischler, 2011). The conversion of goods and activities into commodities, or commodification, has been the dominant force that transformed all societies since at least the mid-19th century[24] (Harvey, 2005; Polanyi, 1944/1957; Sandel, 2013; Sraffa, 1960). The process was not parallel in all countries (i.e. the Communist period in the USSR and its allies or the varied penetration of market-led paradigms in customary native societies of developing countries) but it ended up in the dominant industrial system that fully controls international food trade, feeds a great share of global population and has given rise to the corporate control of life-supporting industries, from land and water-grabbing to agricultural fuel-based inputs.

The enclosure mechanisms, through privatization, legislation, excessive pricing or patents, have played a role in limiting the access to food as a commons, transferring common properties from the many to the few. This commodification process, understood as the development of traits that fit better with the mechanized processes developed by the industrialized food model, is a human-induced social construct that deprives food from its non-economic attributes just to retain its tradable features, namely durability, external beauty

[21] The Global Subsidies Initiative http://www.iisd.org/gsi/ [Accessed January 7 2014].

[22] The average support to agricultural farmers in OECD countries in 2005 reached 30% of total agricultural production, equalling to 1 billion $ per day (UNCTAD, 2013). In OECD countries, agricultural subsidies amount $400 billion per year. Moreover, the world is spending half a trillion dollars on fossil fuel subsidies every year. In 2011 the US government gave $1billion in fuel tax exemptions to farmers. The overall estimate for EU biofuels subsidies in 2011 was €5.5–€6.8 billion (IISD, 2013; WWF, 2011).

[23] Many types of food are often endowed with sacred beliefs (fish and bread in Christianity, people is believed to be made of corn among the Mayan peoples, quinoa is sacred for the Peruvian Incas, cows are sacred and uneatable in India) and their production and distribution are thus governed by non-market rules, being in many cases produce, distribute and eat in commons (Diamond, 1997; Fraser and Rimas, 2011; Montanori, 2006).

[24] What makes any good, action or activity a commodity is the possibility of trading it for profit. Today, not everything useful is a commodity but there are still few things that can't be bought in the market. Capitalism can be characterized by the production of commodities by means of commodities, as all means of production can also be traded (raw materials, labour, money, knowledge).

and the standardisation of naturally-diverse food products[25]. The commodification of food meant more food miles, immoral food wastage, an impoverishment of food diversity, a reduction of food varieties to those who are able to cope with transport hurdles and stay attractive to customer and all-the-year presence of seasonally produced foods. During this process, the nutrition-related properties of food were neglected and cheap calories became the norm[26]. However, these cheap calories came at great cost to the environment, human health and societal well-being, lowering farm prices of food producers and sustaining cheap rural labour, forcing small-scale farmers to flee to urban areas (Carolan, 2013; Roberts, 2013).

And so we reached the current situation where the value of food is no longer based on its many dimensions that benefit humans. The value in use (a biological necessity) is highly dissociated from its value in exchange (price in the market) (Timmer *et al*., 1983). However, food is unique among commodities in its multiple dimensions such as a basic human need that should be available to all, a fundamental human rights that should be guaranteed to every citizen, a pillar of every national culture, certainly a marketable product that should be subject to fair trade and sustainable production and finally a common good that should be enjoyed by all humans and governed in a common and responsible way. Actually, the consideration of food as a pure commodity opposes radically to all the other dimensions, rather important for our survival, self-identity and community life. This reduction of the food dimensions to one of a commodity explains to many authors[27] the very roots of the failure of the global food system, a system that produces food in excess to adequately feed the whole planet but it is not capable of guaranteeing equitable food access to everybody by simply using the market rules. The conventional industrialised food system is operating mainly to accumulate and underprice food resources and maximize the profit of food enterprises instead of maximizing the nutrition and health benefits of food to all of us[28]. Fully privatized food means that human beings can eat food as long as they have money to buy it or means to produce it, means that are mostly private goods (land, agro-chemicals, patented seeds) although not always (local landraces, rainfall, agricultural knowledge). With the dominant no money-no food rationality, hunger still prevails in a world of abundance.

3.h.- The over-reliance on market forces to govern the agri-food system

One of the dominant economic doctrines of recent decades has been that market forces by themselves could regulate the national and international food systems to pull hungry people

[25] The neo-liberal trend to carry out economic valuations in monetary terms of any type of ecosystem service, originally meant to create economic incentives for conservation, has definitely paved the way for the subsequent commodification of ecosystem services (Gomez-Baggethun and Ruiz-Perez, 2011).

[26] By cheap calories we mean low-cost sources of dietary energy such as refined grains, added sugars and fats. They are inexpensive and good tasting and, jointly with salt, they form the basis of ultra-processed industrial food. In contrast, the more nutrient-dense lean meats, fish, fresh vegetables and fruit are generally more costly because they are not so largely subsidized (Drewnowski and Darmon, 2005; Monteiro *et al*., 2011).

[27] There is a growing literature of alternative food movements, activists in developed and developing countries, academic rural sociologists and Keynesian economists that highlight the pervasive nature of food assigned by the industrial food system, denouncing the consideration of food as a pure commodity that can be speculated with, modified genetically, patented by corporations or diverted from human consumption just to maximise profit (Anderson, 2004; Christ, 2013; Kotagama *et al*., 2008/2009; Magdoff and Tokar, 2010; Zerbe, 2009). The commons approach to food is gaining track via urban-led alternative food networks, rural food sovereignty movements and progressive academic schools of thought.

[28] For additional critics to the industrialised food system dominated by mega corporations and how these companies have just sought to maximize profit at the expense of nutritional value, original taste, natural diversity of food varieties and local/seasonal markets see also Azetsop and Joy (2013), Clapp and Fuchs (2009), Foster, Magdoff and Buttel (1998), Rosset (2006), Weis (2007).

out of the plight of starvation and destitution. It was praised that market-led food production and allocation would finally achieve a better-nourished population, as long as the world's average wealth increased. However, reality has proven otherwise as unregulated markets may still not provide a socially efficient quantity of food even if enough income was distributed to low-income groups. Moreover, despite the reliance on industry self-regulation and public–private partnerships to improve public health and nutrition, there is no evidence to support their effectiveness against hunger, obesity and safety considerations (Hawkes and Buse, 2011; Moore-Lappe *et al.,* 1998). Transnational corporations are major drivers of obesity epidemics by maximising profit from increased consumption of ultra-processed food and drink (Ludwig *et al*., 2001; Monteiro *et al.,* 2011). Marion Nestle has recently uncovered how Coca Cola is supporting scientific research to influence in the public opinion towards their industrial fatty and high-sugar products[29]. These conflicts of Interest between economic profit and scientific knowledge have proven to exert a reporting bias in industry-financed academic research so as to mask or discard the direct relationship between ultra-processed sweetened drinks and obesity (Bes-Rastrollo *et al.,* 2013). The consumption of unhealthy food and drinks is occurring faster in food systems that are highly penetrated by foreign multinationals in poor countries (Stuckler *et al*., 2012), where government regulations and public opinion are usually not capable of controlling corporate leverage. That explains why the only evidence-based mechanisms that can prevent harm caused by unhealthy commodity industries are public regulation and market intervention[30]. This means, more state not less.

A food system anchored in the consideration of food as a commodity to be distributed according to the demand-supply market rules will never achieve food security for all (Rocha, 2007). It is evident that the private sector is not interested in people who do not have the money to pay for their services or goods, whether be healthy food or staple grains. Moreover, markets, governed by private, individual self-interest, will not provide an adequate quantity of public goods, such as public health, good nutrition or hunger eradication, with enormous although non-monetised benefits to human beings, as the positive externalities cannot be captured by private actors. Those public goods have to be sought and maintained by the public sector and the collective actions of citizens.

