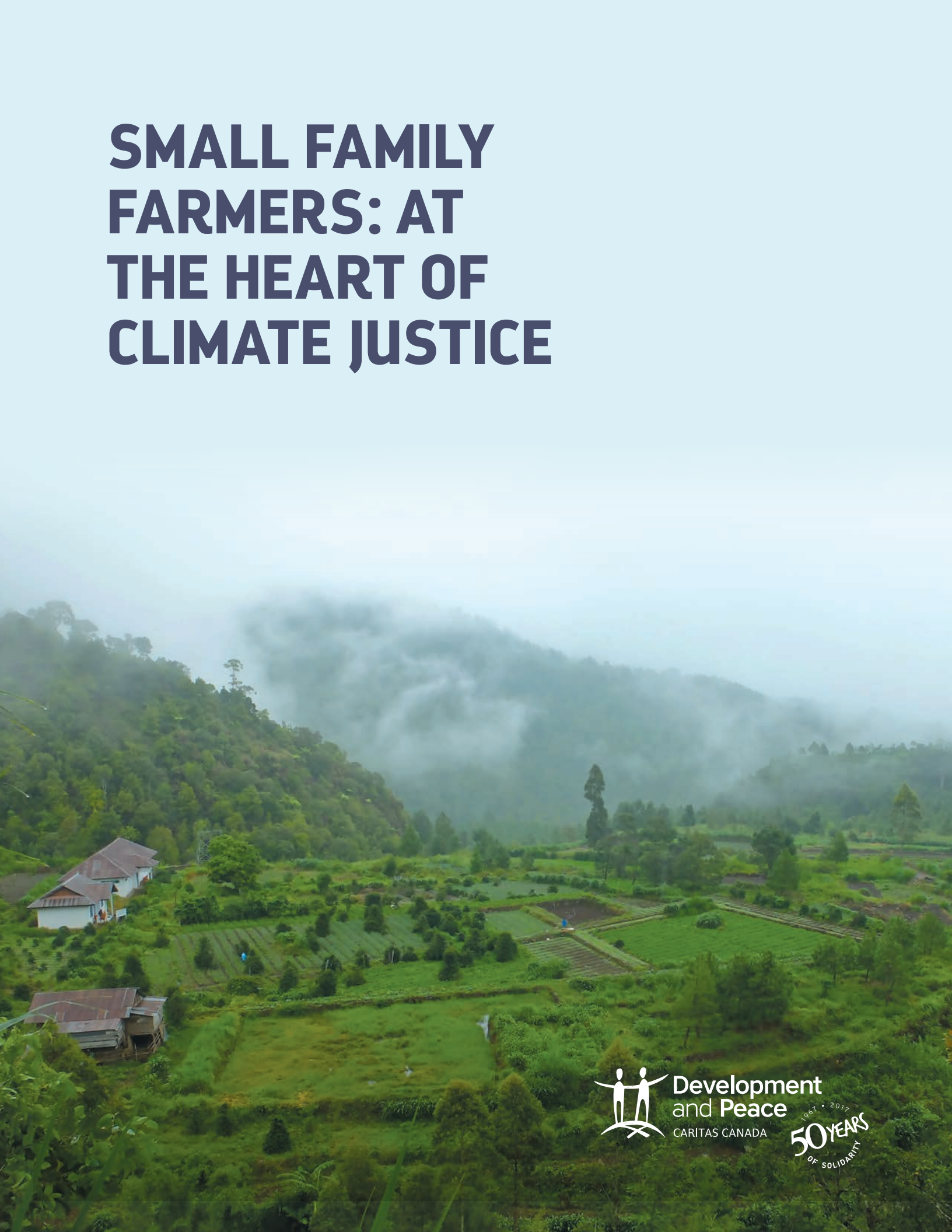


# SMALL FAMILY FARMERS: AT THE HEART OF CLIMATE JUSTICE



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and Peace  
CARITAS CANADA

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**50 YEARS**  
OF SOLIDARITY



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The Canadian edition of "*Small Family Farmers: At the Heart of the Climate Justice*" (English version of *L'agriculture paysanne au cœur de la justice climatique*) is a Development and Peace publication. November 2016.

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Acknowledgements: Development and Peace thanks *Entraide et Fraternité*, the francophone international development agency of the Belgian Catholic Church, for having authorized the adaptation of its study *Paysans résolus, réchauffement combattu* (Warming conquered by peasant resolve), published in November 2015, to the Canadian context. We also wish to thank Jean-François Bissonnette, PhD, who participated in the Canadian version.

# PREFACE

According to the latest report by the Intergovernmental Panel on Climate Change (IPCC) published in March 2014, there is no longer any doubt that global warming is caused by humans. Agriculture is closely linked to the issue of global warming (CHAPTER 1). On the one hand, this sector is responsible for more than one third of global greenhouse gas (GHG) emissions yet, on the other, agriculture, which is dependent on climate conditions, is strongly impacted by climate change. Farmers in the Global South are already facing multiple issues caused by global warming. Canadian agriculture (CHAPTER 2) is also impacted by the effects of climate change, although it is, generally speaking, less vulnerable than subsistence farming in the Global South (CHAPTER 3).

A number of actors in the farming sector agree that there is an urgent need for improved practices in order to limit the impact of the industrial agricultural model on climate change, while reinforcing environmentally and socially responsible initiatives. Despite the issues with which the farming sector is confronted, it has never had leverage in the climate negotiations that have taken place over the past 30 years, neither as a GHG emitting sector, nor as a solution for mitigating global warming or for adapting to the changes it entails.

The measures taken to combat global warming and to reduce GHG emissions have proven to be ineffective, even disastrous, for small family farmers. In addition to suffering the effects of global warming, the fundamental rights of farmers are flouted in the name of the right of Western states and multinational companies to pollute (CHAPTER 4). At the root of global warming, and of the ineffectiveness of measures taken to tackle it, is an economic and cultural model that is also the

source of a large number of inequalities and injustices worldwide, including food insecurity. Small family farmers and the social movements defending them, have been denouncing and combating this deregulated economic system for many years. Their struggle goes hand in hand with the fight against global warming.

Small family farming proposes social, economic, and production alternatives that constitute appropriate responses to counter global warming and to thoroughly transform the dominant economic model that is responsible for it (CHAPTER 5). Development and Peace, supported by small family farming movements from the Global South and the Global North, is putting forward recommendations concerning how agriculture can help cool the planet (CHAPTER 6).

## CHAPTER 1

# AGRICULTURE AND GLOBAL WARMING

Among human activities, farming is one of the largest GHG emitters, but its impact on global warming varies depending on the agricultural model applied. Industrial agriculture and small family farming are not on an equal footing when it comes to GHG emissions. The impacts on global warming are not comparable either, since small family farming is mainly practiced in countries most affected by climate change — one of the main reasons why Development and Peace and its partners denounce the industrial agricultural model and call for support of small family farming, which is the nurturer of the planet.

### The impact of agriculture on global warming

GHG emissions due to agricultural production are responsible for 11 % to 13 % of GHG emissions worldwide (Tubiello et al., 2015). This sector can be considered a major emitter, particularly when contrasted with its share of the global GDP, which in 2014 was 4 % (World Bank, 2016). GHG emissions from agriculture are unique in that they are composed mainly of methane (from livestock breeding and flooded rice cropping) and nitrous oxide (from the use of chemical fertilizers), representing respectively 45 % and 46 % of the GHG emissions of the agricultural sector. The agricultural sector is responsible for more than 70 % of global emissions of nitrous oxide (N<sub>2</sub>O) and more than 50 % of methane (CH<sub>4</sub>) emissions (Giraud et al., 2012).

If we take into account greenhouse gases emitted upstream (manufacturing of agricultural inputs) and downstream (product processing, transportation, and marketing) from agricultural production, as well as changes in land use due to agriculture

(mainly deforestation), we arrive at a GHG level of 30 % to 32 %. When packaging, freezing, and retail sales, as well as food waste, are taken into account, the global industrial agriculture system represents an estimated 44 % to 57 % of total GHG emissions (GRAIN, 2016).

All agricultural models do not, however, contribute equally to global warming. What we understand as industrial agriculture should be differentiated from small family farming.

#### INDUSTRIAL AGRICULTURE

In this text, industrial agriculture refers to the agriculture that came out of the Green Revolution. It is based on intensive technology packages, *i.e.* the use of heavy machinery, chemical inputs (fertilizers and pesticides), improved or genetically modified seeds, and extensive cultivation of monocultures.

This type of agriculture “covers between 70 % and 80 % of the world’s arable land. Surprisingly, it generates less than one third of agricultural products” (Jamart et al., 2014, 24, our translation).

> NITROGEN FERTILIZERS: MAIN N<sub>2</sub>O EMITTERS

Industrial agriculture is the prime generator of GHG emissions in the farming sector. Nitrogen fertilizers (chemical fertilizers, manure, or slurry) emit nitrous oxide directly when they are spread on the land (part of the nitrogen is released into the atmosphere), and indirectly, through the processes of nitrification and denitrification in the soil whereby they are volatilized or leached into waterways.

The table below shows nitrous oxide emissions resulting from nitrogen fertilizers. Emissions are expressed in terms of tonnes of CO<sub>2</sub>-equivalent (GtCO<sub>2</sub>eq). All greenhouse gases do not have the same global warming potential (GWP), but for the purposes of facilitating the calculation of GHG emissions, CO<sub>2</sub> is used as a standard and its GWP is "1," so for instance, methane and nitrous oxide have a GWP 25 and 298 times greater than CO<sub>2</sub>, respectfully. GHG emissions are always measured in tonnes of CO<sub>2</sub>-equivalent. In order to measure the CO<sub>2</sub>-equivalent of a tonne of N<sub>2</sub>O for example, we simply multiply by 298.

In addition, agricultural yields of the industrial model tend to decrease over time, resulting in an increased use of nitrogen fertilizers. Over the past 40 years, the use of products, such as pesticides, to protect plants has risen eight-fold while production has not even doubled over the same period of time and is expected to drop drastically by 2050 according to the FAO (Jamart et al., 2014).

> INTENSIVE LIVESTOCK BREEDING:  
THE PRIMARY SOURCE OF CH<sub>4</sub>

Industrial agriculture also applies to intensive livestock production, which is the main source of methane (CH<sub>4</sub>) emissions. Ruminants regurgitate their cud in order to chew it again. This digestion process causes them to belch, thereby producing important quantities of methane emissions. A cow emits an average of 1.4 GtCO<sub>2</sub>eq per year (Vandaele et al., 2010). Another CH<sub>4</sub> emission factor related to intensive livestock production is the management and processing of livestock waste. Manure and slurry concentration in a single place results in anaerobic fermentation, itself a substantial source of methane. Importantly, livestock waste concentration only occurs in the context of enclosed rearing or feedlots.

> THE USE OF HIGH CO<sub>2</sub>-LEVEL  
EMITTING FOSSIL FUELS

Extensive development of industrial agriculture, *i.e.* cultivating large areas of monocultures, involves the use of farming machinery, which also emits CO<sub>2</sub>. Since industrial agriculture dominates the world market, its yields are shipped over long distances by sea, air, and land, another source of CO<sub>2</sub> emissions. Intensive greenhouse farming and enclosed rearing in heated barns contribute to emissions as well.

> DEFORESTATION AND LAND USE  
CHANGE: INDIRECT EMISSIONS CAUSED  
BY INDUSTRIAL AGRICULTURE

Industrial agriculture is both technologically intensive, *i.e.*, productivity per hectare is boosted by the use of technology packages, and extensive, *i.e.* yields are increased by expanding cultivated areas. Extending agricultural space is made possible by the development of machines and it entails the "colonization" of new lands that were previously used for other purposes.

Clearing and deforestation of natural areas are thus being perpetuated. These natural areas absorb and store CO<sub>2</sub>. When they are destroyed due to farm land conversion, the CO<sub>2</sub> stored in the trees and soil is released into the atmosphere, causing the area to lose its CO<sub>2</sub> absorption capacity as well.

Livestock farming also contributes to global warming due to the deforestation carried out to free up land to be used as living space for animals or for cultivating their food. Approximately 70 % to 90 % of deforestation is related to the expansion of feed crops and pastures, representing 15 % to 18 % of global emissions (GRAIN, 2016). As much as 75 % of all arable land in the world is intended for animal fodder (Greenpeace, 2015, 7). Improved living conditions in developing countries have resulted in greater meat consumption - a sign of prosperity - and this constitutes a major environmental challenge for the years to come.

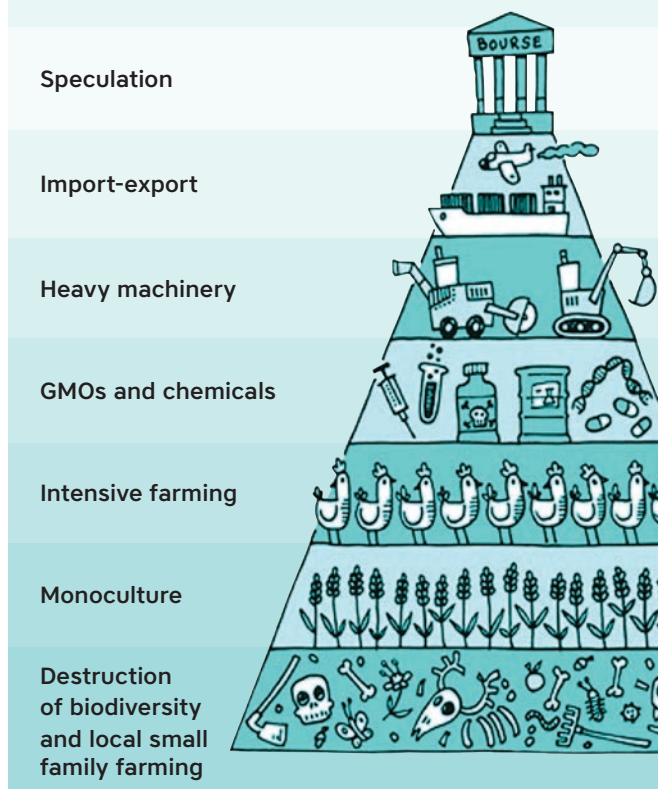
**NITROUS OXIDE EMIT FROM USAGE OF ONE TON OF NITROGEN FERTILIZERS**

DIRECT EMISSIONS	INDIRECT EMISSIONS	EMISSIONS DURING FERTILIZER PRODUCTION	TOTAL NITROGEN FERTILIZER EMISSIONS
5 GtCO <sub>2</sub> eq	5,5 GtCO <sub>2</sub> eq	3,6 – 6,1 GtCO <sub>2</sub> eq	14,1-16,6 GtCO <sub>2</sub> eq

Source : Vandaele et al., 2010



## AGRI-BUSINESS PYRAMID



### > ENVIRONMENTAL DEGRADATION: AN ADDITIONAL IMPACT OF INDUSTRIAL AGRICULTURE

Greenhouse gas emissions are not the only adverse effect resulting from industrial agriculture. Intensive livestock farming causes water and soil pollution as well as ecosystem imbalances. As explained in the FAO's 2006 report on livestock farming (FAO, 2006), animal waste used as fertilizer contains excessively high levels of nutrients and sometimes hormones, medicine residue (antibiotics), and pathogens. The soil cannot entirely absorb these substances, the remainder being washed into rivers, lakes, and coastal seas. This leads to soil and water acidification and ultimately to the disruption of ecosystems, "dead zones" and "green tides" (algal bloom) in coastal areas,<sup>1</sup> deterioration of coral reefs, and damage to human health.

