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Agroecology in times of COVID-19.

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Most of our global problems: energy shortages, water scarcity, environmental degradation, climate change, economic inequality, food insecurity and others cannot be addressed in isolation, as these problems are interconnected and interdependent. When one of the problems is aggravated, the effects spread throughout the system, exacerbating the other problems. Like never before, the systemic nature of our world has been revealed to us by the coronavirus pandemic: human, animal and ecological health are closely linked. Is this one of the lessons that COVID - 19 is here to teach us ? Regardless, the pandemic is undoubtedly a wake up call to humanity to rethink our capitalist , highly consuming mode of development and the ways we relate to nature. The times we live, demand a holistic response to the crisis, one that addresses the root causes behind the now obvious socio-ecological vulnerability and fragility of our globalized world.

Agroecology provides an inspiring example of a powerful systemic approach and in this time of the corona virus pandemic, agroecology can prove helpful to further explore the links between agriculture and health and realize that the way we practice agriculture can provide opportunities for improving health , but if done wrongly, agriculture can cause major risks to health.

The ecological and health consequences of industrial agriculture

For decades many agroecologists have denounced the impacts of industrial agriculture on human and ecosystem health. Large-scale crop monocultures occupy about 80% of the 1.5bn ha devoted to agriculture

around the world. Because of their low ecological diversity and genetic homogeneity, they are highly vulnerable to weed infestations, insect invasions and disease epidemics, and recently to climate change.

To keep pests at bay, about 2.3bn kg of pesticides are applied every year - less than 1% of which reaches the target pests. Most end up in the soil, air and water systems, causing \$10bn in environmental and public health damages in the US alone. Such accounting does not include worldwide human pesticide poisonings, which affect ca26m people annually. Pesticides pose major risks to the general population through residues in the food supply. Many insecticides have been linked to declines in animal species such as pollinators, natural enemies of pests, as well as a decline in non-target butterflies and beetles, birds and soil biota in crop fields, all of which contribute to key ecosystem services in agriculture. This loss of biodiversity costs hundreds of billions of dollars annually in crop production and human health, and reinforces the pesticide treadmill amplifying its human and ecological negative effects. The appearance of about 586 species of insects and mites resistant to 325 insecticides has left us without tools not only to deal with crops pests but with human diseases such as dengue, malaria and others.

Much has been written about how modern animal operations are particularly vulnerable to devastation from influenza. Large farms which hold tens of thousands of chickens or thousands of pigs in the name of efficient protein production, create an opportunity for viruses such as influenza to mutate and spread. More than 50 million chickens and turkeys in the United States were killed by avian influenza. The practices at these industrial operations (confinement, respiratory exposure to high concentrations of ammonia, hydrogen sulfide, etc, from concentrated waste) not only leave animals more susceptible to viral infections, but can sponsor the conditions by which pathogens can evolve to more virulent and infectious types. These ever-changing viruses give rise to the next human pandemic as it happened in April 2009, with a new strain of influenza in humans known as H1N1. The virus became known as swine flu and spread quickly around the world to reach pandemic status.

Another factor contributing to the emergence of pandemics is the massive and indiscriminate use of antibiotic products and growth promoters in industrial livestock models. Enrique Murgueitio of CIPAV affirms that “in

addition to being polluting and expensive, the worst effect on human health is the creation of conditions of resistance of pathogenic strains to drugs. Like other viruses, , super bacteria such as *Pseudomonas aeruginosa*, *Escherichia coli*, *Staphylococcus aureus* and *Salmonella spp*, are in line for the next pandemics, for which there are no control products available.

There are, of course, other livestock production systems such as silvopastoral systems, which based on agroecological principles ensure healthy animal production, in addition, restore landscapes and are less conducive to promoting epidemics. Antibiotics are not used in these systems (except in emergencies) since they live outdoors in biodiverse agroecosystems and their diet is based on natural foods that come from healthy soils, thus strengthening the immune systems of these animals.

The situation is aggravated as biodiverse agro-landscapes in which crops are interspersed with uncultivated areas are being replaced by large areas of monoculture that cause deforestation leading to disease emergence. As pointed out by evolutionary biologist Rob Wallace “many of those new pathogens previously held in check by long-evolved forest ecologies are being sprung free, threatening the whole world. Capital-led agriculture that replaces more natural ecologies offers the exact means by which pathogens can evolve the most virulent and infectious phenotypes”. In other words, previously boxed-in pathogens in natural habitats, are spilling over into local livestock and human communities due to the disturbances caused by modern agriculture and its associated agrochemicals and biotechnological innovations. A mere 4% increase in deforestation in the Amazon increased the incidence of malaria by nearly 50 %. The coronavirus pandemic reminds us that by violating basic laws of ecology in the name of profit, more emerging infectious diseases in people will come from wild and industrially raised domestic animals.

Declines in crop diversity and human health

Another consequence of the intensification of agriculture has been the decline of crop diversity in agrolandscapes. Despite the fact that humans could eat more than 2500 plant species, the diet of most people is composed of 3 major crops such as wheat, rice, and corn that provide more than 50% of the calories consumed globally. Yet more than 850

million people who do not have enough calories to eat. On the other hand more than 2 billion people (mostly children) that eat mostly calories, suffer from hidden hunger, whose intake and absorption of vitamins and minerals (are too low to sustain good health and development.