3.i.- A transition towards an open & fair agri-food system that guarantees sustainability

In conclusion, with millions of people needlessly dying prematurely each year from hunger and obesity in a world of ample food supplies, nobody can dispute the need for a change. The mass industrial food model, which is becoming highly dominant, is increasingly failing to fulfil its basic goals: producing food in a sustainable manner, feeding people adequately and avoiding hunger. There is a need to bring unconventional and radical perspectives into the debate on possible solutions for a transition towards a fairer and sustainable food system. Following Wrights' real utopias, there is an urgent need to develop alternative visions to the industrial food system, no matter how little support that mat get, since the mere fact of proposing alternatives outside the dominant mainstream may contribute to creating the conditions in which such support can be built (Wright, 2010). And the power of food to generate a substantial critique to the neoliberal corporate and industrialized food system and to harness multiple and different alternative collective actions for food shall not be underestimated (McMichael, 2000). Food is a powerful weapon for social transformation.

[29] http://www.foodpolitics.com/2013/10/annals-of-nutrition-science-coca-cola-1-nhanes-0/ [Accessed January 7 2014].

[30] Strong laws consistently had a biggest impact in curbing school sales of junk food and sweetened drinks and thus in slowing childhood obesity (Moodie *et al.,* 2013; Taber *et al.,* 2012; WHO, 2013).

The development of capitalism in agriculture has produced the following results: environmental degradation, hazardous foodstuffs, a spectrum of pesticide-induced diseases, exploitation of the developing world by capitalist firms and rich countries and impoverishment of petty enterpreneurial producers around the world. In addition to constituting a burning indictment of this mode of agricultural exploitation, the ill-effects of the transformation of agriculture by capital reinforce the urgency of posing the question: *what is the alternative?*

4. The alternatives to industrial models: Open, sustainable and commons-based agri-food system

The alternative is that form of agriculture which has come to be known as *sustainable*. Wherever it has been tried, the adoption of the model of sustainable agriculture has proven to be beneficial for the environment as well as for the health and livelihood of small farmers. Its main features are as follows (Altieri 1995; De Schutter 2010; Pretty 2008; Wikipedia 2014c, 2014d):

- It is based on the application of *ecological and agroecological principles*. For example, it integrates ecological processes and biological controls such as nitrogen-fixing, nutrient cycling, soil regeneration and predation; and makes use of locally available resources such as low-cost, organic compost recycled from yard and kitchen waste.
- *It is knowledge-intensive*: sustainable agriculture requires the development and diffusion of skills and knowledge that allow farmers to use traditional techniques in place of industrially manufactured inputs.
- *It is community-driven*: one of the principles of sustainable agriculture is that the effective mitigation of common agricultural and natural resource problems, such as for pest, watershed, irrigation, forest and credit management, demands the active participation of the community. Thus, sustainable agriculture systems are designed to involve the community in their management and day-to-day operation: for instance, by organising local, organic food markets; by setting up community seed banks and seed sharing networks; by running farmer field schools; by organising farmers into co-ops for direct retailing to consumers or for the provision of shared services to farmer communities.

The character of sustainable agriculture is nicely summed up in Conway's (1985, 1986) definition of its properties as characterised by high *productivity*; *sustainability* and *resilience* in environmental as well as economic terms; and *equitability* in the sense that, relative to other modes of agricultural production, the benefits of sustainable agriculture are distributed more evenly among its human beneficiaries.

Benefits of sustainable agriculture

1.- High productivity. Contrary to what many people think, the adoption of sustainable agriculture is not less productive than intensive types of single-crop farming (monoculture). Quite the contrary, the introduction of agricultural biodiversity (the integration of trees and livestock into farming) and the shift in agricultural factors of production from use of chemical pesticides and synthetic fertilisers to natural substitutes (e.g. *Desmodium*, which corn farmers in East Africa plant to 'push away' pests and *Faibherbia Albida*, a nitrogen-fixing tree that can

be used as a natural fertiliser) has been shown to *increase productivity*. Characteristically, Pretty et al.'s study (2006) of the effect of the adoption of sustainable agriculture in 286 agricultural projects in 57 developing countries (covering 37 million hectares), which is the largest study of its kind, reported an incrase in crop productivity by an average of 79%. Crucially, however, this increase in productivity is not achieved at the expense of quality. On the contrary, the reduction in the use of agrochemicals has the effect of improving the quality of agricultural products and, by extension, the nutrition of the broader community.

2.- It helps reduce rural poverty. Replacing agrochemicals with natural substitutes (such as nitrogen-fixing legumes and natural enemies) makes small farmers less dependent on external, industrially manufactured inputs, which often constitute the greatest part of their total farming costs. In consequence, they become less dependent on agrochemical firms and moneylenders (De Schutter 2010, pp. 9-10; Centre for Sustainable Agriculture 2006).

3.- At the same time, *it makes agricultural labour more pleasant and healthy*. A number of studies, such as Sherwood et al.'s (2005) study of organic potato farmers in the Andean highlands throughout Northern Ecuador, have shown that sustainable farming is 'more attractive to farmers, because it procures pleasant features for those working the land...such as shade from trees or the absence of smell and toxicity from chemicals' (De Schutter 2010, p. 11; also, see Sosa et al. 2010).

4.- It makes agricultural systems more *resilient to climate change*. Indicatively, by introducing intercropping, Chinese rice farmers have improved remarkably their crops' resistance to diseases, while increasing their yields by 89% (Zhu et al. 2000). More generally, the low-carbon, resource-preserving character of ecological farming edges agriculture onto a sustainable path through the shift in the factors of production from polluting agrochemicals towards natural substitutes.

5.- It has the backing of farmer communities and movements, which it brings together. Sustainable agriculture sprung out of the bosom of NGOs and activist organisations and spread through farmer field schools and farmer movements such as the Campesino a Campesino Movement in Central America (De Schutter 2010, p. 14; Holt-Gimenez 2006; Sosa et al. 2010). Thanks to its communal character as well as to the strong links with grassroots farmer movements that it has maintained to this day, sustainable agriculture is a rather effective organisational platform for community mobilisation (Pretty 2003).

The next section illustrates these benefits through two case-studies. The case study on the region of Andhra Pradesh in India demonstrates a mode of transformation of agricultural production that promotes community involvement and the sharing of knowledge, skills and methods; that develops and harnesses the agricultural commons; that is environmentally sustainable as well as economically beneficial for small farmers. The second case study discusses how the Open Source Ecology network of farmers and engineers leveraged the global design commons and the Internet to successfully engage the global community of open hardware hackers and hobbyists in the development of industrial farm machines (e.g. tractors) that are adapted to the needs of small farmers, being cheap to build and easy to repair and customise by end users.

Case-study 1: Sustainable agriculture in India

An example of a large-scale adoption of the model of sustainable agriculture comes from Andhra Pradesh, one of India's largest states with more than 70% of the population engaged in agriculture. Throughout the 2000s a wave of suicides shook the country: more and more smallholder farmers were taking their lives because they had no money to repay their debts, which were largely attributable to the cost of external inputs such as chemical pesticides, synthetic fertilisers and genetically modified (GM) seeds[31]. The crisis, which took on epidemic proportions in 2004-2005, rendered imperative the trying out of alternatives. NGOs and agricultural activists like *SECURE (Socio-Economic and Cultural Upliftment in Rural Environment)*[32] and the Hyberabad-based *Centre for Sustainable Agriculture (CSA)*[33] sprung up to promote modes of sustainable farming that do not use industrial pesticides and GM seeds. Although most of the farmers were extremely sceptical about organic farming methods and very hesitant to try them, a few of them started with the help and huidance of the above activists to experiment with non-pesticidal management in their cotton fields[34]. The results were remarkable: their yield remained in the same levels, but the quality of the crop was higher now and so could be sold at a higher price in the market. At the same time, they saved money that they would have spent on procuring industrial pesticides, fertilizers and seeds[35] (see Fig. 1, 2 below)(Centre for Sustainable Agriculture 2006; Raidu & Ramanjaneyulu 2008).

