



With Climate Chaos, Who Will Feed Us?

The Industrial Food Chain
or The Peasant Food Web?



With Climate Chaos, Who Will Feed Us?

The Industrial Food Chain
or The Peasant Food Web?



Illustrations: Rini Templeton (cover, p.5, 46), Diego Rivera (p.3)

This text is based on an ongoing research into climate chaos and the food crisis.

The full document can be downloaded from <http://www.etcgroup.org/>

It includes over 100 references and acknowledgments to the people and institutions from whose work we draw the data.

Action Group on Erosion, Technology and Concentration

ETC Group, 2014

comes from discarding cosmetically imperfect fruits and vegetables; from the problems of long-distance transportation; from good quality foods discarded by supermarkets; and the amount that consumers throw away after purchase. Statisticians have spent less time estimating the quantity, health cost, and opportunity cost of overconsumption. The calculation is complicated: how much of the 80% of the world's agricultural land and fertilizers that goes to animal feed –that turns into meat and dairy products– becomes “waist” as some consumers eat several times the amount recommended by health authorities? This document attempts to calculate all of these forms of waste and we conclude that the Chain delivers only about 30% of the food that people both eat –and need. The Chain is not capable of reaching those who are hungry and malnourished.

Fifty years later, we must recognize that peasants have the *capacity* and the *will* to feed the hungry –they need only the *means*: Food Sovereignty.

51

Illustrations: Rini Templeton (cover, p.5, 46), Diego Rivera (p.3)

This text is based on an ongoing research into climate chaos and the food crisis.

The full document can be downloaded from <http://www.etcgroup.org/>

It includes over 100 references and acknowledgments to the people and institutions from whose work we draw the data.

Action Group on Erosion, Technology and Concentration

ETC Group, 2014

comes from discarding cosmetically imperfect fruits and vegetables; from the problems of long-distance transportation; from good quality foods discarded by supermarkets; and the amount that consumers throw away after purchase. Statisticians have spent less time estimating the quantity, health cost, and opportunity cost of overconsumption. The calculation is complicated: how much of the 80% of the world's agricultural land and fertilizers that goes to animal feed –that turns into meat and dairy products– becomes “waist” as some consumers eat several times the amount recommended by health authorities? This document attempts to calculate all of these forms of waste and we conclude that the Chain delivers only about 30% of the food that people both eat –and need. The Chain is not capable of reaching those who are hungry and malnourished.

Fifty years later, we must recognize that peasants have the *capacity* and the *will* to feed the hungry –they need only the *means*: Food Sovereignty.

51

The Web works hard not to waste food or the resources to produce food. Where there is “loss” it is almost exclusively due to problems of storage or transportation –not from overconsumption, cosmetic concerns or neglect. Food that is deteriorating is often rescued for livestock or fertilizer. Would this were true for the Chain!

Neither is the Web a pseudonym for agroecology, organic farming, permaculture, or any other production system. Peasants make their decisions about synthetic fertilizers or pesticides for economic, environmental, or access reasons and some use chemicals for their commercial produce and avoid them for their own consumption. The bottom line is, however, that much/most of what peasants produce is de facto “organic.”

Industrial Food Chain?

It is also hard to calculate what food is produced –and how much is consumed– in the Chain. Much has been written about the food waste that

The Web works hard not to waste food or the resources to produce food. Where there is “loss” it is almost exclusively due to problems of storage or transportation –not from overconsumption, cosmetic concerns or neglect. Food that is deteriorating is often rescued for livestock or fertilizer. Would this were true for the Chain!

Neither is the Web a pseudonym for agroecology, organic farming, permaculture, or any other production system. Peasants make their decisions about synthetic fertilizers or pesticides for economic, environmental, or access reasons and some use chemicals for their commercial produce and avoid them for their own consumption. The bottom line is, however, that much/most of what peasants produce is de facto “organic.”

Industrial Food Chain?