### > THE NEGATIVE SOCIAL IMPACT OF INDUSTRIAL AGRICULTURE

In addition to being a primary source of GHG emissions, industrial agriculture has had a negative social impact on rural areas since the time of its expansion in the 1960s. It benefits

1 "Dead zones in the oceans are coastal areas where the water closer to the seafloor is depleted in oxygen" (Diaz 2001, our translation). The lack of oxygen makes it impossible for animals to survive. Fish and invertebrates disappear, leaving behind a "dead zone." See Greenpeace's 2008 report "Dead Zones: How Agricultural Fertilizers Kill Our Rivers, Lakes and Oceans," p. 5. Available at <http://www.greenpeace.org/canada/en/documents-and-links/publications/dead-zones/>

large-scale farmers, who are able to invest in the inputs and machinery required by this model. Small family farmers quickly found themselves deeply in debt, eventually leading to bankruptcy. Their lands were bought by large-scale producers, leading to land concentration on the one hand, and the emergence of landless farmers on the other. Daily exposure to chemicals in the context of industrial farming affects the health of agricultural labourers (cancers, disruption of the endocrine system, and so on). The end consumer of industrial agriculture products is not favoured by the system either. The nutritional quality of these products is poor, and traces of pesticides and antibiotics may be found in them, potentially causing cardio-vascular disease and obesity.

## SMALL FAMILY FARMING

Small family farming varies greatly worldwide. Nevertheless it is defined by some general characteristics. Firstly, this type of agriculture is a family affair, i.e. the farm is family run and uses family labour. It is both the family's primary activity and primary source of income. In addition, as highlighted by Mazoyer, throughout the world, most small family farmers use only manual and animal labour (Mazoyer, 2008). The area farmed by small family farmers rarely exceeds two hectares. **Although small family farming may have a foothold on international agricultural markets with annuity products intended for export, it is clear that it must be supported, because it still guarantees, first and foremost, the food security of families and communities** (Kesteloot, 2007).

Figures from the World Bank show that small family farmers—almost 1.5 billion people, including 500 million landless peasants—represent over half of the world's labour force (World Bank, 2008). **In the Global South, small family farming includes about 85 % of farmers and produces 60 % of the food consumed worldwide, while occupying only 20 % to 30 % of arable land** (Caudron, 2014). This situation has been condemned by the United Nations Environment Programme, the United Nations Food and Agriculture Organisation, and the United Nations Special Rapporteur on the Right to Food (GRAIN, 2016, 82).

### > THE SMALL FAMILY FARMING MODEL: A LOW EMITTER OF GHG

There are no specific figures for the GHG emissions produced by small family farming because little research has been done in this regard. In addition, the term "small family farming" refers to a wide variety of agricultural systems and models, which makes it difficult to analyze. Nevertheless, small family farming is still the dominant model in certain countries of the Global South, and it is possible to estimate its impact on global warming by analyzing GHG emissions from agriculture by country.

This method of analysis shows that the majority of agricultural GHG emissions come from countries where the dominant

agricultural model is industrial agriculture, while agricultural GHG emissions produced by countries in the Global South, where small family farming is still the main form of agriculture, are almost nonexistent (Giraud et al., 2012).

In comparison with the industrial model, practices used by small family farmers emit less greenhouse gas. Firstly, small family farmers have less access to chemical inputs, including nitrogen fertilizers, which are major N<sub>2</sub>O emitters. Secondly, the small areas that they farm do not require the use of tractors and large agricultural machinery, which are also big CO<sub>2</sub> emitters. The production of small family farmers is mainly for household subsistence and local markets, translating into lower freight transport emissions. As for livestock breeding, it is rarely intensive in the case of small family farming. Moreover, traditional peasant systems favour breeding small and intermediate ruminants such as goats or sheep or monogastric animals like pigs and chickens, which emit less methane (FAO, 2013).

Moreover, the small family and peasant agricultural model lends itself to the development of agroecological practices with a capacity for preserving the environment, and even cooling the planet. For example, practices such as the crop cover system and agroforestry absorb more GHGs than they emit.<sup>2</sup>

#### > SOME FAMILY FARMING PRACTICES RESULT IN GHG EMISSIONS

However, some practices that are characteristic of small family farming produce high levels of GHG emissions. One such practice is flooded rice farming, a substantial CH<sub>4</sub> emitter. Of course, in many developing countries, especially in Asia, rice is the major staple food for poor peasant populations.<sup>3</sup>

However, small family farming is an indirect emitter of GHG, as a consequence of deforestation. In countries where family farming is still the main agricultural model, the demographic pressure in rural areas creates the need to expand farming land through burning and cutting down forests. Demographic growth also increases the need for fuelwood, since small family farmers have little access to energy, and for wood as construction material, thereby causing deforestation.

However, this view must be tempered. The causes of deforestation vary from one place to another, but on a global scale, deforestation-induced CO<sub>2</sub> emissions are mainly attributable to clear-cutting the Amazon forest and the Indonesian tropical

forest. The main reason for such clear-cutting is the expansion of industrial agricultural areas. Family farming is the primary culprit of deforestation in dry tropical forest zones, such as the Sahel region, whereas tropical rain forests provide enough dead wood for the needs of the local population. In addition, the economic and social conditions endured by small family farmers (shortage of land, little access to productive resources, absence of support and infrastructure from the state, and so on) force them to adopt subsistence rationales that have a negative impact on the environment and on GHG emissions (Carracillo, 2009).

## The impact of global warming on agriculture

Of all human activities, agriculture is the most affected by weather conditions. It is also among the sectors with the greatest impact on global warming. It has and will continue to have serious repercussions on agriculture and therefore on food security for a growing number of people.

### GENERAL CONSEQUENCES

#### > RISING TEMPERATURES

Rising temperatures generate pests and invasive plants that may limit the growth of crops. In Madagascar, for example, temperature rise has allowed grasshoppers to survive the winter and devastate crops year after year. It has also led to the emergence of Striga, a very tenacious weed that ravages crops (Caudron, 2015).

Temperature rise also disrupts seasons, especially in tropical areas where the dry season is lasting longer. This affects plant growth and results in poorer yields.

In some regions, the melting of glaciers, which partly regulates streamflow, is accelerated, threatening to engender severe freshwater shortages.

#### > INTENSIFIED EXTREME EVENTS

Extreme weather events such as heavy rains, drought, and cyclones will intensify. Droughts are not only more severe, but also last longer, destroying crops and killing animals. The rains that follow dry seasons are also more intense and lead to floods that damage crops and erode the soil, affecting its fertility and curbing agricultural yields. Cyclones and other disasters worsen, leading to more destruction and flooding.

Droughts and the inability of the soil to absorb the more abundant rains reduce the availability of freshwater that is absolutely essential to agriculture and livestock breeding.

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2 For more information about agroecological practices, see Entraide et Fraternité's analysis: Caudron, M. 2015. Madagascar – Paysans et paysannes face au changement climatique at <https://www.entraide.be/Madagascar-paysans-et-paysannes-face-aux-changements-climatiques> (in French).

3 According to the French Institute for Research and Development, producing one kilogram of rice creates 120 grams of methane emissions, corresponding to 2.76 kg CO<sub>2</sub> eq. Rice-farming-related methane emissions come from the decomposition of organic matter in places devoid of oxygen, such as the water of flooded rice fields. When water is drained in order to harvest the rice, the methane produced in the soil is released in the atmosphere (Roger and Le Mer, 1999).

> RISING SEA LEVELS

In addition to reducing available arable land, in particular in river deltas, the rise of sea levels pollutes groundwater, further affecting water resources. Ocean levels could rise an estimated two metres by 2100, compressing agricultural land in coastal regions and deltas, where almost 60 % of the world’s population lives. “In India alone, losses by 2030 could range from 1,000 to 2,000 km<sup>2</sup> [...]” (FAO, 2015)

> LOSS OF BIODIVERSITY

Changes affecting the climate, in particular land and sea temperature rise, put pressure on biodiversity and the capacity to provide ecosystem services<sup>4</sup> that maintain a natural balance. Local species are forced to adapt, migrate, or disappear, while other species enter or develop in a given area, sometimes at the expense of indigenous species.

SOME ALARMING FIGURES	
DECLINE IN AGRICULTURAL YIELDS	FOOD INSECURITY
According to most emissions scenarios, agricultural yields may <b>decline by at least 5 %</b> by 2050 and by at least 10 % by 2100 compared to late 20 <sup>th</sup> century levels (IPCC, 2014), whereas the FAO affirms that production should rise between 60 % and 70 % by 2050 in order to meet the growing need for food (FAO, 2015).	In drought-prone countries, particularly in South Asia and Africa, the drop in basic cereal crop yields <b>will increase child malnutrition by 20 %</b> (Lloyd et al., 2011).
Temperature rise beyond the 3°C level may speed up the decrease in yields. In addition, projections suggest that global warming will cause a greater variability in yields from one year to the next (IPCC, 2014).	In the coming 40 years, <b>food insecurity will affect 265 million more people</b> , and up to 600 million more by 2080 (Eriksson et al., 2011).
According to Lobell and Gourdji (2012), leaving aside the factors that have led to increased agricultural production, climate change has already caused <b>a 4 % to 6 % decrease</b> in wheat and corn yields between 1980 and 2008.	<b>Between 200 million and one billion people may be forced to migrate</b> because of climate change by 2050 (IOM, 2008). A large number of the displaced will be peasants who will no longer be able to farm, further accentuating global food insecurity.
Deryng et al. (2014) believe that corn, wheat and soy production may undergo <b>an average drop of 24 %</b> b 2080 due to lengthier periods of heat and drought.	
LOSS OF BIODIVERSITY	ACCESS TO WATER
The IPCC (2014) estimated that a 2 to 3°C rise would cause <b>the extinction of 20 % to 30 % of animal and plant species</b> , gravely jeopardizing the resilience of food systems.	According to the IPCC (2014), <b>80 % of the world’s population experiences limited access to water</b> . Projections suggest that the percentage of the population living in water shortage affected regions will increase, depending on the level of global warming, by between 8 %—if the temperature rises by 2°C—and 13 %, if it reaches 5°C (Gerten et al., 2013).
NATURAL DISASTERS	
Climate change threatens to increase the number and severity of natural disasters, in particular the number of <b>cyclones, floods, and droughts</b> (Mechler and Bouwer, 2014).	

4 Ecosystem services are the benefits that humans draw from ecosystem processes, such as oxygen production, CO<sub>2</sub> absorption, pollination, and so on.

## Impacts on small family farming

The injustice inherent in global warming, whereby the poorest pay the price for the actions of the rich, is even more blatant in regards to small family farmers.

The impact of global warming on agriculture varies greatly from region to region. For example, in temperate and cold areas such as northern Europe and North America, the rise in temperatures up to a certain threshold should improve agricultural yields. By contrast, in tropical and hot areas, the effects on agriculture are and will remain devastating. These are the parts of the world where developing countries are located, where 70 % to 90 % of the population is rural and composed of small family farmers. This is also where food insecurity is already most severe.

In addition to the constraints that small family farming is already experiencing (lack of state support, scarcity of resources, limited access to land, demographic growth and unfair competition from the industrial agriculture of developed and emerging economies), it will have to face a growing number of challenges, such as the depletion of water resources, increasingly resistant pests and invasive plants, cyclones, droughts and floods.

Industrial agriculture in hot and tropical regions will also be impacted by global warming, but it has access to impressive means and support from most governments in the Global South, unlike small family farmers who are generally left to their own devices.

▼ Burundian women in her field.  
Picture from Adisco, partner  
of Development and Peace  
in Burundi.



### > THE DETERIORATING SITUATION OF FEMALE FARMERS<sup>5</sup>

The situation of female farmers has worsened in a very specific way.<sup>6</sup> They are disadvantaged by the roles and responsibilities imposed on them by the local sociocultural context, which is reinforced by the prevailing market economy ideology.<sup>7</sup> Global warming engenders a scarcity of resources and further limits the access of women farmers to them, resulting in longer working hours, a heavier burden of domestic tasks and ensuring the food security of the family.

Even under normal conditions, these women have difficulty accessing sufficient funds for production and related freight costs. With climate change affecting agricultural yields (drought, field and road flooding, etc.), women farmers are seeing their revenues dwindling, and even disappearing.

Human displacement caused by climate change directly impacts women: either the man of the household migrates and the woman is left alone with their children to carry a heavier workload and is more financially insecure (women heads of household are poorer), or women leave with their children and face numerous dangers on their migration journey. They often fall victim to discrimination, harassment, violence, abuse, and human trafficking.

Finally, as already mentioned, global warming engenders the risk of disease. Women have little access to healthcare, or to transportation or money to get the care they need. In addition, they are often in charge of supplying the family with drinking water and therefore more exposed to diseases transmitted by mosquitoes that proliferate near water sources, such as malaria or dengue fever.

5 The following paragraphs are drawn from Carracillo and Cusson, *Changements climatiques : quelles recommandations pour les paysannes ? Analyse Entraide et Fraternité*. (Climate Change: Recommendations for Women Farmers. Analysis produced by Entraide et Fraternité) 2015 (in French).

6 As shown by the CARE report, climate-change-induced injustice affects women doubly. On the one hand, the poorest populations in developing countries are the primary victims of the repercussions of climate change, although they have contributed the least, and have very few financial or technological resources to meet the challenge and adapt. On the other hand, women suffer from social and cultural constraints, placing them in the most precarious situations and making them more vulnerable to climate change than men. Consequently, CARE establishes a relationship between poverty resulting from gender inequality and poverty aggravated by climate change. CARE International. Tackling the Double Injustice of Climate Change and Gender Inequality. Copenhagen, 2014, [www.careclimatechange.org/files/Double\\_injustice.pdf](http://www.careclimatechange.org/files/Double_injustice.pdf) (page visited on July 26, 2016.)

7 Placing them at a disadvantage even if climate conditions were excellent.

## CHAPTER 2

# CANADIAN AGRICULTURE IN THE FACE OF CLIMATE CHANGE

### The prevailing agricultural model in Canada

Canadian agriculture is characterized by its diversity. This sector is of crucial national importance, representing 8 % of the GDP in 2011 and 6.7 % in 2013, and providing one in eight jobs. Most Canadian agricultural producers cultivate large areas and use capital- and energy-intensive techniques (fertilizers, fuel), but we also find a form of “small-scale” agriculture that innovates in terms of resilient practices.<sup>8</sup>

Census data shows that the agriculture sector is undergoing important transformations. Although dominated by the industrial model, small family farming remains widespread. Between 1996 and 2011, the number of farms dropped by 25 % and the size of farms expanded by 22 %, from 608 to 778 acres. This consolidation points to an ongoing restructuring of agriculture, with many farmers expanding their businesses and intensifying the use of new technologies. Between 2005 and 2011, the only farms that rose in number are those within the income category of over \$500,000 (Statistics Canada, 2011 Census of Agriculture).

The restructuring of agriculture has resulted in a steady increase in farms that operate as large-scale companies,

while the number of individual farms continues to decrease.<sup>9</sup> Meanwhile, the proportion of leased agricultural land has been on the rise for a few decades, accounting for 38 % of cultivated land in 2011 (Statistics Canada, 2011 Census of Agriculture). This phenomenon is attributable to higher land prices, as well as to the growing number of retired farmers and investment funds that lease their land.

Another strong trend in Canadian agriculture is the sharp rise in the use of inputs over the past 30 years. The use of chemical nitrogen fertilizers doubled from 1971 to 2011, while the total area of cultivated land increased by only 15 %. Expenditures on chemical fertilizers and manure increased by 24.5 % between 2005 and 2010 (Statistics Canada, 2011). Over this time period, increased use of chemical fertilizers was mainly on large large farms. The observed improvement in productivity is partly attributable to the use of nitrogen fertilizers, which are produced from natural gas and contribute to the GHG emissions of the agricultural sector (Statistics Canada, 2015).