Fig. 1 (Source: Centre for Sustainable Agriculture 2006, p. 44)

Table 3 Non-pesticidal and conventional management in cotton, 2001–2 (8 farmers in Punukula)

	Average yield (t/ha)	Cost of plant protection (Rs/ha)	Net income (Rs/ha)
Non-pesticidal management	1.56	4301	3420
Conventional management	1.47	8596	–5201

Fig. 2: Agriculture cost of production for small farmers in AP (Source: Centre for Sustainable Agriculture 2013)

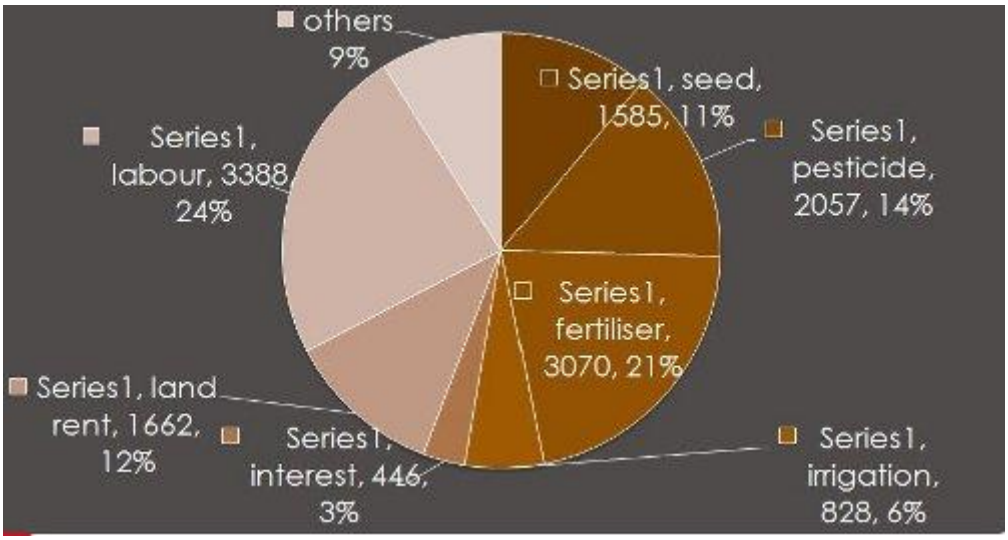
[31] As activists from the Centre for Sustainable Agriculture explain: 'Farmers...had to borrow money so they could buy pesticides. They would get credit from local "all-in-one" dealers who sold them seeds, fesrtilizers and pesticides. The dealers would sell these items on credit, then charge interest rates of 3-5% per month. The farmers were in no position to repay these loans, so would have to agree to sell their produce to the dealer. The dealer in turn would fix the price lower than the market value of the crop. The farmers had no choice but to accept this price, in the hope that the dealer would again support next year's investments. They were trapped in a vicious cycle of high costs, low produce prices and unpaid debts...The social stigma of indebtedness – especially when the moneylender put pressure for repayment, was unbearable for many' (Centre for Sustainable Agriculture 2006, p. 41).

[32] http://www.securengo.org

[33] http://csa-india.org

[34] For example, by replacing chemical pesticides with biological ones such as neem seed-kernel extracts and chilli-garlic extracts.

[35] The reduction in the use of agrochemicals and their substitution by natural pesticides and fertilisers in three communities of potato growers in Carchi, Ecuador led to the same results (Sherwood et al. 2005, p. 157).



So, convinced about the merits of no-pesticide farming, they spread the word to nearby villages. Soon (2004-5), an entire village in Andhra Pradesh called *Punukula* declared itself to be pesticide-free, stating that pesticide dealers are undesirable. By switching to sustainable farming, farmers in this village community had managed not only to pay off their debts but also to increase their profits, while restoring ecological balance in their fields. As a result, Punukula became the symbol of a nascent sustainable agriculture movement: its success influenced increasingly more neighbouring villages to switch to non-pesticidal management and ecological farming, reaching 92 villages with more than 5000 farmers by 2004. But Punukula's success attracted also the attention of the state government, which committed itself to supporting the scaling up of no-pesticide farming across 5000 villages from 2005-6 onwards as a pilot project. To this end, a collaborative initiative was set up to provide an organisational platform for concerted action by public institutions (like the state-run Society for Elimination of Rural Poverty), cadres of farmers, village representatives, NGOs and community-based organisations like the Centre for Sustainable Agriculture. In the context of this initiative, over 450 *farmer field schools* were set up in villages to provide training in sustainable agriculture to more than 20000 farmers, while agricultural credit was mobilised from several banks, including the State Bank of India, with the aim of eliminating farmers' dependence on 'all-in-one' dealers and local moneylenders. In parallel, *community seed banks* and *seed sharing networks* were established so farmers could produce and share their own seeds, and *farmer-consumer cooperatives* were set up to coordinate the production and distribution of agricultural products (Centre for Sustainable Agriculture 2006; Raidu & Ramanjaneyulu 2008). The results of this intervention programme have been extremely positive: in villages that adopted organic farming, there are no more suicides or cases of pesticide-induced disease, while agricultural incomes have improved in tandem with the health and livelihood of farmers (see Fig. 3, 4 below)(Centre for Sustainable Agriculture 2013; Ratnakar and Mani 2010).

Fig. 3 (Source: Centre for Sustainable Agriculture 2013)

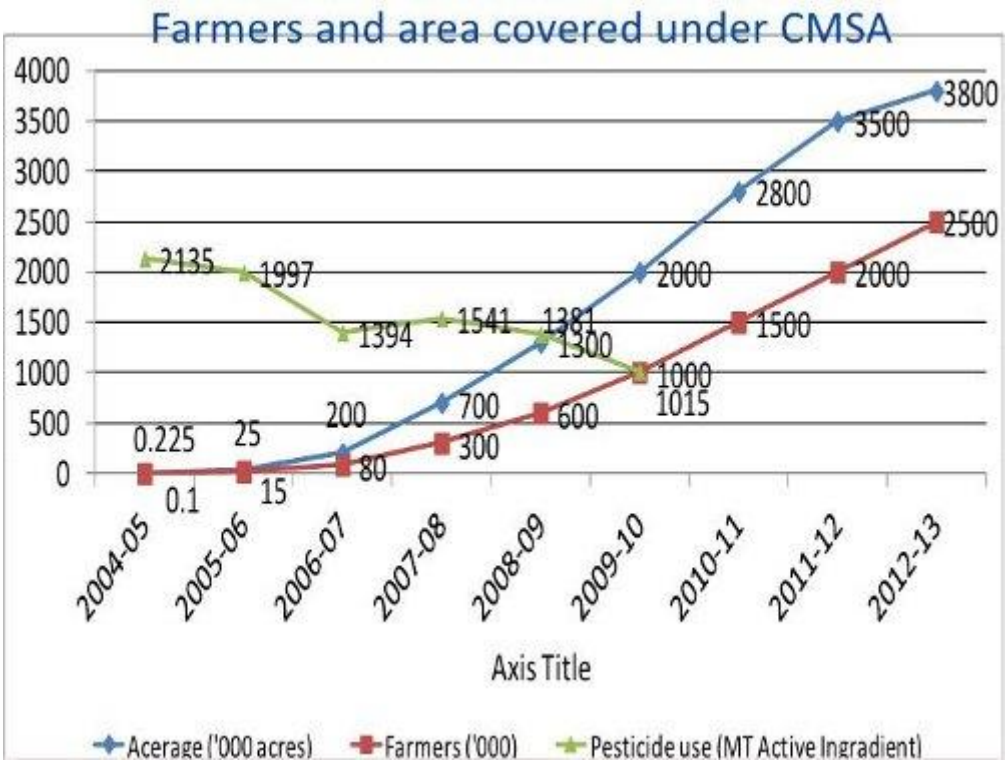


Fig. 4 (Source: Centre for Sustainable Agriculture 2013)

Crop	Cost of cultivation (Rs/Ac.)		Yield (Q/Ac.)		Gross Returns (Rs.)		Net returns (Rs.)	
	Organic	Non-Organic	Organic	Non-Organic	Organic	Non-Organic	Organic	Non-Organic
Paddy	11950	14340	32	32.2	29340	29630	17390	15370
Maize	7922	8314	21.8	19.6	19620	17640	11698	9326
G.Nut	9270	10340	9.8	9.8	24500	24500	15230	14160
Chickpea	4800	5650	5.5	6.5	11270	12300	6475	6650
Chilli	48918	72237	24.5	26.5	147000	117000	98082	47013
Onion	13200	15400	71.6	67.6	28800	26000	15600	10600
Cotton	10980	10380	4.5	4	13500	11600	2520	1220

Although the community-managed, sustainable agriculture model might best be understood as a unified system for the production and distribution of agricultural products, there are two aspects of the model on which we would like to lay more emphasis: (1) the development of open source seed sharing networks and community seed banks and (2) the setting up of producer-consumer cooperatives with their own meeting grounds.