It is also hard to calculate what food is produced –and how much is consumed– in the Chain. Much has been written about the food waste that



Diego Rivera

The Industrial Food Chain uses 70% of the world’s agricultural resources to produce just 30% of our global food supply. Conversely, the Peasant Food Web provides 70% of the global food supply while using only 30% of agricultural resources.



Diego Rivera

The Industrial Food Chain uses 70% of the world’s agricultural resources to produce just 30% of our global food supply. Conversely, the Peasant Food Web provides 70% of the global food supply while using only 30% of agricultural resources.

The Peasant Food Web encourages diversity through breeding millions of varieties of thousands of crops, nurturing thousands of livestock breeds and aquatic species, while the Industrial Food Chain has narrowed this vast cornucopia down to a dozen crops, a handful of livestock species and collapsing fish stocks.

The Industrial Food Chain wastes two-thirds of its food production, devastates ecosystems, causes over \$4 trillion in damages, and either under-nourishes or over-feeds 3.4 billion people. The Peasant Food Web is environmentally and nutritionally constructive.

The Peasant Food Web encourages diversity through breeding millions of varieties of thousands of crops, nurturing thousands of livestock breeds and aquatic species, while the Industrial Food Chain has narrowed this vast cornucopia down to a dozen crops, a handful of livestock species and collapsing fish stocks.

The Industrial Food Chain wastes two-thirds of its food production, devastates ecosystems, causes over \$4 trillion in damages, and either under-nourishes or over-feeds 3.4 billion people. The Peasant Food Web is environmentally and nutritionally constructive.

ocean or freshwater fishers, pastoralists, or hunters and gatherers. Many peasants fit all of these categories. Small farmers often have fishponds and livestock. They often hunt and gather –especially in the sometimes-difficult weeks before harvest. Many peasants move back and forth between city and countryside. When we say “Web” we are talking about the complex of supportive interconnections shared by peasants and communities. Conversely, the “Chain,” although complex, locks in each link and rarely takes into account the “hidden harvest” gathered seasonally from forests, roadsides and savannas. The bounty from urban farming (crops, fish and livestock) is seldom considered.

The mix of peasant food sources renders statistical estimates difficult. To complicate things further, peasants grow around 7,000 crops but industrial food chain “bean counters” focus on about 150 crops. The world does not have accurate figures. This document offers our best estimate of the share of the food supply that comes from forests, fish, urban production, etc., but it is only a calculation. We invite others to help with this essential research.

ocean or freshwater fishers, pastoralists, or hunters and gatherers. Many peasants fit all of these categories. Small farmers often have fishponds and livestock. They often hunt and gather –especially in the sometimes-difficult weeks before harvest. Many peasants move back and forth between city and countryside. When we say “Web” we are talking about the complex of supportive interconnections shared by peasants and communities. Conversely, the “Chain,” although complex, locks in each link and rarely takes into account the “hidden harvest” gathered seasonally from forests, roadsides and savannas. The bounty from urban farming (crops, fish and livestock) is seldom considered.

The mix of peasant food sources renders statistical estimates difficult. To complicate things further, peasants grow around 7,000 crops but industrial food chain “bean counters” focus on about 150 crops. The world does not have accurate figures. This document offers our best estimate of the share of the food supply that comes from forests, fish, urban production, etc., but it is only a calculation. We invite others to help with this essential research.

Two Solitudes?

So, is everything “black and white”? Do policymakers only have a choice between the Industrial Food Chain and the Peasant Food Web? Not necessarily; peasant producers often participate to varying degrees in both systems. But, there is a clear distinction in starting premises: one perspective is that the current Western production paradigm –based on multinational agribusiness– is the only credible starting point. The other perspective is that smallholder producers (i.e., peasants) must be at the center of all local, national and global food policies. This document unapologetically presents the case for the peasants’ perspective.

Peasant Food Web?