Nevertheless, the number of certified organic farm operators (or those in the process of obtaining such certification) has continued to rise over the past few years, reaching 4,120 in 2011, and representing 1.8 % of total farming in the country. Growth is highest in Ontario and Quebec, whereas British Columbia is home to the largest proportion of these farms. This trend shows the enhanced value of small-scale and environmentally-sound farming, which goes beyond certified organic farming alone.

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<sup>8</sup> Agriculture operating costs have rapidly increased over the past few years, i.e. by more than 40 % over the period stretching from 2003 to 2013. The factors contributing most to rising costs are commercial seeds (+107 %), fertilizer and lime (+90 %), and fuel for machinery (+80 %). (Agriculture and Agri-Food Canada, 2015).

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<sup>9</sup> Consequently, out of the total number of farmers, “millionaires,” i.e. farmers who declare an income of over one million dollars, rose sharply from 3.2 % to 4.7 %. Their share of total agricultural income climbed from 42.8 % to 49.1 %.

## The globalized agricultural system

Most of the food produced and consumed in Canada is part of the international agri-food trade. This generates substantial levels of emissions downstream, mainly from production, processing, conservation, and distribution. According to some estimates, the hike in trade and therefore transportation of primary or processed foodstuffs accounts for 5 % to 6 % of global GHG emissions. Processing, packaging, freezing, refrigeration, and retailing represent an estimated 13 % to 18 % of total global emissions (GRAIN, 2016, 4).

Canada is among the largest exporters of agricultural and food products in the world, ranking 3<sup>rd</sup> in 2013. Canadian agri-food exports amounted to 3.5 % of the total value of international exports in the sector for that year and were mainly destined for the United States, followed by the Chinese market. According to Agriculture and Agri-Food Canada (2015), approximately half of the total value of the country's primary agricultural production is exported. Canada is also an important exporter of foodstuffs - the world's 6<sup>th</sup> - with 2.9 % of total global exports in 2013. It is therefore a large contributor to the portion of emissions corresponding to the shipping of agricultural and food products abroad.

Canadian agri-food exports and imports have been continuously on the rise over the past few years (Farm Credit Canada, 2014). New bilateral and free trade agreements, namely the Trans-Pacific Partnership and the EU- Canada Comprehensive Economic and Trade Agreement, are aimed at diversifying export markets for Canada, which are viewed as too dependent on the United States. However, these measures are a boost for international trade that is based in large part on the industrial agricultural model. In Canada, and around the globe, the pressure exerted by this prevailing agricultural model, which is based on unrestrained liberalization and adds to the impact of climate change, is borne by women more than men, affecting their quality of life and their health (Roppel et al., 2006).

**Substantial food waste causes significant levels of GHG emissions, like the current dominant agri-food system that generates this waste. In Canada, the majority of food waste comes from households and the retail and services sectors. An estimated 30 % of total available foodstuffs in Canada went to waste in 2010, 20 % by households, and 9.1 % by the retail sector.**

## The impact of climate change on agriculture in Canada

### GHG EMISSIONS FROM AGRICULTURE COMPARED TO TOTAL EMISSIONS PER PROVINCE IN MTCO<sub>2</sub>E, 2012

PROVINCE	GHG AGRICULTURE	TOTAL GHG
Alberta	19,0	267,0
Saskatchewan	11,9	74,8
Ontario	9,4	167,0
Quebec	7,5	81,2
Manitoba	6,3	21,3
British Columbia	2,3	64,0
Prince Edward Island	0,5	2,0
Nova Scotia	0,4	18,3
New Brunswick	0,3	15,7
Newfoundland and Labrador	0,1	10,1
TOTAL	58,0	722,4

Climate change in the agriculture sector is already of deep concern for the federal and provincial governments in Canada. The *Growing Forward 2* (2013-2018) policy framework introduces new tools in addition to those already in place to help farmers adapt to and deal with extreme events caused by climate change. These tools include a drought-monitoring system, an interactive weather monitoring system, and AgriRecovery, a financial support tool in the event of a natural disaster (Canada oral declaration, UNFCCC, Bonn, 2016).

Canadian agriculture, dominated by cereal and oilseed production, as well as by cattle breeding, is one of the sectors most affected by climate change. Considering the warming expected throughout the country, these changes will have various effects depending on regions and farming sectors. Warming will be more marked in northern Canada, where the growing season might become longer. On the other hand, increased climate variability and more numerous extreme events may

exacerbate the vulnerability of certain crops that environmental and economic factors have already rendered fragile (Natural Resources Canada, 2015).

The southern and central Prairies, a region that periodically experiences water shortages, will be more exposed to the impacts of global warming. Although precipitation is expected to increase slightly across the planet, greater variability in rains might accentuate the vulnerability of agriculture in the Prairies. Extreme weather events, such as the 2001 and 2002 droughts, and the floods of 2010 and 2011, which had devastating effects on cereal yields, may occur more frequently (Agriculture and Agri-Food Canada, 2015). In the Prairies, droughts and floods may reduce available grazing land and forage production, potentially leading livestock breeders to reduce the size of their herds.

Other adverse effects of warming in Canada are expected, especially a rise in the incidence and severity of pest infestations and crop diseases. More frequent infestations of parasites and pathogens affecting animals are also anticipated. Higher levels of CO<sub>2</sub> in the atmosphere may contribute to the proliferation of weeds—an incentive for farmers to use more plant protection chemicals, thereby increasing the sector's energy consumption (Agriculture and Agri-Food Canada, 2015).

A recent study by Natural Resources Canada shows that climate change will make Ontario's agriculture sector vulnerable to drought and to pest and pathogen infestations. Between the years 2000 and 2004, the damage caused to crops by direct and indirect climate change in Ontario resulted in agricultural insurance payments in the amount of \$600 million. According to Ontario's National Round Table on the Environment and the Economy, this figure will grow significantly over the coming years (Greenhouse Gas Progress Report, 2015). In Quebec, agriculture experts analyzing climate warming scenarios insist on the incidence of more severe water shortages that may cause the productiveness of certain crops such as corn to dwindle in some regions (Bélanger and Bootsma, undated).

Like a number of other Canadian provinces, British Columbia has little arable land (5 % of its territory).<sup>10</sup> The province's modest agri-food economy is dependent on international markets. Here, the more frequent occurrence of droughts, forest fires, and floods will add to the numerous constraints that have traditionally affected farmers, such as swings in commodity pricing (Crawford and Beveridge, 2013). Consumers in British Columbia and elsewhere in Canada rely on imports of fruits and vegetables from California. Access of BC consumers to fresh produce has been directly affected by the increasing frequency of droughts on the west coast of the United States (Crawford and Beveridge, 2013). This situation prevails throughout Canada's provinces and territories. Despite advancements in greenhouse agriculture, Canada, a northern

country, is dependent on fruit and vegetable imports during the winter.

## The Canadian agriculture sector's contribution to GHG emissions

Federal researchers have been monitoring emissions in the agriculture sector since 1992 as part of Canada's obligations under the United Nations Framework Convention on Climate Change (Environment and Climate Change Canada, 2015). Agricultural production and livestock breeding in Canada are estimated to have directly contributed an average of 8.2 % of total emissions for the years 2013 and 2014 (Environment and Climate Change Canada, 2015). This figure includes carbon dioxide (CO<sub>2</sub>) emissions related to land use, methane (CH<sub>4</sub>) emissions attributable to livestock manure and digestion, and nitrous oxide (N<sub>2</sub>O) emissions generated mainly through the use of nitrogen fertilizers.

The calculation of emissions from agriculture in Canada does not include emissions related to the use of fossil fuels for machinery or the production of fertilizers and plant protection products (herbicides and insecticides); to the use of energy for transporting, processing, and conserving commodities; to the international marketing of foodstuffs; or to the waste generated by the sector (Agriculture and Agri-Food Canada, 2015). Although data for Canada is not available, studies have established the worldwide contribution of agriculture to be one third of total emissions (GRAIN, 2016). Taking into consideration only emissions related to the production process, Canadian government experts expect direct emissions of the agriculture sector to drop over the coming years. However, this is a narrow, partial estimate of agriculture that overlooks the overall context of the industrial agri-food system.

Agriculture sector emissions have increased by 21 % since 1990. The factors explaining this trend over the time period in question include the increasing use of inorganic nitrogen fertilizers, in particular in the Prairies, as well as the expansion of intensive breeding of cattle, pigs and poultry. Emissions due to livestock breeding alone represented 62 % of agriculture sector emissions in 2014 (Environment and Climate Change Canada, 2016). Alberta, where cattle breeding is concentrated, contributes 30 % of Canadian agriculture emissions (Government of Alberta, 2016). While livestock numbers have remained at their 2011 level, the use of nitrogen fertilizers has continued to climb with the expansion of crop production over the past few decades (Environment and Climate Change Canada, 2016).

<sup>10</sup> Out of this 5 % arable land, only 1 % is of excellent quality (Crawford and Beveridge, 2013).

New practices<sup>11</sup> sometimes limit agriculture-induced emissions and increase carbon sequestration in the soil. This partly offsets emissions of other GHGs. Taking into account carbon sequestration in the soil, the portion of emissions directly related to agriculture dropped from 8 % to 6 % of total emissions in Canada for 2014. This is thanks to the replacing of annual crops with perennials, such as tame hay, and the adoption of minimal tillage or direct seeding techniques.<sup>12</sup> These labour-free practices enable carbon storage in the soil and an overall decrease in emissions, while fostering improved soil quality. Agricultural lands used in this way are described as “carbon sinks” (Agriculture and Agri-Food Canada, 2016).

In 2011, direct seeding techniques, which do not require tillage, were introduced on over half of Canada’s annually cropped land. These techniques are widespread in the Prairies where the extent of cultivated land and erosion-exposed soil makes the environmental and financial benefits of direct seeding more substantial. Quebec has doubled the amount of land cropped in this manner, reaching more than half a million acres, in large part due to government incentives paid between 2009 and 2013 (Statistics Canada, 2016). In addition, the use of manure as a natural fertilizer, widely practiced in Quebec, Ontario, and British Columbia, produces fewer GHG emissions.

## Large agrochemical companies behind the industrial model

Powerful interests linked to multinational companies control a large part of the seed, fertilizer, and pesticide markets, in turn supporting the expansion of the industrial agricultural model in Canada and resulting in more GHG emissions. The phosphorus, potassium, and nitrogen fertilizer industry is represented by the organization Fertilizer Canada, which acts as “spokesperson” for an industry that generates \$12 billion each year. Fertilizer Canada promotes the use of chemical fertilizers, in particular the variety that is nitrogen-based, blocking the use of fertilizers that curb nitrous oxide emissions. Organizations such as the National Farmers Union oppose the mass promotion of expensive and highly polluting chemical fertilizers by supporting the use of organic fertilizers instead.

Various plant protection methods, including herbicides, pesticides, and fungicides, are broadly used across the country. These methods stem from an industrial process that is energy-expensive and as such contributes to climate change

and pollutes the environment. In Quebec, pesticide use has grown exponentially over the past few years. Sales of glyphosate alone, a herbicide used in genetically modified corn and soybean production, rose by 27 % between 2006 and 2012 (Ministère de l’Environnement du Québec). Figures are similar in most provinces, in particular in Ontario and Alberta (Carex Canada, 2015). In Alberta, sales of this herbicide increased by 41 % between 2008 and 2013 (Alberta Environment and Parks, 2015). The boom in herbicide use is attributable to various factors, including genetically modified cultivars and direct seeding techniques, which may favour the growth of “weeds” while eliminating labour (Friedrich, 2005).

The use of genetically modified organisms results in a reliance on herbicides. In Canada, over 80 % of corn and canola, and over 50 % of soybeans are grown from genetically modified seeds, which are resistant to some herbicides (Canadian Biotechnology Action Network, 2015). The genetically modified seed and crop protection product manufacturers and distributors include companies such as Cargill and Monsanto. In Canada, the industry is represented by Croplife Canada, with sales revenues close to \$2 billion. These transnational companies promote genetically modified and patented seeds and chemical technologies for controlling pests, pathogens, and weeds, all of which proliferate with climate change (Croplife International). Croplife Canada is a powerful lobby that controls much of the information about new agri-food technologies and their uses (Canadian Biotechnology Action Network, 2015).

While climate change increases the risk of infestation by stimulating invasive species, the argument in favour of GMOs and pesticides to control these overlooks their contribution to GHG emissions. Despite the limited attention paid by scientists to pesticide-related emissions, recent research has been able to quantify them. It has thus been shown that the recent infestation of soybean fields in North America by an Asian insect pest, a phenomenon attributable to climate change, involved significant emissions related to production, transport, and insecticide use. Calculations have established that the massive use of insecticides in order to control this specific infestation represented the equivalent of 10.6 kg of CO<sub>2</sub> per hectare—an alarming figure when we consider that this crops extends over several million hectares in North America (Heimpel et al., 2013).

Scientific studies show that climate change increases the risk of pest and weed infestations, which in turn may cause a sharp rise in pesticide use on a global scale. The impact of pesticide use on GHG emissions is undeniable (Delcour et al., 2015) and fully justifies promoting an alternative model that favours organic pest control methods, as opposed to industrial agriculture.

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11 Beneficial management practices (BMP) include a number of techniques implemented on the watershed scale, aimed at reducing soil erosion, water runoff, and evaporation of agricultural inputs.

12 Direct seeding techniques are also called “one pass seeding” since the labour of bringing deeper layers of soil to the surface and weeding, which is done prior to seeding, is not required.



## Alternative agricultural models

Despite the clear predominance of industrial agriculture in Canada, numerous initiatives are aimed at opening the way to agriculture that is more environmentally-friendly and better oriented towards community needs.

**Urban and peri-urban agriculture** are enjoying unprecedented popularity in the country. Although they only meet an estimated 5 % of food needs in urban areas, this contribution is of great importance to certain population groups (Future Direction International, 2013). It is a recognized fact that in disadvantaged neighbourhoods, urban agriculture improves food security. In fact, poor populations are often deprived of access to fresh products, and urban and peri-urban agriculture can help meet this need (Hoorweg and Munro-Faure, 2008).

In large cities such as Montreal, Toronto, and Vancouver, urban agriculture is promoted by neighbourhood associations, environmental organizations, and in general, by municipal governments. In Quebec, an urban agriculture network that brings together all of the practice's stakeholders has existed since 2009. Despite the willingness of Canadian civil society to support urban agriculture, a lack of space and the costliness of this practice remain the main limiting factors. However, new agricultural techniques, such as vertical gardens and hydroponic and aeroponic agriculture, are making it possible to overcome the lack of space (Future Direction International, 2013).

**Community-supported agriculture**, which often upholds the principles of organic agriculture and agroecological approaches, is also a promising avenue for Canada. This method of linking producers and consumers while eliminating wholesalers and ensuring a supply of high quality products is becoming increasingly popular. Consumers become farmers' partners by buying in advance a part of their production, thereby helping farmers to remain debt free. Producers regularly supply partners with baskets of fresh fruit and vegetables at drop-off locations in the community (Équiterre, 2011). This type of agriculture, like urban agriculture, promotes short distribution routes, avoiding expensive and energy-heavy modes of transportation and refrigeration, and eliminating retail-related waste. This type of community-supported agriculture is not represented by a national organization, but according to estimates, there are 40 participating farmers or farmer associations in Alberta alone and 400 throughout Canada (Frick et al., 2013).

Moreover, a number of initiatives are aimed at improving the resilience of small-holder Canadian farmers through ecological knowledge and the sharing of techniques. **The Bauta Family Initiative** coordinated by USC Canada stands out in this

respect.<sup>13</sup> This program has been established in five regional centres throughout Canada, and it is aimed at facilitating training and networking, selecting new cultivars through participatory on-farm research, seed collecting and distribution, as well as funding of seed production. This initiative allows for collaboration between farmers with a view of promoting free access to a range of seeds that are adapted to the climates of Canada's various regions.