Open source seed networks and community seed banks. For many centuries, seeds were considered the common heritage of humankind and so were freely shared among farmers. The introduction of various IP limitations throughout the 20th century, however, by turning seeds into an object of intellectual property, had the effect of severely destabilising this tradition of producing seeds and sharing them, while forcing farmers into a relationship of dependency upon the companies now manufacturing and selling them (Aoki 2009; Brush 2004; Centre for Sustainable Agriculture 2012; Kloppenburg 2010). As a solution to this problem, the

sustainable farming community in Andhra Pradesh set up community seed banks in several villages and established open source seed sharing networks[36] which made it once again possible for farmers to produce their seeds and share them (Centre for Sustainable Agriculture 2006; Raidu & Ramanjaneyulu 2008). Thus, these community seed banks and open source seed sharing networks served to create a *knowledge commons* for the conservation and revival of existing varieties as well as for practices of participatory plant breeding aimed at evolving new varieties.

Producer-consumer cooperatives. A common problem for small farmers around the world is the lack of direct access to markets and distribution channels for their products, which keeps them dependent on intermediaries. The way farmers in Andhra Pradesh addressed this problem was by setting up *Sahaja Aharam*[37]a farmers-consumers cooperative federation which is active through direct retailing in ten cities (*mandals*)[38]. The meeting grounds of the co-ops allowed them to sell their products directly to consumers and develop a relationship of collaboration with them based on mutual trust. Thus, they were able to use this form of organising the production and distribution of agricultural products through farmer-consumer cooperatives as the stepping stone towards a model of *community-supported agriculture* (Wikipedia 2014b; Zizania 2013) that is not only sustainable but also open and participatory, broadening the participation of consumers in the process of agricultural exploitation through locally-organised, bottom-up community structures based on trust and knowledge sharing.
To recap, the case of the Indian state of Andhra Pradesh illustrates a model of transformation of the agricultural sector from a system of monoculture, chemical pesticides and GM seeds towards one based on the use of intercropping, freely shared seeds and traditional techniques, which has come to be known in India as community-managed, sustainable agriculture. But more than that, it demonstrates that sustainable farming is not only environmentally sound but also viable as a business model for small farmers on a much larger scale than is currently practiced in most parts of the world. In fact, the adoption of such a model of sustainable agriculture has a particularly beneficial and empowering effect on small farmers, as it eliminates their dependency on the 'all-in-one dealer' and limits the extent of 'debt trap' problems such as those that in the past plagued Andhra Pradesh's farmer community.

Case-study 2: Open Source Ecology

Open Source Ecology (OSE)[39] is an open source hardware[40] project focused on manufacturing a set of fifty industrial machines, called the 'Global Village Construction Set' (GVCS), which the OSE considers to be sufficient for creating a small civilisation with modern comforts from locally available resources. The development of the machines is distributed across a global network of parsimoniously linked, self-managing groups of hardware hackers and hobbyists who share design information through the Internet and build prototypes, which are then tested in a farm in Missouri, USA.

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[36] Open source seeds are distributed under open source licenses like the GNU GPL. The rationale is that 'there will be no restriction on using [seeds licensed under an open source license] to develop new varieties or experiment with but it is essential that the variety derived from this should also be available without any monopolistic claims and restrictions on further development' (Centre for Sustainable Agriculture 2012).
[37] http://www.sahajaaharam.in
[38] http://www.csa-india.org/institutions
[39] http://opensourceecology.org
[40] All design information related to the technologies developed by OSE (e.g. schematics, 2D fabrication drawings, circuit diagrams, 3D CAD files, machine-readable CAM files, instructional videos and user manuals) is licensed under the OSE License for Distributive Economics, which adapts the Creative Commons CC-BY-SA 3.0 license to hardware.

Fig 5: The 50 OSE-developed industrial farm machines

The history of the project starts with a young PhD named Marcin Jakubowski. Fresh out of his PhD in energy physics, Jakubowski decided to commit himself to an enterprise of a less theoretical nature and started a sustainable farm in rural Missouri, USA. However, he soon came to realise that the machines which are commercially available to farmers did not suit his needs. Tractors, for example, are not only expensive to buy but also difficult to modify and repair, despite their repetitive break-downs. To Jakubowski, the problem was clear: this kind of machines were not designed to empower farmers but to keep them in a relationship of dependency to the companies manufacturing them. Armed by the determination that farmers need machines that are low-cost and easy to build in a do-it-yourself (DIY) fashion, he took it upon himself to re-design these machines from scratch. So, as a start, he designed a new tractor and posted the design on the Internet under an open license so that others could modify and improve it. This attracted the attention of the Internet community and of hardware hackers and hobbyists around the world, who soon started to contribute improvements and build prototypes. And thus, the Open Source Ecology (OSE) network was born in 2003. With the help of this network of contributors, Jakubowski identified the fifty machines – from cement mixers to 3D printers and moving vehicles (see Fig. 5 above) – which are supposed to be necessary to build a sustainable modern village community and embarked on a collective effort to manufacture them. To accommodate the enlarged scope of work, the OSE was officially launched as a platform for coordinating the enterprise and Jakubowski's farm was repurposed into a site for building and testing the prototypes developed by project members from all over the world, many of whom would come to the farm on 'dedicated project visits' to help with the work (Thomson & Jakubowski 2012, pp. 53-70).

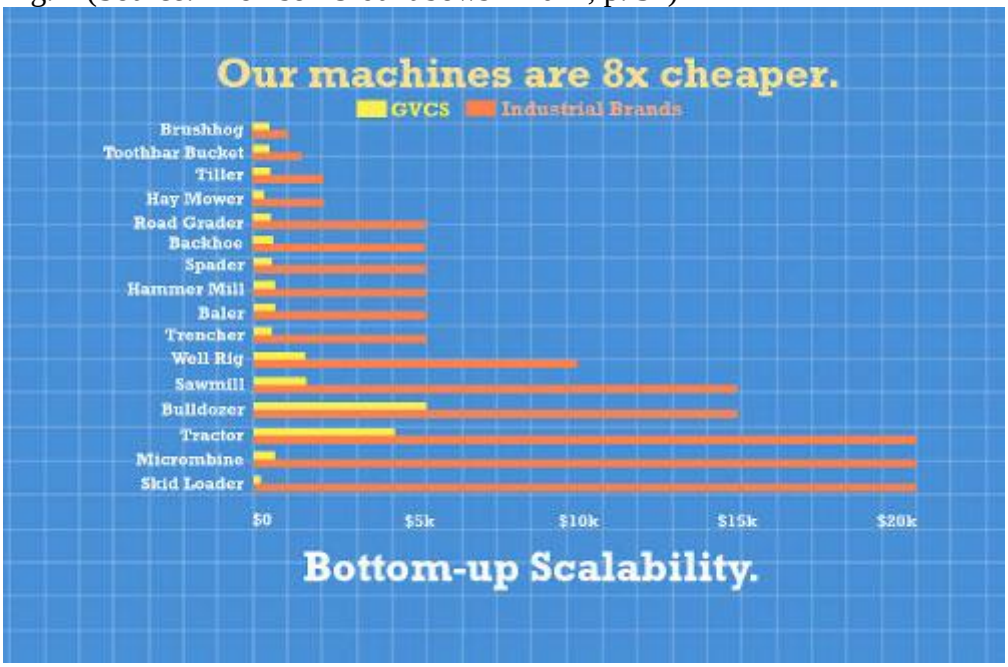
To date, of the fifty machines that make up the 'Global Village Construction Set', eight have already been successfully manufactured, while development of the rest is currently

underway[41].[[20]] By tapping into the contributions of a global community of hardware hackers and afficionados, the OSE project has achieved significant cost reductions. To its credit, the machines built by OSE have a much lower cost of production than their industrial counterparts, being at least eight times cheaper to manufacture. For example, the OSE tractor costs about $5K to build, whereas tractors made by commercial manufacturing firms cost ten times more. The same goes for the OSE compressed earth brick press, the soil pulverizer and the rest of the machines that have been prototyped and tested by the OSE network (see Fig. 6, 8 below)(Open Source Ecology 2014; Thomson & Jakubowski 2012).