The fact that fewer crop species are feeding the world than 50 years ago – raises concerns about human nutrition and also the resilience of the global food system as crop diversity is key for agricultural climate adaptation. Crop diversity loss and attendant homogenization of agroecosystems, could have major consequences for provision of ecosystem system services as well as food system sustainability. The price of failure of any of these crops can be very significant for food security, impacting even more the nutritional status and health of poor and vulnerable people.

As Michael Pollan has indicated “the entire food supply of the United States has undergone a process of “cornification” and most of the corn consumed is invisible, having been heavily processed or passed through food animals before it reaches the people”. Most chickens, pigs and cows today subsist on a diet of corn. Most soft drinks and snacks consumed in the USA contain high-fructose corn syrup, which has been linked to the epidemic of obesity and Type 2 diabetes.

In developing countries, agricultural modernization has led to a loss of food security linked to the disruption of traditional rural communities and their diversified food production systems . Mostly pushed by a corporate globalized food system and free trade agreements, many countries are moving from traditional diverse and rich diets to highly processed, energy dense, micro-nutrient-poor foods and drinks. As a consequence obesity and diet-related chronic diseases have proliferated.

Agroecology and a new food system

In these days when governments are placing restrictions on travel, trade and impose lockdown of entire cities to avoid the spread of COVID-19, the fragility of a globalized food system becomes very apparent. Further trade and travel restrictions could limit the influx of imported foods either from other countries or from other regions of a particular country with devastating consequences on the poor’s access to food. This is

particularly critical for countries that import more than 50% of the food their populations consume. It is also critical for cities with more than 5 million people that in order to feed their citizens, require an entry of no less than 2 thousand tons of food per day, which travels on average about 1,000 kilometers on average. A highly unsustainable food system, easily upset by external shocks like natural disasters or a pandemic.

In the face of such global trends, agroecology has gained much attention in the last three decades as a basis for the transition to an agriculture that would not only provide rural families with significant social, economic, and environmental benefits, but would also feed the urban masses, equitably and sustainably. There is an urgent need to promote new local food systems in order to ensure the production of abundant, healthy, affordable and accesible food for an increasing urbanized human population. This challenge will prove difficult given predicted scenarios of a shrinking arable land base, with less and more expensive petroleum; increasingly limited supplies of water and nitrogen; and, at a time of rapidly changing climate, social tensions and economic uncertainty.

The best agricultural system that will be able to cope with future challenges is one based on agroecological principles exhibiting high levels of diversity and resilience while delivering reasonable yields and ecosystem services. Agroecology promotes the restoration of the landscapes in which farming systems are embedded, which enriches the ecological matrix and its functions in natural pest control, soil and water conservation, etc , but also creates “ecological firebreaks” (sensu Wallace) that may help contain pathogens from ecological release. Much work has been done to restore the production capacities of small scale farmers, by promoting agroecological principles and practices increasing traditional agricultural yields but also enhancing agrobiodiversity and its associated positive effects on food security and environmental integrity. This work is key for the food sovereignty of many communities, as small farmers who control only 30% of the global arable land, produce between 50-70% of the food consumed in most countries

Urban agriculture (UA) has been bolstered as a major sustainable alternative to enhance food security on an urbanized planet. Urban production of fresh fruits, vegetables, and some animal products can be

improved using agroecology, thus contributing to local food security and nutrition, especially in underserved communities. Urban food production has doubled in just over 15 years and this expanding trend will continue as people realize that in time of crisis, access to locally produced food is strategic. Eating nutritious, plant-based foods derived from local organic farms can help fortify our immune systems possibly enhancing our ability to withstand various threats, including contagious viruses like COVID-19.

Concluding remarks

Agroecology has the potential to locally produce much of the needed food for rural and urban communities, particularly in a world threatened by climate change, and other disruptions such as disease pandemics. What is needed is support to amplify agroecology in order to optimize, restore and enhance the productive capacities of local small and urban farmers. In order to realize such potential, successful local agroecological initiatives must be widely spread via farmer to farmer pedagogic strategies, creation of agroecological lighthouses, reviving traditional systems and reconfiguring whole territories under agroecological management. To enhance the economic viability of such efforts equitable local and regional market opportunities should also be developed. Consumers should, at this point, already realize that eating is an ecological and political act, so that when they support local farmers, instead of the corporate food chain, they create socio- ecological sustainability and resilience. Transitioning agriculture via government policies will take time, but each of us can accelerate the process by making daily choices to help small farmers, the planet and ultimately our own health.

Transitioning towards agroecology for a more socially just, economically viable, environmentally sound and healthy agriculture will be the result of the coordinated action of emerging social movements in the rural sector in alliance with urban based movements that are committed to support the radical transformation of the dominant, collapsing globalized food system. It may be wise in these days to reflect on the fact that ecosystems sustain economies (and health); economies do not sustain ecosystems. COVID-19 is reminding us that disrespectful treatment of plant and animal biodiversity has consequences, and when they are harmed, ultimately, so are we. Lets hope that this current crisis triggered

by COVID-19 will help illuminate humankind to search for a new world and softer ways to interact with nature.

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