The **agroecological approach** of this initiative promotes techniques that do not depend on chemical inputs in the way that typical energy-heavy, high-emissions techniques do. The objective is to decrease the dependence of farmers on the big actors of the chemical industry. Improving access to a broad range of seeds and new cultivars helps small-scale farmers adapt to climate change by adopting varieties and techniques that adequately respond to new climate conditions.

A number of organizations have committed to a strategy of promoting small family farming in Canada. Two important Canadian organizations, the National Farmers' Union (Quebec national farmers' association) and the Quebec-based Union paysanne, participate in the international movement known as La Via Campesina. This movement seeks to strengthen sustainable agriculture and agroecology through greater participation by various civil society groups that have been marginalized by industrial agriculture, such as small-holders, family farmers, and women. The type of agriculture promoted by this movement supports the food sovereignty of producers and consumers, in other words, their emancipation from the large corporate interests that currently dominate agri-food and agriculture.

13 USC Canada. The Bauta Family Initiative on Canadian Seed Security. <http://www.seedsecurity.ca/en/>

## KEY CHARACTERISTICS OF SPECIALIZED INDUSTRIAL AGRICULTURE AND DIVERSIFIED AGROECOLOGICAL FARMING

SPECIALIZED INDUSTRIAL AGRICULTURE	DIVERSIFIED AGROECOLOGICAL FARMING
DEFINITIONS	
<p><b>Specialization</b> refers to a socio-economic paradigm whereby producers specialize in the production of a single item (or few items) that they are most efficient at producing, or of a single stage of that item's production. <b>Industrial agriculture</b> refers to modes of farming that are analogous to industrial processes in their scale and task segregation, and seek to derive productivity gains from specialization (see above) and intensification of production. At various points in the report, 'industrial agriculture' will be used as shorthand to refer to a model which entails and is based around highly-specialized production.</p>	<p><b>Diversification</b> refers to maintaining multiple sources of production, and varying what is produced across farming landscapes and over time. <b>Agroecology</b> is understood here as "the science of applying ecological concepts and principles to the design and management of sustainable food systems" (Gliessman, 2007). It encompasses various approaches to maximise biodiversity and stimulate interactions between different plants and species, as part of holistic strategies to build longterm fertility, healthy agro-ecosystems and secure livelihoods. It also represents a social movement; this usage will be specified where relevant.</p>
KEY CHARACTERISTICS	
<p>Crop <b>monocultures</b> (or production of a handful of select crops) at the level of farms or landscapes; <b>Concentrated Animal Feeding Operations</b> (CAFOs).</p>	<p><b>Temporal diversification</b> (e.g. crop rotation) and <b>spatial diversification</b> (e.g. intercropping; mixed farming); diversification employed at various levels, including <b>plot, farm and landscape</b>.</p>
<p>Use of <b>genetically uniform varieties</b> or breeds selected mainly for high productivity, wide adaptability to favourable environments, and ability to respond to chemical inputs.</p>	<p>Use of wide range of species and less <b>uniform, locally-adapted varieties/breeds</b>, based on multiple uses (including traditional uses), cultural preferences, taste, productivity and other criteria.</p>
<p>Vertical and horizontal <b>segregation</b> of product chains, e.g. animal feed production and animal rearing in separate farms, value chains and regions.</p>	<p><b>Natural</b> synergies emphasized and production <b>types integrated</b> (e.g. mixed crop-livestock-tree farming systems and landscapes).</p>
<p><b>Highly mechanized, labour-saving</b> production systems.</p>	<p>More <b>labour-intensive</b> systems.</p>
<p>Maximization of yield/economic returns from a <b>single product</b> or limited number of products.</p>	<p>Maximization of <b>multiple outputs</b>.</p>
<p>Intensive use of <b>external inputs</b>, e.g. fossil fuel, chemical fertiliser, pesticides and antibiotics.</p>	<p><b>Low external inputs</b>; recycling of waste within <b>full nutrient cycling</b> and circular economy approaches.</p>
<p>Production of large volumes of homogenous products for national and international markets, typically within <b>long value chains</b>.</p>	<p>Production of a wide range of less homogeneous products often destined for <b>short value chains</b>; multiple sources of production, income and livelihood.</p>

Source: IPES Food Report "From university to Diversity: A paradigm shift from industrial agriculture to diversified agroecological systems" 2016 p.11 [www.ipes-food.org](http://www.ipes-food.org)

## CHAPTER 3

# AGRICULTURE IN THE GLOBAL SOUTH: CONTRIBUTION TO GHG EMISSIONS AND THE IMPACTS OF CLIMATE CHANGE

### The main sources of emissions

As previously mentioned, agriculture is a major contributor to GHG emissions, both in countries of the Global North and the Global South. Certain practices are particularly polluting, such as intensive cattle breeding, due to the methane emissions created by the digestive process of enteric fermentation and the use of synthetic nitrogen fertilizers. These two practices alone represent 65 % of agriculture-related emissions (WRI, 2014).<sup>14</sup> It is also important to underline the impact of deforestation and the conversion of natural soils into agricultural lands in countries of the Global South. In addition, agricultural mechanization, industrial food processing, and long-distance commodity transportation increase the climate change footprint of the agri-food sector. These practices are tending to

<sup>14</sup> In regards to agriculture, strictly speaking, enteric fermentation related to the digestive process of cattle is the primary source of emissions, followed by emissions caused by decomposition of manure in the fields, the use of synthetic fertilizers, rice growing, and so on (Tubiello et al., 2014, 22).

spread in the Global South where small family farming is often marginalized by public policy in favour of industrial agriculture.

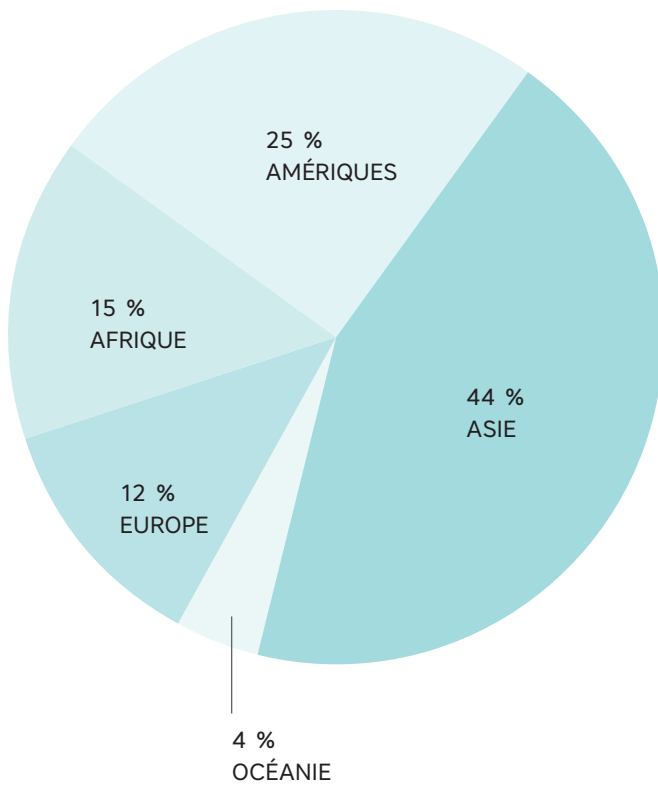
### A varied picture depending on the regions

Emissions vary greatly depending on the regions and countries in question. Asia is by far the biggest source of agriculture-related emissions with 44 % of the total, while the Americas rank second (25 %), followed by Africa (15 %), Europe (12 %), and Oceania (4 %). The trend observed since 2000 reveals an increase in the contribution of agricultural-sector emissions in Asia, Africa, and to a lesser extent the Americas, while European and Oceania emissions have slightly decreased (Tubiello et al., 2014).

The increase of agricultural emissions in Asia in recent decades can be attributed to the use of industrial techniques, synthetic fertilizers, and especially an increase in livestock production. Yet, this trend has also reached

Africa, where emissions increased by 2 % per year from 2000 to 2011, *i.e.* almost as quickly as in Asia (2.3 %) (Tubiello et al., 2014). Scenarios for the first half of the 21<sup>st</sup> century predict that growth in agricultural emissions will be more pronounced in Asia and Sub-Saharan Africa. These two regions will also experience two-thirds of the increase in food demand. Demand for vegetable oils and animal products will also increase sharply, and the production of both is associated with high GHG emissions (FAO, 2012).

### REPARTITION OF THE BIGGEST AGRICULTURAL EMITTERS



∨ Indonesian women planting rice.

## Emissions related to deforestation motivated by agricultural expansion

Emissions induced by land-use and forest change are closely linked to agriculture since it is estimated that over 80 % of deforestation is caused by the expansion of agricultural land (GRAIN, 2016). In Indonesia and other tropical countries, deforestation is all the more disquieting because it is the second largest source of greenhouse gas emissions after fossil fuels, *i.e.* the fifth most important source of anthropogenic emissions (Pachauri and Reisinger, 2007). In regards to permanent conversion of forests and peatlands to agricultural use, the methods applied, such as burning, generate important quantities of CO<sub>2</sub>. In addition, the carbon sinks represented by forests and forest soil disappear.

The IPCC has estimated that approximately 7 % to 14 % of global emissions are caused by deforestation in tropical countries (EU, 2014). However, the forests of countries of the Global South represent 40 % of the world's forest carbon sinks (FAO, 2015). These emissions are mainly attributable to the expansion of industrial agriculture in the Amazon, the Indonesian archipelago, and to a lesser extent, the Congo Basin. Large palm oil plantations in Indonesia and soybean and cattle farms in Brazil are often cited as explanations for the massive deforestation carried out in these countries (GRAIN, 2016). This situation, documented by the IPCC as early as 2007, has attracted international attention and contributed significantly to the development of the REDD program (*Reducing emissions from deforestation and forest degradation*).<sup>15</sup>

15 REDD is an international and transnational initiative launched in 2008. It is aimed at countering global warming induced by greenhouse gas emissions resulting from the degradation, destruction, and fragmentation of forests. It is coordinated by the UN, which established the UN-REDD program. It is based on financial incentives and is indirectly related to the carbon market. A number of peasant and social movements are critical of this initiative.



## The major agricultural emitters

Industrializing countries, where agriculture is increasingly dominated by practices causing high levels of emissions, are now fully included in international climate negotiations, which was not the case under the Kyoto Protocol. **More specifically, 86 % of countries targeted agriculture and land change in the context of their intended nationally-determined contributions (INDC)** (FAO, 2016). The Chinese and Brazilian agricultural sectors rank respectively as the first- and second-largest emitters, followed by the United States, India, Indonesia, Russia, the Democratic Republic of Congo, Argentina, Myanmar, and Pakistan. The agricultural sectors of these ten countries account for over 50 % of worldwide agricultural emissions (WRI, 2014).

### THE 10 BIGGEST AGRICULTURAL EMITTERS

- 1 China
- 2 Brazil
- 3 United States
- 4 India
- 5 Indonesia
- 6 Russia
- 7 Democratic Republic of Congo
- 8 Argentina
- 9 Myanmar
- 10 Pakistan

If the agriculture of countries of the Global South is now at the forefront of climate negotiations, it is mostly because of their demographic growth and intensified agricultural production motivated by the need to meet the food requirements of urban populations. Among the ten largest agriculture-related emitters, eight are countries of the Global South, but the situation varies greatly from one country and one sector of activity to another. For example, the two world giants in terms of population, China and India, have per capita emissions that remain largely below those of long-established industrialized nations. India, in particular, is still a country of small family farmers, whose practices are low emitters.<sup>16</sup> Over 85 % of Indian agricultural producers farm on plots smaller than two hectares in size and have little access to chemical inputs

<sup>16</sup> Nevertheless, agriculture, change of land use, and forestry represented 30 % of India's emissions in 2012. (WRI, 2015).

(Kaul, 2015).<sup>17</sup> By contrast, Chinese agriculture, also of the small-holder type, is subject to an intensified adoption of high-emitting new technologies (Huang et al., 2012). In China and India, agricultural emissions represented respectively less than 5 % and 18 % in 2012, and their governments are little inclined to restrict the adoption of new polluting agricultural technologies<sup>18</sup> (Pahuja, 2014; Liu, 2015).

## Agricultural exporters of the Global South: what are they doing to protect the climate?

### > PARAGUAY

In this context, it is no great surprise to discover that Paraguay, a landlocked country rich in arable land, is also undergoing a huge growth in industrial crops intended for export. **In this country, the surface dedicated to soybean monocultures expanded from 1.6 to 3.5 million hectares from 2006 to 2013, and exports doubled.**<sup>19</sup> Paraguay was the sixth largest soybean producer and fourth largest exporter (Oxfam, 2014). Sizeable Brazilian and American agricultural exporters are targeting southern Paraguay, where they continue their expansion to the detriment of the Atlantic Forest. The semi-arid plains of the north have also been seized for cattle breeding, and the resulting deforestation exacerbates the fragility of this ecosystem and monopolizes scarce water resources (Hird, 2015). This recent phenomenon further accentuates the important disparities between large landowners and peasant populations. It therefore comes as no surprise that agriculture-related emissions increased by 59 % between 1990 and 2012 (WRI, 2015), while farming and changes in land use accounted for over 85 % of total emissions from 2000 to 2010 (ONU-ECLAC, 2009).

In its INDC declaration, the government of Paraguay lauded its environmental governance and agricultural model, while affirming the goal of increasing its integration into international agricultural markets. In addition to an increased use of renewable energies, its strategy to control and reduce emissions focuses on the gradual elimination of deforestation and an expansion of protected areas, along with a reduced use of fossil fuels. The Paraguayan government intends to promote

<sup>17</sup> It should be noted, however, that small-holders, who represent 85 % of the farming population, cultivate only 44 % of the farmland in India, which raises the issue of inequality, because sizeable farms representing 15 % of farmers, own the majority of the land (Kaur, 2015).

<sup>18</sup> In China agriculture accounts for a small part of the nation's emissions, essentially because of the significant contribution of the manufacturing and energy industries, which rely heavily on coal-fired power plants.

<sup>19</sup> The attractiveness of Paraguay for agricultural investment has fuelled significant economic growth, the greatest in Latin America over the past 30 years (ONU-CPDN, 2015). However, these figures conceal the broad expansion of an unfair and unsustainable agricultural model.

environmental protection and reforestation by funding ecosystemic services, thereby encouraging the commodification of its national territory as a carbon sink (ONU-CPDN, 2015). In general terms, the country's commitments remain modest, *i.e.* reducing emissions by 10 % from projected 2000-2013 levels by 2030, with an additional 10 % conditional upon international assistance. In reality, Paraguay is not referring to the level of emissions of a given year, but rather to emissions that would have been produced if no reduction measures were adopted, which follows the "business as usual" scenario (IISD, 2015).

#### > INDONESIA

The boom in agricultural production intended for export at the expense of forests and natural areas is not limited to South America. In South-East Asia, Indonesia is one of the countries where deforestation related to agricultural expansion has been particularly intensive over the past few decades. An estimated 1.2 million hectares of forest disappeared over the first decade of the century, mostly for the production of palm oil monocultures by national and transnational companies (UN-REDD, Indonesia 2016). **This country is the third most sizeable GHG emitter after China and the United States due to the destruction of its forests and peatlands. Between 2000 and 2010, an estimated 60 % to 80 % of emissions were related to deforestation and to the use of burning as a technique for preparing the soil for large-scale monocultures** (Stowers, 2015; UN-INDC, 2015).<sup>20</sup> From 2000 to 2005, emissions rose exponentially by around 35 %, also due to the extraction and use of fossil fuels, of which Indonesia has significant reserves (UN-REDD, Indonesia 2015). Indonesia, the world's largest producer and exporter of palm oil, is attempting to increase its production by supporting the biodiesel sector as a prime new market.