Fig. 6 (Source: Jakubowski 2011)

MACHINES	OPEN SOURCE ECOLOGY (Materials Cost)	INDUSTRY STANDARD (New Purchase)
Tractor with loader, up to 54 hp, hydraulic drive	$6k	$40k +
Compressed Earth Brick Press, up to 16 bricks per minute, fully automatic, 2"-6"x6"x12" bricks, 700 psi	$4k	$40k +
Soil Pulverizer, 5 ton per hour capacity	$800	$20k +
2 Hydraulic Power Units, self-contained, 27 hp, 14 gpm @3000psi	$4k ($2k each)	$15k +
TOTAL	**$15k**	**$115k +**

Fig. 7 (Source: Thomson & Jakubowski 2012, p. 54)



Although community contributions raised through crowdfunding campaigns have so far been OSE's main source of financial support (Jakubowski 2011), the aforementioned production cost savings allow the OSE project to finance its activities by selling its machines directly to farmers. Indicatively, it estimates to make about $80K a month by selling its tractors at a price of $10K (Jakubowski 2013).

[41] Those eight machines include a bulldozer, rototiller, multi-purpose tractor, backhoe, universal rotor, drill press, multi-purpose 'ironworker' (which incorporates the functionality of a punching machine, a plate shear, a section shear, a punch and shear machine and a copper-notcher), and a CNC torch table.

However, the sustainability of the OSE enterprise extends well beyond its business model: OSE furnishes a working example of how farming – and the manufacturing of agricultural machines, more broadly – can be carried out in a way that is not only productive but also *environmentally sustainable*. For example, the electricity that Jakubowski's farm consumes, which now includes a 4000 square foot fabrication facility and a 3000 square feet living unit, comes from renewable energy resources, using methods like closed-loop manufacturing (which recycle waste materials into livestock for other production processes; for a detailed discussion, see Kelly 1994, ch. 10) and technologies that the OSE project itself has built such as photovoltaic panels and wind turbines (Open Source Ecology 2013). Equally important, OSE-manufactured machines are designed with the principle of durability in mind and in such a way as to be easily repairable and modifiable by end-users. In that regard, OSE machines are paradigmatic of what is called *sustainable design*: they are designed to last for a lifetime, rather than throw away and replace by newer machines, 'they use less energy, fewer limited resources, do not deplete natural resources, do not directly or indirectly pollute the environment, and can be reused or recycled at the end of their useful life' (Wikipedia 2014a).
To sum up, the example of OSE demonstrates how a project can leverage the open knowledge commons (in the case of OSE that includes everything from machine designs to user manuals) and the Internet for distributed development by a global community of volunteer contributors. Furthermore, OSE furnishes a concrete example of how *open source appropriate* technology (Pearce 2012b) can be used to enhance the autonomy of farmers and transform agricultural production in the direction of economic and environmental sustainability alike.

5. General principles for policy making

Through the above case-studies, we have come to identify a set of enabling conditions, from which we can draw several general principles to guide policy making efforts aimed at reinforcing the development of sustainable agriculture.

5.a.- The commons as a key enabler

In section 3, we remarked how the development of capitalist agriculture has been identical with the enclosure of the agricultural commons and the substitution of expensive, industrial, proprietary inputs for freely shared resources (e.g. seeds) and traditional techniques. The experiences of Andhra Pradesh's small farmers reflect this line of development and show clearly that dependence on external inputs such as chemical pesticides is not only environmentally unsustainable but also economically destructive for petty agricultural producers. To solve this problem, sustainable agriculture proposes the use of freely shared resources, traditional knowledge and (agro)ecological methods in place of those external inputs. To put it differently, sustainable agriculture is based on a thriving, multifaceted commons, which it uses as a set of inputs to the production process: the commons of traditional knowledge; the commons of scientific-agroecological knowledge; and the commons of resources such as seeds. In fact, the commons constitute not only the single most important enabling condition for the model of sustainable agriculture practiced by farmers in India, but also the cornerstone of the distributed manufacturing model evolved by the OSE community to build machines for small farmers. In consequence, it is absolutely critical to develop policies that support the development and preservation of a thriving commons in the agricultural realm.

5.b.- The needed narrative change: food as a commons

There is a need to reclaim a discourse and a rationale of the commons to be applied to food at global, national and local level. The price of food shall rightly reflect its value to society and its multiple dimensions, not just the value in exchange. Fortunately, several dimensions of food are already considered as commons (see next section), as well as the consequences of healthy food and adequate nutrition. In both economic and political terms, food and nutrition security could be considered a Global Public Good as it is beneficial for the individuals, communities, nations and the planet in general, even if not everybody is contributing or paying for its provision.

5.c.- The need for investments in knowledge

The transition to the sustainable agriculture model entails significant switching costs, as it requires farmers to invest in developing the relevant skills and mastering new techniques. Without the development and diffusion of such an 'ecological literacy' across farmer communities, attempts to scale up practices of sustainable agriculture are bound to fail. That is why *farmer fieldschools* have proved to be such an effective vehicle for training farmers in sustainable agriculture methods and for disseminating those skills and knowledges. Such farmer field schools already exist in Ecuador where they have been successfully used as an organisational platform for the diffusion of ecological literacy (Sherwood et al. 2005)[42]. It is obvious therefore that their operation must be supported and, ideally, expanded across rural areas in Ecuador. Yet, though the development of farmer field schools is a necessary condition for kickstarting the transition process to sustainable agriculture, it is not by itself sufficient to ensure its long-term scaling up. Ultimately, all these actions and policy interventions, should not be geared just towards farmers but towards allowing all members of society to develop a more engaged relationship with the production of food and the cultivation of land. Realistically, such a culture shift can only be accomplished by making agricultural training an integral part of the basic school curriculum.

5.d.- The importance of creating new markets and farmer organisations

The experience of Indian farmers demonstrates beyond any doubt that small organic food producers cannot rely on capitalist firms (such as agrifood firms and trade intermediaries) for access to consumer markets. Instead, they need to organise their own organic food markets and set up their own organisations for direct retailing to consumers. Naturally, in order to be effective, the operation of such agricultural markets and organisations should be supported by an appropriate institutional framework.

5.e.- The importance of access to credit and investment resources

Equally important, farmer organisations need access to financial resources that can be used for investment purposes. It was for that reason, as we saw, that the State Bank of India set up in 2006 a micro-credit system to help farmers switch to no-pesticide farming (Raidu & Ramanjaneyulu 2008; Centre for Sustainable Agriculture 2013, 2006; Ratnakar & Mani 2010). Setting up a *community-managed credit system* or a *community investment fund* for use

[42] Attesting to the successful operation of farmer field schools in the Andean highlands throughout Northern Ecuador, the Ministry of Agriculture includes farmer field schools in its national Food Security Program. Furthermore, farmer field schools have been set up in Peru, Bolivia, Colombia, El Salvador, Honduras and Nicaragua (Sherwood et al. 2005, p. 158).

by member-organisations, as has been long practiced by federations of co-ops and collectivist organisations around the world, is the logical next step[43].
The importance of participation Sustainable agriculture practices 'are best adopted when they are not imposed top-down but shared from farmer to farmer' (De Schutter 2010, p. 18). Consequently, it is critical to ensure their participation in the policy-making process, thus transforming it into a 'mode of social learning, rather than an exercise of political authority' (Pretty et al. 2002, p. 252). Such participation not only lends legitimacy to transition policies and programs, as they have been co-designed with farmers, but also *empowers the poor*, helping ensure that policies are truly responsive to their needs. In a nutshell, small farmers should be seen as experts that must be consulted with and engaged in the policy-making process, rather than as beneficiaries of state aid.

5.f.- The crucial role of policy

The successful transition of such a great number of village communities to sustainable farming within a period of no more than five years attests to the effectiveness of the pilot scaling up strategy that was used in the Andhra Pradesh region and to the importance of the policy interventions it included such as:

- The development of *community seed banks* and *open source seed sharing networks* as a shareable infrastructure for agricultural production.
- The provision of special economic incentives (e.g. tax benefits) for sustainable agriculture projects.

5.g.- Food-related Knowledge-based Commons in Ecuador

Many food-related aspects are already considered, to a certain extent, common goods, while others are yet rather contested (wild foods and water) or generally regarded as private goods (cultivated food). Below, eight aspects of food-related knowledge are presented, most of them still considered commons (or public goods) but many of them under threat of enclosure by patents or legal privatization schemes. The Ecuadorian Government should guarantee the universal and free access to that knowledge by guaranteeing Creative Commons license to most of them, and preventing restrictive license to enclosure its access.

1.- Traditional agricultural knowledge: a commons-based patent-free knowledge that would contribute to global food security by upscaling and networking grassroots innovations for sustainable and low cost food production and distribution (Brush, 2005).

2.- Modern science-based agricultural knowledge produced by public national and international institutions: Universities, national agricultural research institutes or international CGIAR, UN or EU centres, they all produce public science, widely considered as a global public good (Gardner and Lesser, 2003).

3.- Cuisine, recipes and national gastronomy: Food, cooking and eating habits are inherently part of our culture, inasmuch as language and birthplace, and gastronomy is also regarded as a creative accomplishment of humankind, equalling literature, music or architecture. Recipes are a superb example of commons in action and creativity and innovation are still dominant in this copyright-free domain of human activity (Barrere *et al.*, 2012; Harper and Faccioli,

[43] A good example is the so-called 3% Fund run by co-op federations in Italy whereby member co-ops contribute 3% of their annual profits to a collective Fund that is used for investment purposes (see, for example, Logue 2006 or Mancino & Thomas 2005).

2009). It is worth mentioning this culinary and convivial commons dimension of food has received little systematic attention by the food sovereignty movements (Edelman, 2013), although it is being properly valued by alternative food networks (Sumner *et al*., 2010; The Food Commons, 2011).

4.- Edible plants and animals produced by nature: Nature is largely a global public good (i.e. Antarctica or the deep ocean) so the natural resources shall also be public goods, although it varies depending on the proprietary rights schemes applied in each country. Fish stocks in deep sea and coastal areas are both considered common goods (Bene *et al*., 2011; Christy and Scott, 1965).

***5.- Genetic resources for food and agriculture*:** Agro-biodiversity is a whole continuum of wild to domesticated diversity that is important to people's livelihood and therefore they are considered as a global commons (Halewood et al., 2013). It should be mostly patent-free to promote and enable innovation. Seed exchange schemes are considered networked-knowledge goods with non-exclusive access and use conditions, produced and consumed by communities.

6.- Food Safety considerations: Epidemic disease knowledge and control mechanisms are amply considered as global public goods, as zoonotic pandemics are a public bads with no borders (Richards *et al*., 2009; Unnevehr, 2006). Those issues are already governed through a try-centric system of private sector self-regulating efforts, governmental legal frameworks and international institutional innovations such as the Codex Alimentarius.

7.- Nutrition, including hunger and obesity imbalances: There is a growing consensus that health and good nutrition should be considered as a Global Public Good (Chen et al., 1999), with global food security recently joining that debate in international fora (Page, 2013).

8.- Food price stability: Extreme food price fluctuations in global and national markets, as the world has just experienced in 2008 and 2011, are a public bad that benefits none but a few traders and brokers. Those acting inside the global food market have no incentive to supply the good or avoid the bad, so there is a need of concerted action by the states to provide such public good (Timmer, 2011).

6. The enabling political and legal framework of Ecuador

The *National Plan for Good Living 2013-2017* as well as the *Constitution of Ecuador* itself gives explicit support to the development of sustainable agriculture. Particularly, in addition to the emphasis it lays on the transformation of the productive matrix in the direction of environmental sustainability, one of the National Plan's strategic goals is to 'construct a more diversified, productive and sustainable agricultural sector' and 'promote new non-polluting industries...based on [the development of] bio-products and ecological services' (p. 41)[44]. In a similar vein, the Constitution strongly supports 'the introduction of ecological and organic technologies in farm and livestock production' (Art. 281/3)[45]. The crucial role of the commons in enabling the development of sustainable agriculture is highlighted, with particular reference to the use and free exchange of seeds (Art. 281/6).

[44] For quotes and page citations, we used the english version of the National Plan for Good Living 2013-2017.
[45] For quotes and citations, we used the english translation of the Constitution of Ecuador (retrieved from http://pdba.georgetown.edu/Constitutions/Ecuador/english08.html).

In parallel, explicit support is given to the entrepreneurial activity of small agricultural producers and organisations. The National Plan underlines the importance of achieving 'food self-sufficiency...by working with small farming families' (p. 39) and "strengthening the popular and solidarity economy and micro-, small-, and medium enterprises within the productive structure" (*Policy 10.5*, p. 81). The Constitution goes even further and forbids large estate farming[46]. In the context of realising these goals, the Constitution proposes the use of 'preferential mechanisms for the financing of small producers' (Art. 281/5) and the strengthening of support for 'the development of networks of producers and consumers' (Art. 281/10), while the National Plan, in recognition of the knowledge-intensive nature of sustainable agriculture, commits itself to provide training for agricultural producers who wish to produce and market bio-products and ecological services (p. 41).

Moreover, a commons-based food producing system can guarantee the right to food of any person in Ecuador, a right enshrined in the Constitution (2008)[47], and the right to Buen Vivir included in the Food Sovereignty Framework Law (2009)[48]. This new food system will also embrace a Universal Food Coverage plus the scaling up of sustainable agriculture practices with the aim of transiting towards an open, sustainable and fair food system.

To sum up, both the National Plan for Good Living and the Constitution of Ecuador give explicit policy support to the development of sustainable agriculture and propose a string of supportive interventions towards this direction, such as the provision of (a) economic incentives for small farmers and (b) training in organic farming.

The next section puts forward several policy recommendations that are designed to support and reinforce the aforementioned aims and policies of the Ecuadorian policy framework.

7. Main policy recommendations

We put forward several policy interventions that address such strategic priorities of the National Plan for Good Living[49] (pp. 38, 39, 41, 81, 89) as:

- The support to small farmers and small and medium-sized organisations in the agricultural sector to adopt and expand the use of sustainable agriculture methods
- The transformation of the productive matrix in the direction of environmental sustainability.
- The construction of the knowledge society.

[46] According to Article 282 of the Constitution, 'Large estate farming and land concentration is forbidden'.

[47] In 2008, Ecuador includes the Right to Food in its Constitution (art 13) as well as the food sovereignty (art 281 and 282). Art. 13.- Las personas y colectividades tienen derecho al acceso seguro y permanente a alimentos sanos, suficientes y nutritivos; preferentemente producidos a nivel local y en correspondencia con sus diversas identidades y tradiciones culturales. El Estado Ecuatoriano promoverá la soberanía alimentaria. http://www.asambleanacional.gov.ec/documentos/constitucion_de_bolsillo.pdf

[48] http://www.soberaniaalimentaria.gob.ec/?page_id=132
Amongst the important elements included in the framework law, one could mention its emphasis placed in several provisions on small-scale farmers, who in many underdeveloped countries constitute the majority of people affected by hunger and food insecurity, the calls for the largest possible participation in the development of food sovereignty activities, and the protection of indigenous people and the setting of timeframes and concurrent obligations for the government to realize the right to food (De Schutter, 2010).