Indonesia is an archipelagic country that is particularly vulnerable to the effects of climate change, mainly the rise of sea levels and tropical storms. In the context of the INDC, it committed to reducing its emissions by 26 % by 2030 and as much as 41 % on the condition of obtaining international assistance. Like Paraguay, it put forward these reductions following a "business as usual" growth scenario, established according to a trajectory of emissions for the 2000-2010 time period.

Government authorities have already implemented a number of measures to curb deforestation and peatland conversion for agricultural use, namely a moratorium on primary forest conversion (2010-2016), as well as measures to improve forest management by fostering civil society participation (UN-INDC, 2015). Indonesia is barely keeping a lid on deforestation, which is intensifying despite the nation's international commitments

and multiple programs (Margono et al., 2014).<sup>21</sup> The establishment of a Directorate General of Climate Change has not helped to give teeth to the measures deployed. In addition, improvement is difficult to assess because of Indonesia's limited technical and institutional means. Agriculture as such is also officially targeted by these measures, but there are no specificities provided as to the interventions envisaged, and authorities seem more preoccupied by deforestation (UN-INDC, 2015).

## Burundi: a country of subsistence agriculture

Unlike the other countries presented, subsistence agriculture is of central importance in Burundi, which remains a marginal participant in international agri-food trade. **Agriculture holds a prominent place in the country's economy, representing 30 % of Burundi's GDP, providing 90 % of jobs and 95 % of nutritional needs.** (*Coalition contre la faim*, 2013). The agricultural sector is primarily made up of family-run, non-specialized farms with little access to machinery. These farms are typically very small: between 0.3 and 0.5 hectares on average (Burundi, 2008). A landlocked country, Burundi is characterized by its very densely-populated rural areas (more than 600 inhabitants/km<sup>2</sup> in certain regions), and the steady growth of its agriculturally-dependent population. This demographic reality puts a great deal of pressure on the nation's land and exacerbates tensions between landowners and landless peasants (*Coalition contre la faim*, 2013). Women, who make up the majority of the labour force, are often deprived of the same rights as men to own land.

The agricultural system in Burundi is generally very diverse and includes the cultivation of income-generating cash crops, such as cocoa or coffee, subsistence crops, and livestock breeding. This agricultural system, called agro-sylvo-pastoral as it combines the three agricultural elements, provides for the subsistence of families while at the same time allowing them to sell produce. Even though these are traditional practices and emit few greenhouse gases, they are relatively unproductive and represent obstacles to improving food security in the country (Burundi 2008).

In order to fight endemic poverty and food insecurity, authorities have sought to intensify food production. This strategy relies heavily on using chemical fertilizers and as a result has been denounced by numerous farmers' organizations (*Coalition contre la faim* 2013). **These organizations instead support the development of agroecology, which promotes the use of**

<sup>20</sup> The data provided by Indonesian authorities remain piecemeal and the most recent data provided in the context of the INDC date from 2005 (UN-INDC, 2015).

<sup>21</sup> Margono et al.'s study (2014) reveals that Indonesia lost 840,000 hectares of forest in 2012, compared to Brazil which lost 460,000 hectares, although the Indonesian forest represents barely 25 % of the surface of Brazil's Amazon forest!

organic manure fertilizer and allows farmers to avoid costly and polluting chemical fertilizers. Agroecological practices such as controlling water flow, using crops to fight against pests, and agroforestry are in widespread use in Burundi. However, the value of these practices remains unrecognized by authorities who instead promote intensive agricultural production based on Green Revolution techniques, with the goal of increasing exports (OGENA, 2015).

When Burundi announced its intended nationally-determined contributions (CPDN/INDC) ahead of the Paris Agreement, it drew attention to the vulnerability of its agricultural sector to climate change. The state defined its needs in terms of adaptation while promoting the resiliency of its development model with respect to climate change. In order to help the agricultural sector adapt, authorities are working to improve water management and irrigation, as well as to intensify and diversify agricultural production, particularly through the use of chemical fertilizers and different agroecological methods. Given Burundi's poor capacity to ensure technical monitoring of national emissions and its high dependence on agriculture, specific targets for reducing emissions coming from this sector were not specified. Burundi's contributions to the fight against climate change are based mainly on controlling forest development, reforestation, and agroforestry, in order to increase carbon sink capacities in wood fibre. Improving agricultural methods is therefore not seen as a way to reduce the sector's emissions for the time being (UN- INDC, 2015).

## Small family farms are under pressure across the globe

It is indeed the smallest farmers who contribute the least to climate change while at the same time being the most vulnerable to its impacts. The industrial agricultural model proliferates at the expense of forests and contributes to climate change while farmers, often without financial resources and confined to two-acre plots or less, are most likely to suffer its consequences. This can be partly attributed to the glaring inequality that peasant communities face in the Global South. As previously mentioned, **the 85 % of farmers who produce 60 % of the food consumed in the world hold only 20 % to 30 % of arable land** (Caudron, 2014; GRAIN, 2016). This situation can be traced to national and international policies that have provided systematic advantages for the development of industrial agricultural export networks. This is the case in countries such as Paraguay and Indonesia. However, instead of trying to move away from this model in climate negotiations, the governments of these two countries are trying to increase industrial agriculture production even while they voice support for efforts to reduce GHG emissions.

### > PARAGUAYAN SMALL FAMILY FARMERS FACING CLIMATE CHANGE

Paraguay has one of the highest concentrations of land ownership in the world, with 8 % of agricultural producers owning 80 % of arable land (Oxfam, 2014). The country's institutions provide little help to small food producers, despite the attempted agrarian reform of the past few decades. While soybean exports are booming, many farming communities find themselves surrounded by single cash crops (monocultures) and their health and quality of life affected by chemical contamination from industrial cropping. Low greenhouse gas-emitting family farms use high-level expertise, yet they are marginalized. Many farmers leave rural areas for cities due to pressure from large landowners (Oxfam, 2014). What is more, the absence of a subsidy program and other supports increases the vulnerability of a sector that is already beholden to market pricing instability. Small farming communities suffer from high rates of poverty, making them even more vulnerable to changes in climate that affect conditions for agriculture.

In this South American country where much of the land is semi-arid, climate change has an unequivocal impact on agriculture and specifically on small farming communities. The economy is highly dependent on agriculture, which represented 20 % of Paraguay's GDP in 2013-2014 and covers 55 % of its territory. The majority of crops are not irrigated and rely on rainfall, making the sector particularly vulnerable to drought conditions. Much of the soil in the country's south-east is considered degraded, and most small family farmers do not have insurance in case of crop failure (World Bank, 2009). Extensive livestock breeding on semi-arid land is also vulnerable to drought. Certain regions of the world, according to projections, could see temperatures rise by up to 6.2°C by the year 2100. At the same time, rainfall may decrease by 8.3 % to 34.2 %, according to worst-case scenarios. The forest fires, droughts, and storms of 2002-2008 had a profoundly detrimental effect on the country. As an example, the bush fires of 2007 directly affected 200,000 people living in the north-west (World Bank, 2009). Such disasters are expected to occur more frequently over the coming years.



^ Dr. Sylvia Rodriguez from Decidamos, Development and Peace partner in Paraguay

## Paraguay

**“Families that live close to plantations are suffering from being in contact with the surrounding areas. Their own natural crops are destroyed, unable to withstand the chemicals sprayed on the soybean fields, which spread through the air. Their water is also contaminated and people suffer health problems.”**

Tomás Ascurra is a young Paraguayan farmer, a member of COSOR (*Coordinadora de Organizaciones Sociales de Repatriación*), a partner of Development and Peace, in a country where income and land distribution inequalities are among the greatest in Latin America.

In Paraguay, farmers are under a great deal of pressure to sell their land to private, and in most cases, foreign-owned, companies. The intensive growing methods used by these companies are damaging the environment. No less than 85 % of Paraguay’s fertile land is owned by only 2.5 % of landowners. What is more, the vast majority of production is exported and processed outside the country, which inhibits job creation in Paraguay.

Tomás laments the pressure that small farmers are under to sell their land: “They come and offer up to 15 or 20 million guaranis per hectare (\$3,500 to \$4,500 Canadian). People cannot resist. Little by little they are able to acquire all the land in a given area because the adjacent land that has not been sold is contaminated by the pesticides used by soybean producers.”

v Tomás Ascurra and his agroecological field.





In Paraguay, Development and Peace is counting on the mobilization of its remarkable partners and organized communities who advocate and rally to defend their rights and engage in awareness-raising, while continuing to cultivate their small plots of land.

For example, Decidamos, with the support of Development and Peace, organizes several agroecological fairs along with other organizations including COSOR in Asunción, the country's capital city. The small family farmers who are members of partner organizations are able to sell their products at these fairs for a good price. The events thus bring city dwellers closer to farmers, reduce the number of intermediaries, and help farmers earn greater profits.



^ Agroecological field, Paraguay

## Indonesian peasants confronted by climate change

Indonesian agriculture is traditionally dominated by small family farmers both the number of operators and the size of cultivated plots. Generally speaking, smallholders control most agricultural land and cultivate plots that are, on average, less than one hectare. Rice, the staple food of the country, is primarily grown by small family farmers whose irrigated plots range on average from 0.2 to 0.5 hectares. A significant portion of Indonesia's 24 million agricultural properties are too small for owners to exclusively make their livelihood from agriculture, and there are several hundred thousand landless peasants (Lowder et al., 2014). The landless and poorest peasants are demanding new agrarian reform (Inside Indonesia, 2013). This community is particularly vulnerable to the effects of climate change.

While the vast majority of the nation's land is cultivated by smallholder farmers, the situation has been evolving since the 1980s in favour of large farms, which grow crops mostly for export. **During the 1980s, close to 90 % of all land was cultivated by smallholder farmers (Frederick and Worden, 1993). This proportion has fallen since then, although smallholder farmers still cultivated approximately 70 to 80 %<sup>22</sup> of the land in 2015. The expansion of large farms at the expense of smallholder farmers reflects the increased integration of the country into the global food trade, a trend denounced by a number of social movements calling for policies conducive to food self-sufficiency and for the withdrawal of agricultural liberalization policies. While adding to climate change, the**

development of large-scale industrial agriculture also contributes to land grabbing at the expense of small family farming.

**The Indonesian economy is still relatively dependent on agriculture, which represented about 15 % of its GDP in 2013-2014 (World Bank, 2016), and in this regard the effects of climate change are a cause for concern. The average temperature for the whole country is estimated to increase by 0.8°C by 2030 and could reach up to 3°C by 2100. Such warming could reduce rice yields and affect food security in certain regions (Redfern et al., 2012). Experts note that monsoon rains are increasingly delayed and their duration reduced, which is having a detrimental impact on rice production in certain regions of Java and the eastern part of the archipelago. This trend is likely to accelerate in coming decades. It is expected that by 2080, there will be a slight increase in precipitation during the rainy season (10 % from April to June) and a sharp decrease (75 % from July to September) during the dry season (Case et al., 2007). This change in rainfall increases the risk of droughts and floods and makes better irrigation-water management a necessity. Moreover, rising sea levels pose a high risk in the medium-term for the important coastal aquaculture sector. In this context, smallholder farmers and landless peasants will be increasingly vulnerable to the new climate conditions, unless suitable programs help them adapt to these changes.**

<sup>22</sup> Nearly 50 million hectares are cultivated in Indonesia. Small-scale producers provide the vast majority of cereal and fruit crops, as well as maintaining rubber production. Large palm oil operations cover about 5 million hectares, while smallholder farmers cultivate nearly half the land (Bissonnette, 2016).



^ Volunteer from Payo Payo, Indonesia, showing of her carrots harvest.

## Payo-Payo: Dignity for peasant families in Indonesia

Tompobulu, a mountain village located on the Indonesian island of Sulawesi, appears to be living in the clouds, due in part to the ribbons of mist swirling in the streets and surrounding the fruit trees where children climb to pick ripe fruit. But there's more: here one can feel an almost unreal peace, perhaps because Tompobulu upends the city dweller's vision of village life as rife with poverty and misery- a reality that does exist for many of the world's small family farmers, even though they feed most of the planet. So why are things different in Tompobulu?

"Through our research and observations, we found that villagers are often victims of development. The government, NGOs, researchers, and journalists show up and treat people like objects, causing them to lose trust. They are subordinate in the

development process,” explains Karno Batiran, Director of Payo-Payo, a Development and Peace partner.

Payo-Payo, meaning scarecrow, supports farmers and helps them improve their harvests, just as a scarecrow does. Karno and his colleagues founded Payo-Payo when they realized that there was a major disconnect between academic research in agriculture conducted by urban universities, and the actual experiences of small family farmers. The latter have scant access to the pool of developed knowledge, while students have a limited understanding of, and therefore little respect for, existing traditional methods. Payo-Payo’s solution is to get them to work together!

Payo-Payo invites university students, as well as new graduates, to spend two years in a rural village in order to participate in a mutual exchange of knowledge. Students take the time to learn about agriculture. They discuss with small family farmers some of the challenges the village is facing and then seek solutions together. This way, solutions are not imposed; they are better adapted to and meet the real needs of the farmers in question.

Payo-Payo has been working in Tompobulu for a number of years now. Their volunteers have helped organize farmer groups that meet to discuss problems that affect their community and find ways to respond to them collectively. These groups have a spirit of unity and come up with practical solutions, whether sharing a tractor between farm families or finding ways to increase harvests. Payo-Payo has introduced villagers to the System of Rice Intensification (SRI), an agroecology practice where changes in the planting season and water management enhance harvests without chemical or other artificial fertilizers.

Indonesia needs a movement to attach value to the work done by its small family farms. One of the most important palm oil producers in the world, the country continues to deforest and strip the land for this export-based monoculture which significantly contributes to climate change.

With the support of Development and Peace, Payo-Payo is now spreading its work to other villages. One village at a time, it is helping small family farmers find dignity in their work, not only as people who feed the world, but also as those who can help to protect it from climate change.

√ Paddy field, Sulawesi, Indonesia



√ To the right, Mika Lévesque, Development and Peace Program Officer To the left: Payo Payo volunteer



## Burundian peasants resisting climate change

Given widespread dependence on family farming, small sized plots, and rapid population growth, Burundi is vulnerable to the impacts of climate change. Furthermore, strong pressure on its mountain soils has led to significant erosion in recent decades.<sup>23</sup> In Burundi, like elsewhere in the Global South, climate change will likely reinforce seasonal changes in rainfall and increase its variability, while generating a larger number of extreme weather events. While most of Burundi's land surfaces are rain-fed, decreased rainfall during the dry season (June to September) and its increase in most regions during the rainy season (October to April) could exacerbate variations in production. The air temperature is predicted to increase by up to 3°C, which could undermine certain crops (Liersch et al., 2014).

The anticipated effects of climate change are worrisome and affect a number of regions and sectors of activity in Burundi. Rising temperatures could create sub-optimal climatic

conditions for crops that are currently widespread in various regions of the country. Higher temperatures and a longer dry season could reduce the availability of water in regions already affected by seasonal water deficits, such as northern Burundi. These sporadic droughts could increase harvest losses and cattle mortality, as well as the frequency of bushfires (UN-INDC, 2015). It is estimated that in the coming decades, agricultural producers could be forced to adopt new crops that are more resilient to heat and drought. Moreover, surplus water during the rainy season could lead to runoff, resulting in increased soil erosion caused by rain. In this country of mountain landscapes, that is already a cause for concern. The potential increase in extreme rainfall events could also lead to more landslides and floods in the nation's valleys (Liersch et al., 2014). Confronting the effects of climate change, small family farmers are aware of many adaptation techniques but cannot fully implement them without appropriate support from national and international authorities and civil society organizations.

▼ Burundian women in their field.



▼ Burundian men in the field.