[49] Page citations refer to the english version of the National Plan for Good Living (2013-2017).

As we have seen, the *Common-based development* is the single most important enabling condition for the development of sustainable and fair agri-food systems that can guarantee adequate food for all produced in a sustainable way. Based on Elinor Ostrom's[50] polycentric governance (Ostrom, 1990, 2009), food is being produced, consumed and distributed by agreements and initiatives formed by state institutions, private producers and companies, and self-organized groups under self-negotiated rules.

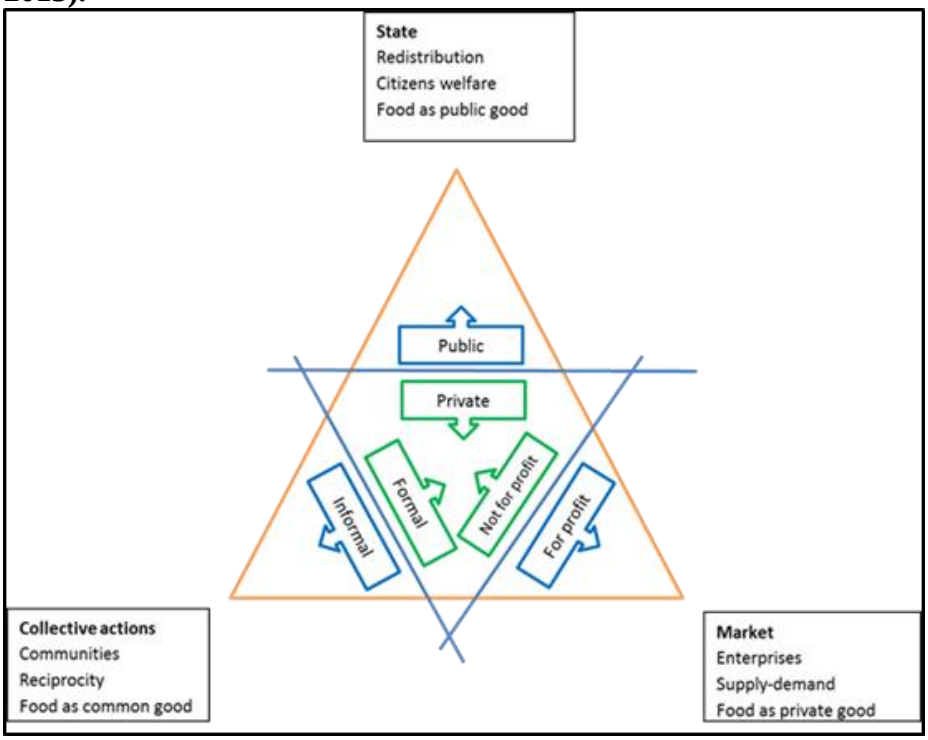
The tri-centric governance scheme (see fig 8) is compounded of

(a) ***civic collective actions for food*** undertaken initially at local level and whose aim is mostly preserving and regenerating the commons that are important for the community (food as a common good);

(b) ***the government*** whose main goal is to maximize the well-being of their citizens and providing an enabling framework to enjoy the commons (food as a public good); and

(c) ***the private sector***[51] that can trade undersupply, specialised or gourmet foodstuff (food as a private good).

Fig. 8: The Tri-centric Governance of the Commons-based Agri-food System (Vivero, 2013).



Those initiatives demonstrate that a right combination of self-regulated collective actions, governmental rules and incentives, and private sector entrepreneurship yield good results for food producers, consumers, the environment and society in general, and the challenge now is how to scale up those local initiatives to national level. Civil Society + Ethical Economy + Partner State (enables and empowers social production = commons-oriented peer production)

[50] Elinor Ostrom was awarded the Nobel Price on Economics in 2009 for her analysis of economic governance of the commons. She analysed hundreds of institutional arrangements and collective actions to govern common-pool resources, such as coastal fisheries, irrigation schemes and community forests.

[51] The private sector's role in this tricentric system can parallel similar roles of private schools and private hospitals in countries with public health/education systems.

Three spaces of transition where policy interventions, legal provision and financial incentives shall be designed in order to steer transition towards a fairer and more sustainable food system:

7.a.- Technological innovations (Science and knowledge)

Food production with less ecological footprint shall be encouraged and subsidized: to shift the subsidies from industrial agriculture to agroecology and low input-based agriculture.

a.1.- Creative Commons farming technology (i.e. Open-source Ecology or Farm Hack[52]) that can be made in every village[53], applying the same principles of free software to the food and nutrition security domain. It seems the patents-based agricultural sector is slowing or even deterring the scaling up of agricultural and nutritional innovations and the freedom to copy actually promotes creativity rather than deter it, as it can be seen in the fashion industry or the computer world. Millions of people innovating on locally-adapted patent-free technologies have far more capacity to find adaptive and appropriate solutions to the global food challenge than a few thousand scientists in the laboratories and research centres (Benkler, 2006).

a.2.- **Minga agro-cientifica: the Open System of Conservation and Exchange of Agro-biodiversity Heritage and Information**. This trans-disciplinary action-research system is a long-term collaborative endeavour between the scientific community and the local communities that need to produce more food in a sustainable and fair way. This initiatives aim to combine the peasants' worldview with scientific rationalism, with a respectful and trans-disciplinary approach between science and ancient knowledge.

a.3.- Food distribution systems that can be re-designed as **space-restricted Food Sheds** such as that elaborated for New York city by Columbia University and Massachusetts Institute of Technology[54].

a.4.- **Knowledge investments**.

- The expansion of farmer field schools across rural areas in Ecuador.
- The introduction of agricultural training into the basic school curriculum.
- The strengthening of (publicly funded) agricultural research, with an emphasis on agroecology[55].
- The development of community seed banks

7.b.- Consumption practices (Behaviour)

Encourage Community-Supported Agriculture, Short-chains, Urban Gardens, Locally-produced Food, Appellations of Origin, farmer's markets and the like, as well as promote by law or fiscal incentives to reduce food waste[56], shorten food chains and re-educate people on

[52] http://farmhack.net/home/
[53] http://www.ted.com/talks/marcin_jakubowski.html
[54] http://www.urbandesignlab.columbia.edu/?pid=nyc_foodshed
[55] It has been shown that agricultural research has 'the largest impact on agricultural production and second-largest impact on poverty reduction (after rural education) in China, and the second-largest impact on poverty reduction in rural India (after investment of roads)'(Fan 2009, p. 2).
[56] https://www.academia.edu/1860940/El_desperdicio_de_alimentos_en_epoca_de_crisis._Soluciones_a_la_paradoja_del_sistema_alimentario_global

the multiple dimensions of food and its value for our societies. For instance, promotion of **urban gardens** and in general stimulating food self-production should be encouraged (from a few tomatoes in your apartment terrace, to be quasi-self sufficient in basic stuff if you are living in a remote village).

We underlined the need for organic food producers to develop their own local markets and organisations. So, to **support the development of new organic food markets and farmer organisations**, we propose:

- The organisation of small organic farmers in collectivist organisations and (producer-consumer) co-ops with their own local markets and meeting grounds.
- The development of a legal framework that provides co-ops and collectivist organisations in the agricultural sector with the organisational autonomy as well as institutional support which is required for their operation[57].[30]

c.- Institutional changes (legal frameworks, policies & financial support).

Using as a legal basis the Constitution and the Food Sovereignty Law, non-market based modes of food provision can be promoted alongside market-based and state-based ones.

c.1.- **Legal space and financial incentives to civic collective actions for food** (i.e. letting them to sell fruits and vegetables in market stalls without much bureaucracy).

c.2.- Any Ecuadorian food-related knowledge (genetic resources, traditional knowledge or science-based knowledge) shall be considered as part of the National Heritage and be granted an open license (such as creative commons share-alike or copyleft). Ecuador should not recognize any patent on living organism or living organism-derived substance[58] that is created on the basis of this National heritage.

c.3.- The implementation of a legal framework based on the GNU GPL[59] for the licensing of (a) plant genetic resources (such as germplasm and seeds) and (b) farming machinery as protection against the danger of their commercial co-optation and private enclosure[60]. The Global Public License (that could take shape as Creative Commons share-alike or Copyleft) could be granted to "Comunas", a legal entity supported by indigenous traditions and a 1937 law[61]. Those Comunas are the communities where the local landraces or genetic resources have been created or where they still survive. Those genetic resources should then be characterised and screened by molecular and phenotypic means. This type of license grants users the freedom to use, study, share, sell, and modify the genetic material that contains the local variety, but the seeds derived from this parental cannot ever be registered with closed patent. This license imposes the subsequent users the maintenance of open licenses (what is termed as Copyleft).

[57] For an elaborate discussion of what that task entails and how it can be achieved, see the FLOK policy documents by Restakis (2014a, 2014b).

[58] For instance, the Epibatidina, a pharmacological substance and its derivatives. http://es.wikipedia.org/wiki/Epibatidina

[59] https://www.gnu.org/copyleft/gpl.html

[60] This recommendation occupies centre stage in a number of recent proposals, such as that by the Centre for Sustainable Agriculture (2012), Kloppenburg (2010) and Srinivas (2002). Clearly, the adoption of such a legal framework is tantamount to the *de facto* abolition of patents on plant genetic resources.

[61] http://fr.slideshare.net/joseluisviveropol/cumbre-del-buen-conocer-floksociety-quito-2730

c.4.- The release of publicly funded research and development in plant varieties under the GNU GPL[62].

c.5.- Th**e-municipalizing all the water management schemes in cities**. Seashores, rivers, lakes and aquifers shall also be governed in a public/commons way, preventing the private sector to enclosure such good (as it is protected by the Constitution and the Food Sovereignty Framework Law).

c.6.- A national programme focused on **local purchases by the state to small farmers, and not big producers**, shall be established so as to acquire food needed for state institutions and facilities such as schools, the army, hospitals and jails.

c.7.- **Banning food speculation in the country**, although allowing financial speculation to be carried out with other commodities and financial products.

c.8.- A Universal Food Coverage

Based on the narrative of food as a commons, a Universal Food Coverage[63] could also be a sound scheme to materialise this open-source knowledge-based transition. Similar to the Universal Health and Education Systems, every Ecuadorian should be entitled to get a minimum amount of food (or its money equivalent) to eat every day. Purchasing power cannot be the barrier that deters poor people to get access to such an essential resource for human bodies. A Universal Food Coverage should be established as part of the social welfare state. In that sense, the minimum wage in Ecuador should be always equal to the Food Basket, so as to force the private sector to respect that threshold.

This social scheme would guarantee a daily minimum amount of food for all citizens (HLPE, 2012). This universal entitlement would protect the only human right declared as fundamental in the ICESCR: freedom from hunger, and it would recognize that eating is a fundamental human need. Considering food as a commons would prioritize the use of food for human consumption, limiting the non-consumption uses. Today, by applying the economic rationale, the best use of any commodity is where it can get the best price (i.e. feed for livestock, pharmaceutical by-products or biofuel).

The food coverage could also be implemented as a Basic Food Entitlement (Van Parijs, 2005) or a Food Security Floor[64]. This Universal Food Coverage equals free provision of essential health and education. Its universality helps avoid corruption, encourages accountability and legal entitlements, it ensures that powerful and influential people have a stake in them, it makes the scheme a matter of citizens' right, avoids any exclusion and it minimises the social stigma associated to charity food banks or food stamps.

Some concrete elements to start a Universal Food Coverage:

[62] For a discussion of the proposal to release publicly funded R&D under the GNU GPL, see Boldrin and Levine's (2013, p.19) as well as Pearson's (2012a) recent contribution in the Journal of Economic Perspectives and Nature respectively.
[63] An idea called for by Nobel Prize Amartya Sen http://www.governancenow.com/news/regular-story/amartya-sen-bats-universal-food-coverage [Accessed January 7 2014].
[64] Similar to the Social Protection Floor proposed by Deacon (2012).

1. State-provided minimum food entitlement: 10 tortillas or one loaf of bread to every Ecuadorian every day (something more testimonial than with a heavy impact, but it needs to start with something tangible).
2. Levelling by law national food basket with minimum wage (revisions to take place four times per year)
3. Food producers (farmers, fishermen) to be employed as civil servants so as to produce food for the national system (likewise engineers, lawyers, teachers or doctors are employed by the state to deliver health, roads and education)
4. State purchased targeting local farmers, so as to guarantee a minimum amount and a fair price to their production, enabling the development of solid national and local markets.
5. Coordinated Safety Nets with a single beneficiary database so as to know how much state-support is given to any given person or household. Combing support from different social programmes, the State should guarantee a minimum amount per month equivalent to the national food basket (in case that person is unemployed).

We remarked the **important role that policy can play** in supporting the transition to sustainable agri-food systems. The re-commonification of food will take several generations so the transition phase should witness greater levels of public sector involvement. The enabling State (similar to that of a partner state[65]) has a vital role to play through taxing and incentives schemes, public credit and subsidies for collective actions, enabling legal frameworks that are not too stringent for self-regulated initiatives and land reforms to maximize common interest. Public/Commons Partnerships shall be promoted so as to guarantee Health, Education, Water, Food and Energy Coverage. The state must be seen as a funding and operational instrument to achieve the society's well-being, being food security part of it. However, this leading role of states should gradually be shifted to the self-initiated collective actions by producers and consumers, as the public provision of food does not surpass the net benefits yielded by the self-organized and socially-negotiated food networks. Therefore, there should be enabling spaces for local governments, local entrepreneurs and local self-organized communities to coexist.

In addition to the above recommendations, we propose:

- That policies be developed which provide special economic incentives for sustainable agriculture projects. This can be implemented in a variety of ways: for example, through (state-supported) micro-credit systems and tax benefits.
- That policies be developed which prioritise public goods: public spending should be re-oriented towards social services and public goods (rather than private goods such as fertiliser subsidies) such as community seed banks, rural infrastructures (e.g. roads, electricity, Internet connectivity), education and agricultural R&D[66].
- That public procurement policies be developed that prioritise organic food along the lines of the public school feeding program in Brazil whereby food is purchased from family farms[67].
- That supportive policies be developed for the setting up of *rural agricultural stations*, *hackerspaces* and *co-working spaces* as a territorial infrastructure for skill sharing and

[65] Based on Michale Bauwens' proposal: http://p2pfoundation.net/Partner_State

[66] Research shows that policies which prioritise public goods are more effective in improving the performance of agricultural systems than those that subsidise private goods (Hunt et al. 2006, p. 24; López & Galinato 2007, p. 1085).

[67] To illustrate the scale of the public school feeding program in Brazil, in 2009 it included 137.000 family farms (De Schutter 2010, p. 20, footnote 89).

technology transfer. As a first step in that direction, we propose that an agricultural station for the manufacturing of open source farm machines (such as those designed and manufactured by OSE) be set up in rural areas.

Powerful messages for a commons-based food transition

1. Civic Collective actions for food are a driving force of food transition
2. We cannot let our food to be controlled and distributed by market forces
3. Enclosure mechanisms, privatization, legislation and patents have limited our access to food as commons
4. The value of food is no longer based on its many dimensions that benefit humans
5. Privatized food means we can eat as long as we have money to buy it or means to produce it
6. Re-commonification of food is essential for transition to fairer and sustainable food systems
7. Food and nutrition security is a global public good
8. *Homo cooperans* replaces *Homo economicus* when dealing with food commons
9. Food commons provides meaning and not just utility to food production and consumption
10. Free food programmes should be part of Universal Food Coverage

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