23 A number of programs have been implemented to disseminate agricultural practices that protect against erosion, and some have been very successful, notably the fixing of contour lines planted with trees that retain soil and increase its fertility (UNDP, 2014).



^ Corn harvest, Burundi.

**“Family farming is the only model that can create jobs, maintain land fertility through more sustainable use, and produce diversified food, thus improving the nutrition and health of various population groups and mitigating shocks related to climate variations, disease, and price volatility. It is also the only model focusing on the development of local land. Family farming ensures balanced national development, while favouring local products, the only ones that can compete with imports. The model prioritizes integrated farms over specialized subsidiaries that quickly fall under the control of multinationals. Land purchases by wealthy residents, land grabs by multinationals, and clever mechanisms for transferring large concessions to foreign companies to produce food for local populations, all epitomize multinational negligence and the corruption of African leaders and should be held up as a crime against humanity and punished as such.” Deogratias Niyonkuru, Director General, ADISCO**

Burundi is a small, overpopulated, central African country where 89.5 % of the population lives by way of subsistence farming on plots of land that do not exceed 0.5 hectares in size and are located on thousands of hills. According to information from the International Monetary Fund (IMF) and the World Bank, Burundi became the poorest country in the world in 2016, a situation made worse by cyclical political crises due to ethnic conflict. To survive on such small plots of land, farmers have developed, over millennia, complex cropping systems based on crop associations that have ensured food security for various population groups.

However, for the past three decades, the agricultural policies imposed by the Bretton Woods institutions have promoted the replacement of these systems by commercial monocultures, mainly rice in the lowlands, and corn and potatoes on hillsides. These monocultures have exacerbated erosion, caused price collapses due to overproduction, and led to a resurgence in malnutrition, with revenues from crop sales inadequate for food and household income needs.

In light of this serious situation, ADISCO, a Development and Peace partner, is promoting a model known as integrated, continuous, and competitive family farming (ICCF, or EFICC in its original French version). It helps farmers improve their operations by integrating the knowledge of peasant systems into even more productive systems that ensure ongoing food security, income security, and soil fertility. This is achieved through beneficial connections between animals, plants, and trees, with a focus on enriching the soil. Such combinations prioritize local food, making communities more resilient when faced with climate change and the voracious appetites of multinationals.

Farmers have formed self-help groups in their hillside communities, cooperatives at the municipal level, and the *Union Haguruka des coopératives multi filières* (the multi-sector cooperative union, or UHACOM). This enables farmers to sell at opportune moments, to process and better market their products, to strengthen their solidarity networks and improve social cohesion, which helps to build a sustained environment of peace.

▼ Burundian women in her field.



▼ Burundian men and his field.



## CHAPTER 4

# FALSE SOLUTIONS TO GLOBAL WARMING

Despite over 20 years of global negotiations to coordinate the fight of all countries against global warming, anthropogenic GHG emissions have never been higher. Since 1992, despite efforts made by states and a segment of the private sector, GHG emissions have increased by 57 %, even though the objective, since the launch of the Kyoto Protocol, has been to reduce them. Furthermore, these primarily market-mechanism-based efforts, such as the flexibility mechanisms of the Kyoto Protocol, have had a negative impact on small family farming and food sovereignty. The measures taken by states do not take into account the adaptation and mitigation potential of the family farming model, preferring to rely on the false solutions proposed by agribusiness.

### The carbon market example

#### HOW IT WORKS

The carbon market includes the different flexibility mechanisms of the Kyoto Protocol as well as the voluntary market. It is part of a set of market mechanisms designed to put a price on carbon, including the carbon tax and the cap-and-trade market for emissions credits. This market enables polluters exceeding their GHG emissions limit to buy carbon credits from other players in the market (polluters not having spent all their carbon credits or GHG mitigation projects that absorb more GHGs than they emit). For example, a coal-fired power plant, which is very polluting, can buy carbon credits from another coal plant that has not used up its carbon credits due

to work it has undertaken to reduce its GHG emissions. Hence the mechanism unburdens the economy of a given country or sector while stimulating efforts to reduce GHG emissions. The company or nation that strives to limit its emissions makes money by selling carbon credits.

Thanks to the Clean Development Mechanism (CDM), a company or state may also purchase carbon credits by investing in projects or companies that contribute to reducing GHG emissions in developing countries, such as a reforestation or forest protection project. . These are called carbon offset credits because they offset emissions that were not prevented by increasing the storage capacity of ecosystems. This is a payment method for ecosystem services, where a company pays to use the carbon storage services provided by an ecosystem. Here, the carbon market does not slow down a company's economic activity for being too polluting, but

provides funding for projects said to be “beneficial” both for the environment and for development.

## Downsides

### > A DEFICIENT MARKET

Although the idea seems good in theory, the carbon market has some downsides, the proof being that GHG emissions have never been as high as they are today. The main flaw of the carbon market is that it allows the biggest polluters to continue to pollute as long as they pay the price.

As long as the price of carbon is high, pollution remains a deterrent to polluters. Unfortunately, all markets have a boom and bust cycle, and the price of carbon, which stood at more than 20 Euros per tonne at the beginning of the 2000s in Europe, is now very low (around 2 Euros per tonne). In Canada, the carbon market is still in its infancy. In 2013 Quebec established a cap-and-trade system, linking it to California’s. The Government of Quebec carries out auctions of emissions units for emitters and expects to lower annual emissions ceilings, which should increase the prices paid.<sup>24</sup> However, there is a risk that the supply of credits will exceed demand, thus favouring the purchase of offset credits at the expense of reducing emissions (Government of Quebec). The Canadian carbon market is about to expand as Ontario and Manitoba develop their own systems. But the federal government’s initiatives in favour of carbon pricing clash with the various approaches of the provinces, some of which are opposed to “overly drastic” restrictions on emissions.

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<sup>24</sup> Radio-Canada. Le marché du carbone, c’est quoi au juste ? April 17, 2015. <http://ici.radio-canada.ca/nouvelles/environnement/2015/04/17/001-marche-carbone-californie-quebec-ontario-fonctionnement.shtml> (in French)

To encourage companies to participate in the market, European countries subject to the Kyoto Protocol have offered an enormous number of carbon credits (the participation of companies in the carbon market is not binding while the participation of countries is). But the 2008 financial crisis slowed a number of sectors of the economy, or caused them to relocate. As companies produced less, they emitted fewer GHGs and therefore were not using all their carbon credits. Supply far exceeded demand and the European market collapsed.

Another mistake illustrating the inefficiency of the carbon market lies in the way GHG emissions of each country are calculated. Firstly, many sectors of the economy are exempt from the carbon market and have no incentive to reduce their GHG emissions. These sectors are not accounted for during GHG emission calculations. This is the case for agriculture (32 % of global emissions). The method of calculating emissions per country is also distorted because it does not include the international transport of goods. Emissions from imports are therefore not attributable to anyone, even though maritime transport increased by 400 % between 1990 and 2010 (Klein, 2015).

The number of carbon credits attributed to a country depends firstly on its total emissions and, secondly, on the goal it set itself in terms of reducing GHG emissions. By not accounting for a large portion of GHG emissions, the calculation is skewed, as is the market itself. Behind this calculation method lies the implicit desire of leaders (and of the lobbies that influence them) to avoid affecting commercial exchanges and free trade, and the resulting economic growth.

### > ABUSES BY CERTAIN COMPANIES

Under the CDM, abuses to obtain carbon credits soon occurred. In India, for example, there have been cases of companies emitting far more GHGs for the sole purpose of being able to easily reduce them in exchange for carbon credits. This way, certain companies earned twice as much money thanks to carbon credits.

## POLLUTE MORE TO EARN MORE

Gujarat Fluorochemicals Limited, which owns a number of coolant production plants in northeastern India, earned almost \$40 million USD per year per plant, initially by increasing its production of HFC-23 gas, the most harmful GHG, and subsequently installing a mechanism to eliminate this gas before its release into the atmosphere. The carbon market has become such a source of profit for this company that its main activity is to acquire carbon credits for purposes of resale (Environmental Investigation Agency, 2013).



> THE CARBON MARKET TO THE DETRIMENT OF FARMERS AND LOCAL POPULATIONS

The lure of profits from carbon credits and the CDM has led to forest protection projects that do not respect the fundamental rights of local populations. In the Brazilian state of Paraná, an American NGO suggested a forest protection project in order to help petroleum giants acquire rights to pollute. The Guarani Indians who lived for generations in harmony with the forest were forcibly displaced, deprived of access and entitlement to their land and resources.

In Honduras, certain large landowners, driven by greed, have developed palm oil farm projects designed to produce biofuels. These are considered to offset GHG emissions, no matter how they are produced. The landowners do not hesitate to displace local farmers from their ancestral lands with the help of local authorities (Klein, 2015). By 2013, the resulting violence had led to the death of more than 100 farmers. This case is just one of a long list where human rights violations are used to appropriate mineral-rich territories belonging to farmers. Development and Peace's solidarity with its partners in Brazil and Honduras strengthens the rights of small family farmers to access land and fight against all types of evictions.<sup>25</sup>

The situation is aptly summarized by Naomi Klein: "In order for multinational corporations to protect their freedom to pollute the atmosphere, peasants, farmers, and Indigenous people are losing their freedom to live and sustain themselves in peace." (Klein, 2015, 222)

**The calculation made by decision-makers and negotiators who have developed the carbon market model is simple: it is easier to appropriate a forest inhabited by small family farmers or Indigenous people, who are without political or economic clout and who live in poorly regulated country, than to attack the practices and privileges of powerful multinational companies in rich countries.**

In addition to these abuses, the carbon market does not benefit the environment – every tonne of carbon that is absorbed through the compensation mechanism is immediately neutralized by another tonne emitted on the other side of the planet by a factory that purchased carbon credits.

Unfortunately, the solution adopted at COP21 is based on reducing GHG emissions by strengthening a global carbon market intended to cover all emitters, with mechanisms that recognize the common, but differentiated, responsibility of developing countries. The solution of a global carbon market is mainly promoted by multinationals in the most polluting sectors, who see it as a way to increase their profits while continuing to pollute (Tansey et al., 2015).

25 Development and Peace. Honduras. <https://www.devp.org/en/international/honduras>; Development and Peace. Re-igniting love for the land in Brazil. February 24, 2015. <https://www.devp.org/en/sharelent2015/news/re-igniting-love-for-the-land-brazil>

## OTHER SOLUTIONS TO CONTROL CARBON EMISSIONS

The recourse to the market to control greenhouse gas emissions has been imposed by governments and private interests to strengthen the current economic system, without fully considering truly democratic and transformative solutions. However, non-market-based approaches are still officially promoted and have been enumerated by the UNFCCC :

### Regulatory measures

Issuance of permits and approvals to industries ; imposition of energy efficiency standards for equipment ; building codes ; emission standards for vehicles ; standards for the operation and maintenance of landfills, etc. ;

### Economic and fiscal measures

Carbon and energy taxes and any tax that supports mitigation efforts ; incentives and subsidies to encourage climate-friendly consumption patterns ;

### Voluntary agreements

Unilateral commitments by industries ; private agreements between industries and the parties ; environmental agreements between industry and governments ; voluntary government programs for companies ;

### Information, education, and consciousness-raising programs

Promoting understanding and a change of attitudes and behaviours ;

### Research and development

Policies that promote the development of new products or procedures ; funding for international initiatives.

## Mitigation and adaptation: What are the challenges for family farming?

Following COP21 and heading into COP22, the stakes are high for family farming. A choice will have to be made between pursuing the above-mentioned carbon neutral system (*i.e.* each tonne of GHG emitted is absorbed elsewhere) and taking effective measures to achieve a zero carbon society (in which human activities no longer emit GHGs).

The challenge is indeed enormous for farmers, especially those in the Global South, who will suffer the most from climate change. If the mitigation of global warming (meaning a drastic reduction of GHG emissions) is not effective, then measures taken to adapt to climate change become almost impossible.

Although the details of the COP22, to be held in Marrakech in November 2016, have not yet been released, we know that one of the initiatives proposed, following the May 2016 United Nations Framework Convention on Climate Change held in Bonn, will focus on the adaptation of African agriculture.<sup>26</sup> This initiative aims specifically to increase funding for adaptation in Africa and to support pilot programs related to carbon sequestration in soils.<sup>27</sup> The funds for these initiatives are to be generated by a set of mechanisms based on the polluter-pays principle.

### > FUNDING FOR ADAPTATION THROUGH THE POLLUTER-PAYS PRINCIPLE

In theory, the polluter-pays principle, introduced by the carbon market, was designed to meet both the mitigation challenge and that of adaptation to climate change by various population groups. A number of industrialized countries levy a 2 % tax on each tonne of CO<sub>2</sub> that is part of a carbon credit transaction. The revenue from this tax is used to finance adaptation projects in developing countries. But with the price of carbon being as low as it is today, the funding for adaptation projects has remained meagre, even with the voluntary participation of industrialized countries (Moutari, 2015). Promises linked to the COP21 Paris Agreement to increase the scope of the global carbon market and voluntary contributions do not seem to herald better funding for adaptation.

The United Nations Environment Programme (UNEP) currently estimates that for all developing countries, the costs of adapting to climate change will be from \$250-\$500 billion U.S. per year

by 2050. And this is only in an ideal scenario, in which global temperatures do not increase by more than 2°C. However, with a global warming mitigation system as uncertain as the INDCs, designed to strengthen the carbon market, and adaptation underwritten by the Green Climate Fund, not only will global warming spin out of control, but adaptation will be impossible as well.

### > LOSSES AND DAMAGE DUE TO CLIMATE CHANGE

We will therefore have to face what experts call “losses and damages.” Although the UNFCCC provides no official definition of this concept, it refers to «a whole series of losses suffered due to climate change, which cannot be avoided by mitigation or adaptation efforts” (Moutari, 2015, 9, our translation). We are referring, for example, to rising sea levels or forced displacement of populations, and loss of their lands, cultural identity, and right to human dignity. As already indicated at the beginning of this study, small family farmers living in areas that are highly affected by global warming and who are mainly dependent on natural resources and the climate for their activities will be among the first to be impacted by these irreversible «losses and damages.» And every farmer who can no longer produce food adds to global food insecurity, one of the biggest challenges of the 21<sup>st</sup> century in the context of global warming.

After a lengthy debate, the COP21 Paris Agreement included an article (8) on the need to avoid losses and damages linked to the effects of climate change. However, according to analysts, this article is not an insurance cover in the event of serious disasters. Indeed, a number of industrialized countries feared that establishing an independent mechanism for managing losses and damages could impute responsibility for climate change-induced disasters to certain countries (Burns, 2016). For the moment, discussions on the implementation of article 8 aim to create an information exchange centre to better manage risk.<sup>28</sup>

Farmers’ movements such as La Via Campesina<sup>29</sup> are therefore waiting for policymakers to set binding targets to drastically reduce GHG emissions, by making the biggest polluters – whether states or businesses -- pay the full price. This would adequately finance the adaptation of various population groups, and especially of small family farmers, to climate change.

26 UNFCCC. COP22. Speech by Salaheddine Mezouar, COP22 President <http://newsroom.unfccc.int/fr/actualit%C3%A9s/discours-d-ouverture-de-m-salaheddine-mezouar-president-de-la-cop22/> (in French).

27 Benmalek, S. 2016. Le Maroc lance une initiative pour permettre à l'Afrique d'accéder aux financements, May 1, 2016. <http://lematin.ma/journal/2016/le-maroc-lance-une-initiative-pour-permettre--a-l-afrique-d-acceder-aux-financements/246473.html> (in French).

28 Sinai, A. 2016. Post COP21 : l'expertise sur les pertes et préjudices liés au climat se met en place. Actu-environnement. <http://www.actu-environnement.com/ae/news/post-cop-21-pertes-et-dommages-26267.php4> (in French)

29 <http://viacampesina.org/fr/index.php/actions-et-nements-mainmenu-26/changements-climatiques-et-agrocarburants-mainmenu-71/1125-l-agriculturepaysanne-est-une-vraie-solution-a-la-crise-climatique> (in French)

> WHAT AGRICULTURAL PRACTICES ARE BEST FOR ADAPTATION?

**COP21 remained silent on the issue of agricultural adaptation. States do not wish to address issues related to agricultural techniques, let alone their agri-food exports. Agriculture is therefore addressed only indirectly through topics such as energy or deforestation, which are 80 % linked to agriculture.**<sup>30</sup> But agribusiness multinationals, aware that they risk being taken to task for their GHG emissions, are trying to impose their agricultural model as part of the solution, in terms of both adaptation and mitigation (see point 4.3. Agribusiness is not the solution.)

COP21 has clearly placed issues related to agriculture and forestry at the heart of negotiations. However, this was done indirectly, with agriculture being considered more as part of the solution for adaptation and mitigation through an increase in carbon stocks. As reported by the Director-General of the FAO, food security and the role of small farmers, *i.e.* those who are most vulnerable to the effects of climate change, have not really been on the agenda.<sup>31</sup> **The principles of agroecology and practices to offset the GHG emissions of industrialized and emerging countries are indeed present in the different files used as a basis for discussions.**<sup>32</sup> However, in more concrete terms, the articles focus instead on strengthening the capabilities of nations to reforest and protect forests so as to reach carbon neutrality. But beyond agro-fuels, whose negative effects on local and rural populations are already well known, there are new methods that could be endorsed and bring about similar effects.

One of the mitigation techniques put forward to achieve carbon neutrality involves modern techniques for burying and even sequestering carbon in the soil. This method consists of recovering the CO<sub>2</sub> in the atmosphere when it is emitted (in the chimney of a coal power plant, for example, or on a petroleum refinery site) and injecting it into the soil at a depth where it will remain. Land would be designated solely for this purpose. It would be risky to work the soil because the buried CO<sub>2</sub> could escape. In its 5<sup>th</sup> report, the IPCC estimates that to respect the limit of a 2 °C increase of the global temperature, recourse to this process is essential<sup>33</sup> and carbon would have to be stored in an area equivalent to the size of Africa. Canada sees itself as a leader in this technique, which liquefies CO<sub>2</sub> emissions and buries them deep in geological structures such as

30 RFI. COP21 : Quelle place pour l'agriculture? December 2, 2015. <http://www.rfi.fr/france/20151202-cop21-climat-place-agriculture-re-chauffement-alimentation-alimentaire-gaz-negociatio> (in French)

31 Devex News. December 16, 2015. Measuring success from COP21: Agriculture, food security and climate adaptation. <https://www.devex.com/news/measuring-success-from-cop21-agriculture-food-security-and-climate-adaptation-87494>

32 COP21 : L'agriculture et la forêt au cœur de la solution climatique. Press file. Thursday, October 15, 2015. (in French)

33 Le Devoir. Capter le CO<sub>2</sub> ou rater la cible. 8 December 2015. <http://www.ledevoir.com/environnement/actualites-sur-l-environnement/457368/capter-le-co2-ou-rater-la-cible> (in French).

decommissioned oil wells. One of the problems to overcome is that carbon sequestration would cause a significant increase in energy costs for the industries that use this process.<sup>34</sup>

We can assume that lands in the Global South and territories that are far from major centres, such as territories in Canada where the nation's Indigenous peoples are concentrated, will serve for CO<sub>2</sub> burial, as they are often already the lands that absorb it (reforestation, forest protection, etc.), with the excesses that we have just seen. Land grabs are a likely consequence of this practice. Furthermore, these solutions do not encourage the reduction of GHG emissions.

While still experimental and dubious at best, this technology is already the subject of a major promotional campaign by certain companies in the fossil fuel sector.

## Agribusiness is not the solution

Recognizing that industrial agriculture is responsible for at least one-third of GHG emissions on a global scale, agribusiness multinationals are defending themselves on all fronts. They want to ensure that they are part of the solution to the problem they helped create. In an attempt to greenwash their image, agribusiness multinationals, and those in other sectors such as car manufacturing or fossil-fuel energy, are playing an increasingly dominant role in climate negotiations.

> POLLUTERS, THE OFFICIAL SPONSORS OF COP21

The example of COP21 is striking. To cover its organization and reception expenses, the French government solicited contributions from private companies that reputedly amounted to 20 % of the total budget of the conference (Valo, 2015). Companies such as GDF Suez, a French energy giant whose GHG emissions account for 37 % of France's emissions, and the Avril Group, active in agribusiness and industrial agriculture,<sup>35</sup> became the official sponsors of COP21.

In turn, the "patrons" of the climate conference were invited to "Solutions COP21," an event held at Paris' Grand Palais from December 2<sup>nd</sup> to 10<sup>th</sup>, 2015, where the most polluting multinationals presented their solutions to global warming, including carbon sequestration and GMOs. This was a case of greenwashing intended above all to divert attention from the real causes (and from those responsible) for global warming.

34 Stockage du carbone. Le Canada va de l'avant. 27 September 2005. <http://ici.radio-canada.ca/nouvelles/Santeeducation/nouvelles/200509/27/001-carbone-stockage-dion.shtml> (in French).

35 *Most notably the number one French agri-fuel investor.*

## > CLIMATE-SMART AGRICULTURE

Among the (false) solutions presented by agribusiness companies is climate-smart agriculture. This vague concept, developed at the FAO in 2009, is used for all agricultural practices that increase production while contributing to the fight against global warming (Delvaux, 2015).

Given its origin within a United Nations agency, climate-smart agriculture would seem a priori positive, and yet it is so vague that it can lead to serious confusion. The notion can encompass truly smart agricultural practices, such as agroecology, as a climate remedy, but other practices, such as using GMOs to improve plant resistance to climate variations, may also find their way into the mix. For example, the FAO simply proposed an “all-of-the-above” concept that satisfies the largest number of actors (agribusiness companies above all) without really providing any actual agricultural solutions to global warming.

The concept was quickly embraced by agribusiness companies who then created the “Global Alliance for Climate-Smart Agriculture” (GACSA). Established in September 2014, this international alliance brings together close to 150 actors, including agencies of the United Nations (the FAO and World Bank), certain countries from the Global North and the Global South, such as the United States and Costa Rica, strategic agricultural research organizations and networks, farmers’ organizations favourable to industrial agriculture and more than 60 multinational companies active in the sectors of agribusiness and chemical inputs (McDonald’s, Walmart, Monsanto, Yara, Haifa Chemicals, etc.).<sup>36</sup>

The minutes of the June 2016 GACSA annual forum emphasize the role of agriculture as a cause of and solution to climate change, reaffirming the objective of ensuring that agriculture fully contributes to reaching the Paris Agreement objectives. Reference is made to the development of various innovative agricultural techniques linked to the three pillars of climate-smart agriculture: productivity, adaptation and mitigation.<sup>37</sup> But by refusing to define benchmarks, GACSA risks becoming a promotional platform for the interests of large transnational corporations that promote industrial agriculture and violate farmers’ rights.

The main objective of this alliance is to impose climate-smart agriculture as the only alternative to climate change. But the so-called smart solutions proposed by the multinational corporation members of the alliance are in no way different from the agricultural practices that are largely to blame for global warming.

For example, the approach of Yara, one of the largest global producers of fertilizers, begins with the premise that GHG emissions from agriculture come mostly from deforestation caused by agriculture. To reduce deforestation, production per hectare needs to be increased. And what better way of increasing productivity than by applying fertilizer? The company proposes to provide fertilizer to producers who do not have access to it, with the help of public funding earmarked to combat global warming. The multinational Monsanto, for its part, imagines a solution based on the invention and sale of GMO flood-resistant seeds designed to withstand the more frequent floods likely to occur in the future (Delvaux, 2015).

**The danger of climate-smart agriculture initiatives in the wake of COP21 is two-fold. First of all, the solutions are false ones; they meet neither the challenge of hunger nor that of climate change. They offer “more of the same,” i.e. an industrial agricultural model derived from the Green Revolution, whose social, environmental, and climate effects are very negative. Secondly, given that the lobbies of these multinationals are very powerful, it is not surprising that decision-makers at COP21 found climate-smart “solutions” so credible.** Multinationals with annual profits of billions of dollars saw an opportunity to get their hands on public funds intended for the fight against global warming, such as the Green Climate Fund, and in so doing, divert attention away from real agricultural solutions to climate change and compete with small family farming by destroying and marginalizing it, even though small family farmers have the capacity to effectively and intelligently fight against climate change. To use a colourful image, giving agribusiness companies the task of fighting climate change is like making a firefighter out of a firebug.

States have been attempting to counter global warming for over 30 years, with no significant results to speak of. Perhaps the mistake lies in the fact that decision-makers are counting on the global economic system to solve the problem, rather than changing the system itself. However, it has become clear that this neoliberal capitalist model, buttressed by multinationals, is the foremost anthropogenic cause of global warming. The solution is not to be found in mechanisms such as the carbon market, which is simply rooted in the same system. As Albert Einstein once said, insanity consists of doing the same thing over and over again and expecting different results. Isn’t it time to adopt other methods to combat hunger and global warming?

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<sup>36</sup> Global Alliance for Climate-Smart Agriculture. Members list as of July 2016. <http://www.fao.org/gacsa/members/current-members/en/>

<sup>37</sup> Global Alliance for Climate-Smart Agriculture. Climate-Smart Agriculture in Action. June 14-17, 2016. <http://www.fao.org/gacsa/annual-forum/en/>

## CHAPTER 5

# BEYOND THE DOMINANT ECONOMIC MODEL: WHAT ARE THE AVENUES FOR CHANGE ?

As pointed out by certain researchers such as Thomas Piketty and Naomi Klein, and as affirmed by peasant movements the world over, the current economic model is undoubtedly one of the “structural” causes of global warming. Anthropogenic GHG emissions have increased exponentially due to the pursuit of deregulated growth. The problems encountered by small family farmers all over the world are also caused by this same model.

And yet alternative solutions to this model do exist. Small family farmers prove it daily. It would seem that the time has come to listen to them and take their ideas into account.

The dominant economic model produces inequalities as well as global warming by way of various intrinsic mechanisms, and small family farmers have been victims of these mechanisms for many decades. They oppose this model while proposing alternatives such as food sovereignty, thus providing a framework for the political struggle for another type of economy. They also propose concrete alternatives such as agroecology, an approach that addresses many of the issues of small family farmers.

**The dominant economic model is neither good for the climate nor for the fight against hunger**

As rightly stated by Naomi Klein in her latest book *This Change Everything*, “the trade architecture and the economic ideology embedded within it played a central role in sending emissions into hyperdrive” (Klein, 2014, 70). This economic model and ideology are the essence of capitalism, understood in terms of “a need for the unlimited accumulation of capital” (Boltanski and Chiapello, 1999, 54) for purposes of increasing the size of the economy and amassing more substantial capital assets.

## > GROWTH NO MATTER WHAT

For Dominique Bourg, a philosophy professor at the University of Lausanne (November 2015), the social contract stemming from capitalism is relatively simple: everyone should be able to calmly produce as much as possible and then calmly enjoy the fruits of their production. According to this writer, what has emerged from the system is a notion of well-being where consumption is equated with personal growth, *i.e.* growth in consumption and production is the engine of development, which in turn ensures the wellbeing of all peoples.

The problem is that the planetary impacts of this model of consumption are rarely taken into account. And even if these impacts are now becoming increasingly evident, it is very difficult to get out of this model of growth. Attachment to growth as the driving force of development is one of the main causes for the lack of decisive action being taken to fight against global warming. Given the logic that growth brings development, decision-makers, as the supposed guarantor of people's well-being, are hesitant to curb it, even in order to avoid the disasters brought on by global warming

## > FREE TRADE DEREGULATES THE CLIMATE

For the past 40 or so years, growth through international trade has been considered the foolproof means of development everywhere on earth. To promote growth, governments have limited their political roles as regulators to take on that of facilitators of deregulation. Deregulation underlies the economic model that is the framework for today's international trade. This decline in the power of government has had various problematic effects when it comes to the current fight against global warming.

First of all, the exponential increase in free trade – which has not brought about the long-awaited development – has created even greater inequalities and more hunger and poverty; it has also contributed to a massive increase in GHG emissions. In fact, trade has taken place over longer distances, with increasing CO<sub>2</sub> emissions fuelled by transportation. The figures speak for themselves: before free trade (1980), the annual growth of GHG emissions was limited to approximately 1 %. In the early years of the 21<sup>st</sup> century, annual emissions rose by an average of 3.4 %. In 2014, they reached a new record of 5.9 % in annual growth<sup>38</sup> (Klein, 2015).

Secondly, the declining role of governments has led to the emergence of powerful international economic actors: multinational companies. Present in all four corners of the world, managing sums of money far greater than the GDP of many

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38 The North American and European desire to develop transatlantic trade through the Transatlantic Trade and Investment Partnership (TTIP) between the United States and the European Union, and the Comprehensive Economic and Trade Agreement (CETA) between Canada and the European Union, points to a glaring inconsistency on the part of decision-makers on both sides of the Atlantic who pretend to fight against global warming while increasing the volume of international trade.

countries, they have become uncontrollable. Now is the time to lead an effective fight against global warming, requiring governments to impose their will on multinationals, as they are the main cause of pollution and GHG emissions. And yet, having become facilitators for international trade, governments follow the dictates of multinationals, while the latter have no interest in limiting their GHG emissions.

Finally, another limitation of free trade, at a time when we need to fight against global warming, stems from the deregulation of trade and the role of nation states as submissive facilitators in the sphere of international trade legislation, as enshrined in the binding power of the World Trade Organization (WTO). In fact, according to this institution's regulations, a country does not have the right to put in place measures to protect its local economy. It also cannot promote national companies to the detriment of foreign companies, at the risk of being sued by another country or multinational corporation. Free trade becomes obligatory, while the fight against global warming and respect of human rights play second fiddle. Thus, "[i]n 2010, for instance, the United States challenged one of China's wind power subsidy programs on the grounds that it contained supports for local industry considered protectionist. China, in turn, filed a complaint in 2012 targeting various renewable energy programs in the European Union [...] Washington, meanwhile, has launched a World Trade Organization attack on India's ambitious Jawaharlal Nehru National Solar Mission, a large, multiphase solar support program [...]" (Klein, 2014, 56).

A program designed to promote the development of renewable energy in Ontario was also forced to swallow the free-trade-rule medicine. As reported by Naomi Klein (2015, 56-59), the 2009 Green Energy Act was meant to enable Ontario producers of renewable energy to resell their surplus electricity at preferential prices, guaranteed in long-term contracts. This measure would have helped Ontario to become the Canadian leader in solar-panel production. At a time when the United States was challenging the Chinese and Indian programs under the WTO, the latter, at the behest of the European Union and Japan, declared that certain provisions of the Ontario program, including those stipulating that a percentage of the equipment used in renewable-energy technology must come from Ontario, contravened international trade law. The ruling rendered by the WTO put Ontario's renewable energy industry in an unfavourable position. We can observe here that free trade, combined with the limiting of governments to their role as facilitators of international trade, prevents solutions for an effective fight against global warming from being put in place.

These three case studies have led researchers and activists to make the claim that the dominant economic model, based on growth as the engine of development, is both the cause of global warming and the obstacle to solutions for limiting it. The fight against climate change calls for a profound reform of this economic model.

> FARMER STRUGGLE AND THE FIGHT AGAINST GLOBAL WARMING

The neoliberal capitalist model is also accused by experts such as Hans Herren and his team of IAASTD scientists,<sup>39</sup> high-powered lawyers such as Olivier De Schutter (the former UN Special Rapporteur on the right to food), civil society in general, and even by small family farmers and the movements representing them, such as La Via Campesina, of causing world hunger and the precarious situation of family farmers. The IAASTD experts clearly state that food security depends on local supply and an increase in government power to regulate and protect national agricultural markets.

In fact, the pursuit of unlimited growth and consumption promotes a cheap food system where production is at minimum cost, and social and environmental impacts are not taken into account. The industrial agriculture system best fits this definition and reflects these priority requirements.

Furthermore, free trade as a pre-condition for development has enabled big industrial producers from industrialized and emerging countries to invade markets in developing countries, bringing about unfair competition between their different production methods. Small family farmers are left behind by this competition and are not sufficiently remunerated for what they produce. They do not receive support from their governments, who, on the one hand, are prevented by WTO rules from favouring local businesses (including small family farmers), and, on the other, encouraged to participate in international trade by prioritizing export-oriented agriculture, which is better suited to industrial farming. The latter system, in addition to being in competition with small family farmers and their local markets, also competes with them for local resources (land, access to water and seeds, etc.).



39 International Assessment of Agricultural Knowledge, Science and Technology for Development. The goal of this scientific collaboration, under the auspices of the United Nations, was to evaluate global knowledge about agriculture and propose possibilities for making proper investments. This report, published in 2009, is the first such report to state that agroecological small family farming is capable of feeding the planet without overheating it.

For this reason, peasant movements continue to denounce free trade, the deregulation of international trade, and the uncontrolled superpower of agribusiness multinationals. Their struggles and the fight against global warming go hand in hand since they have the same opponents and the same grievances.

## Food sovereignty, small family farming and agroecology: responses to global warming

> CLIMATE CHALLENGES AS SEEN BY FOOD SOVEREIGNTY ADVOCATES

The struggles of small family farmers have been incorporated into the food sovereignty movement<sup>40</sup> launched by La Via Campesina in 1996. Food sovereignty is “sustainable,” *i.e.* it respects the environment and does not contribute to global warming.

Food sovereignty proponents also want states to regain their regulatory powers, enabling them to manage their own agricultural policies, independent of the demands of the dominant economic model governing international trade. They also recommend that small family farmers participate in defining these policies, a step that would create a real democratic process.

Food sovereignty has no negative impacts on outsiders, whether neighbouring regions or countries, or their populations, or even on future generations.

Food sovereignty advocates and the movements promoting it are proposing an agricultural development framework that can tackle the challenge of global warming. Multinationals have no place in this framework; rather, it is small family farmers (and their sustainable agriculture) who are at the centre of the food sovereignty movement and who hold the reins of their own development. Not only is food sovereignty an inspiration in the struggle against climate change, based on democracy, human rights, and respect for nature and planetary limits, but it is also a positive force in offering alternatives to the dominant food system, whose global warming impacts are disastrous. Food sovereignty and the solutions it provides could well form the basis of an alternative economic and social model.

< Payo Payo members, Sulawesi, Indonesia

40 Food sovereignty is defined as the right of nations and peoples to have their own food systems, including their own markets, production models, food crops, and environments. This perspective is an alternative to the dominant neoliberal model for agriculture and trade (Wittman et al., 2010).

## > SMALL FAMILY FARMING

Small family farming and the farmers themselves are key food sovereignty actors. First of all, they are the ones who have to endure the dual pressures of the dominant economic model and climate change. Secondly, they invent and create new agricultural and social practices. Their way of life, work, culture, and traditions bring them closer to nature, on which they depend for their very survival. Their knowledge of ecosystems allows them to adapt.

In particular, small family farmers possess knowledge transmitted from generation to generation (medicinal plants, seed selection, etc.) and a great capacity to invent new ways of adapting to changes affecting their environment. Ecofeminism recognizes a special relationship that exists between women and nature, both being victims of male domination. In addition, women are purveyors of food security. In Africa for example, they provide 90 % of all food. Their role must thus be taken into account, given that they have a great deal to offer in the struggle against global warming. (Carracillo and Cusson, 2015).

If small family farming disappears because of global warming and the pressures exerted by multinationals, food sovereignty will be greatly undermined, to the point of reaching unprecedented low levels. And what choices are there for farmers without land, work, or any income? Slums? The route of immigration? It is not hard to imagine the potential conflicts generated by such a situation. A world without small family farmers is unimaginable, for they hold the key to the fight against global warming and hunger, provided they are given proper support.

In general, then, small family farmers are both actors in the fight against global warming and a source of inspiration for anyone else involved in this struggle.

Innovative social, economic, and agricultural practices bring together many traditions and transcend the capitalist model – and they are developed by small family farmers. These practices provide paths for reflection and concrete actions for reforming society so as to respond, at the very least, to two major issues of our time: eliminating hunger and fighting against global warming.

## > AGROECOLOGY

Among the alternatives proposed by small family farmers within the framework of food sovereignty, one stands out for its credibility, efficiency, and capacity to respond to issues regarding global warming and the changes it brings about. Agroecology is most of all an approach to agriculture where human activities are integrated into ecosystems and nature and respect their rules. It is defined by a number of principles that gives it many meanings (Caudron, 2015).

Agroecology is also a scientific approach, the goal of which is to better understand how natural ecosystems work and to fully grasp the very set of agricultural practices that imitate

natural processes and apply them to agriculture. It improves the traditional and ancestral practices of small family farmers in the context of climate change.

The concept of agroecology can also refer to a social movement that is part of food sovereignty, a movement that rejects the dominant industrial agricultural model, as well as the ideology on which the latter is based. This social agroecological movement has many philosophical roots, questioning the relationship of human beings to nature and the resulting way in which society is organized. Far from stopping at these issues, agroecology, when applied through new local initiatives, provides concrete solutions, both from the production point of view and in terms of organizing human relationships and interactions with nature.

**According to USC Canada, agroecology “takes into account environmental impacts, animal welfare, and human social aspects. It combines scientific inquiry with the place-based knowledge and innovation of Indigenous and peasant farming communities. Agroecology’s core principles include: maximizing biodiversity; recycling locally available natural resources to enhance soil fertility; and emphasizing interactions and productivity across the agricultural system. Agroecology uses farmers’ knowledge and experimentation as a starting place in contrast to the top-down delivery of agricultural science and technology. It is knowledge-intensive, emphasizing low-cost techniques that work with the local ecosystem. It takes a whole system approach to agriculture that considers a wide range of conditions and issues. Because it recognizes the particular nature of each ecosystem, agroecology can include methods such as organic farming, but does not specifically embrace any one particular method of farming.”**

Source: <http://usc-canada.org/the-issues/agroecology>



## CHAPTER 6

# A FEW RECOMMENDATIONS

The expectations and challenges in the fight against global warming are enormous, as are its consequences. Above and beyond protecting the planet, the very conditions for the survival of the human race are at stake. If we follow the recommendations of the IPCC immediately (see box), it is still possible to take action to avoid the worst. Everyone needs to get on board, but all action must be coordinated at the highest level (*i.e.* the United Nations) and in a democratic manner, by guaranteeing everyone's participation, in particular that of the most vulnerable members of society (especially small family farmers and women), and a pursuit of the general interest. Civil society around the world expected the decision-makers who met in Paris in December 2015 to recognize the failure of the capitalist model in the fight against global warming so as to be able to transition towards a just and sustainable society without GHG emissions. As Dominique Bourg points out, the time for pitting the interests of some against others has long passed. It is now time to overcome divides, especially the North-South divide, and to unite our efforts to ensure the very survival of the human race in a world based on equity and justice.

In solidarity with peasant movements, women's movements, and civil society associations, we have formulated the following recommendations:

› AT CLIMATE NEGOTIATIONS AND PARTICULARLY AT COP22

- We ask decision-makers and negotiators from all countries, and particularly those from Canada, to make sure that reinforced pre-2020 action, which must precede the entry into force of the Paris Agreement, rallies all countries to the climate change struggle and, at the very least, makes it possible for Kyoto Protocol commitments to be respected.
- We urge national policymakers to ratify and implement the Paris Agreement in the most rigorous and legally-binding manner, in order to eliminate all GHG emissions of human origin by the end of the century. In this regard, the recommendations formulated by the IPCC must serve as guidelines for actions to be undertaken.
- Market-based GHG emission-reduction mechanisms have proven to be ineffective. They are not an appropriate solution and must be discouraged.
- The solutions proposed by multinationals, particularly those working in the fossil fuel and agribusiness sectors, are false solutions. They must be rejected. Multinationals are responsible for increasing GHG emissions, as well as for numerous injustices and countless human rights violations. They are not part of the response to the challenges of the 21<sup>st</sup> century. Their behaviour must be controlled, their activities regulated, and their social and environmental impacts evaluated and judged in a binding manner.
- The regulation of business activities must lead to a fundamental overhaul of international business practices. First of all, the WTO must be reformed so that its mission ceases to promote the development of international business and ensuing deregulation. It must include the fight against human rights violations, global warming, and social injustice. Business is a tool for improving people's well-being, not an end in itself.
- Human rights – including the right to food and to gender equality – form a binding framework to which everyone (citizens, businesses and countries) should submit. The recognition of these rights in the Paris Agreement must not remain merely symbolic: the struggle against global warming must be closely linked to respecting human rights, rather than the rights of companies.

› WHAT ARE THE IPCC RECOMMENDATIONS?

In order to have a chance at keeping global warming levels below the 2°C target by 2100, global GHG emissions have to be sharply reduced in the upcoming years. More specifically, global emissions must be reduced by 40 % to 70 % by 2050, compared to 2010 levels, and to reach almost zero emission levels by 2100. In order to reach this objective, the IPCC has made various recommendations:<sup>41</sup>

- Global emissions due to energy production must be reduced by 90 % by 2070, compared to 2010 levels.
- The “zero-carbon” share of electricity production must reach 80 %, versus the current 30 %.
- Transportation-related emissions must be reduced by 15 % to 40 % (particularly through energy efficiency improvements and investments in public transport and infrastructure for walking and cycling).
- Investment flows have to be reoriented between 2010 and 2029: investments in fossil fuels must be reduced by \$30 billion per year and increased in “carbon-free” electricity by \$147 billion per year; and investments in energy efficiency (transportation, buildings, and industry) must increase by \$336 billion per year.

It is clear that these requirements are extremely demanding in relation to what is currently being done. The IPCC has calculated that in 2012, 67 % of global GHG emissions were subject to laws and standards (versus 45 % in 2007). However, despite the increasing number of strategies to reduce emissions, the latter have continued to increase significantly. Countries need to take the appropriate steps to meet these challenges, for no measures are ever ambitious enough when it comes to the climate. In this regard, the Paris Agreement, signed during COP21, is by no means reassuring since it provides no certainty regarding its enforceable value, an essential component when it comes to reducing emissions.

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41 Fifth Assessment Report of the IPCC. Working Group III: Mitigation of Climate Change. <http://www.ipcc.ch/report/ar5/wg3/>

› IN TERMS OF SUPPORT FOR  
SMALL FAMILY FARMING

Agroecological small family farming, in the context of food sovereignty, constitutes an appropriate and credible response to climate change and to combating hunger. As such, individual countries and international organizations have to support small family farmers the world over, and especially in the countries of the Global South, which will be most affected by climate change. To support small family farming, individual countries, and Canada in particular, must make the following commitments:

- To build infrastructure and supply basic services for rural communities, enabling farmers to develop their operations;
- To take direct action, in the form of agricultural policies, as well as policies to combat climate change, taking into account the key role of small family farming in the fight against hunger and climate change;
- To educate and support small family farmers so that they can adapt to climate change and develop new agricultural and social practices that will enable them to make the transition to a sustainable and just food system;
- To small family farmers and the movements defending them who, as key players in the fight against hunger and climate change, must have a space where their voices are heard by all bodies that make decisions affecting farmers, including on the international level, and in contexts where decisions are made about measures to combat climate change; and
- To have decision-makers the world over take action forcing multinationals to comply with binding standards as concerns respect for the environment and our climate, as well as social, economic and human rights. Multinationals, in their pursuit of profit, have extremely negative impacts on climate change and on the food security of farmers.

› IN TERMS OF GENDER AND THE EQUAL  
RIGHTS OF WOMEN AND MEN

The aim is to:

- Strengthen the participation of women farmers in particular, and women in general, in all the important decision-making stages, at the local, regional, national and international levels, during the development, planning, implementation, monitoring, and assessment phases of programs, policies, and actions in the fight against climate change (mitigation and adaptation measures). Farmer's and women's associations and movements need to be reinforced;
- Ensure that women are better represented on decision-making bodies and among experts in the domain of environmental sciences;
- Ensure the education of women farmers in particular, and women in general, promote their access to new technologies, and strengthen their capacities,<sup>42</sup> *i.e.* provide these women with the necessary means to adapt to climate change (knowledge transfer, training, and access to education, technology, and credit, etc.<sup>43</sup>) and identify the internal and external causes that hinder their capacity development, including land-title conflicts or the non-recognition of domestic work<sup>44</sup> – and remedy them; and
- Make sure that proposals for adaptation and mitigation do not worsen women farmers' living conditions, which are already difficult, or cause discrimination leading to the vulnerability of women in terms of access to financial, land, and natural resources.

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42 Taking "capacities" into account is a permanent process based on "existing potentials"; it is a complex long-term process that requires the involvement and empowerment of local and national actors. (Carracillo, 2009, 45, our translation)

43 FAO, "Renforcement des capacités" (capacity building), Rome, September 2011. ([http://www.fao.org/fileadmin/user\\_upload/capacity\\_building/cd\\_brochureandinsert\\_fr\\_web.pdf](http://www.fao.org/fileadmin/user_upload/capacity_building/cd_brochureandinsert_fr_web.pdf) (in French))

44 For example, capacity building on the technological level means involving women so that they can benefit from training in the use of equipment and from the economic opportunities that ensue.

## CONCLUSION

# SMALL FAMILY FARMING AT THE HEART OF CHANGE

According to the philosopher Dominique Bourg, the climate crisis is forcing society to once again ask itself fundamental questions that go to the very essence of what it means to be human, of our place in nature, of living together, of justice, and more. These questions are being asked by a growing number of people trying to create a new, more just, and less consumer-oriented society. Pope Francis urges humanity “to realize that a true ecological approach always becomes a social approach; it must integrate questions of justice in debates on the environment, so as to hear both the cry of the Earth and the cry of the poor.”<sup>45</sup> We must listen to small family farmers who, on a daily basis, are

experiencing the consequences of global warming and the injustices of the current economic model, and are experimenting with agronomic, economic, political, and cultural alternatives. Let’s recognize their importance and preserve their place in tomorrow’s world. Small family farmers will provide the food of the future, will protect the land and the environment, and are economic, social, and cultural innovators. They are working on the transition that will enable humanity to fight effectively against global warming and move beyond the current economic model that is causing it.

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<sup>45</sup> Pope Francis. Encyclical Letter On Care for our Common Home. Médiapaul: Montreal.

✓ Paddy field, Sulawesi, Indonesia







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Back cover page picture :  
Volunteer from Payo Payo,  
Indonesia, showing of her  
carrots harvest.



### A FEW RECOMMENDATIONS

In solidarity with peasant movements, women's movements, and civil society associations, Development and Peace puts forward the following recommendations:

**At climate negotiations and particularly at COP 22, agriculture must be at the heart of solutions.**

Development and Peace asks that international investments aimed at taking action against climate change:

- 1 Recognize the essential role of small family farming in the struggle against climate change and hunger in agricultural and environmental policies;
- 2 Support access to land for small family farmers, agroecology, and the development of local farmers' markets;
- 3 Ensure that the voices of small family farmers, through the movements that represent them, are included in all consultations and decisions that affect them.