Many prefer to talk about “farmers” or “smallholder producers” and are concerned that “peasants” is patronizing or pejorative. In this document, we use “peasant” to describe all those who produce food mostly for themselves and their communities whether they are rural, urban, or peri-urban farmers,

48



Two Solitudes?

So, is everything “black and white”? Do policymakers only have a choice between the Industrial Food Chain and the Peasant Food Web? Not necessarily; peasant producers often participate to varying degrees in both systems. But, there is a clear distinction in starting premises: one perspective is that the current Western production paradigm –based on multinational agribusiness– is the only credible starting point. The other perspective is that smallholder producers (i.e., peasants) must be at the center of all local, national and global food policies. This document unapologetically presents the case for the peasants’ perspective.

Peasant Food Web?

Many prefer to talk about “farmers” or “smallholder producers” and are concerned that “peasants” is patronizing or pejorative. In this document, we use “peasant” to describe all those who produce food mostly for themselves and their communities whether they are rural, urban, or peri-urban farmers,

48



1. Who feeds us today?

The Industrial Chain:

Provides 30% of all food consumed (crops, fish, etc.) but uses about 70-80% of world's arable land to grow 30-40% of crop-derived food; accounts for >80% of fossil fuels and 70% of water used in agriculture; causes 44-57% of emitted GHGs annually; deforests 13 million ha and destroys 75 billion tons of topsoil each year; controls almost all of the 15% of food that is traded internationally, (i.e., 15% of all the food produced in the world) and dominates the \$7 trillion commercial grocery market, while leaving almost 3.4 billion either undernourished or overweight.

6

1. Who feeds us today?

The Industrial Chain:

Provides 30% of all food consumed (crops, fish, etc.) but uses about 70-80% of world's arable land to grow 30-40% of crop-derived food; accounts for >80% of fossil fuels and 70% of water used in agriculture; causes 44-57% of emitted GHGs annually; deforests 13 million ha and destroys 75 billion tons of topsoil each year; controls almost all of the 15% of food that is traded internationally, (i.e., 15% of all the food produced in the world) and dominates the \$7 trillion commercial grocery market, while leaving almost 3.4 billion either undernourished or overweight.

6

We don't know we don't know for two related reasons: first, because we have spent half a century immersed in the largely uncontested presumption that the prevailing Western model of food production, processing and consumption (the "Industrial Food Chain" in this document) is inevitable; virtually everything we think about our food security is based upon this premise; second, we have become dependent upon the limited statistics and interpretations volunteered by agribusiness. Even as we are told that "agribusiness as usual" is unstoppable, less and less information about the reality of markets and market share is made public. ETC Group began tracking agribusiness markets in the late 1970s. Over the decades, individual companies and industry analysts have grown more secretive. This is, in part, because the number of analysts is consolidating as rapidly as agribusiness itself. As a result, policymakers accept that increases in meat and dairy consumption, obesity, and the need for fertilizers and pesticides are unchallengeable realities. The demands of "paying customers" are sacrosanct; the demands of the hungry are negotiable. We hope this document will promote a debate over the conventional wisdom surrounding the Industrial Food Chain.

47

We don't know we don't know for two related reasons: first, because we have spent half a century immersed in the largely uncontested presumption that the prevailing Western model of food production, processing and consumption (the "Industrial Food Chain" in this document) is inevitable; virtually everything we think about our food security is based upon this premise; second, we have become dependent upon the limited statistics and interpretations volunteered by agribusiness. Even as we are told that "agribusiness as usual" is unstoppable, less and less information about the reality of markets and market share is made public. ETC Group began tracking agribusiness markets in the late 1970s. Over the decades, individual companies and industry analysts have grown more secretive. This is, in part, because the number of analysts is consolidating as rapidly as agribusiness itself. As a result, policymakers accept that increases in meat and dairy consumption, obesity, and the need for fertilizers and pesticides are unchallengeable realities. The demands of "paying customers" are sacrosanct; the demands of the hungry are negotiable. We hope this document will promote a debate over the conventional wisdom surrounding the Industrial Food Chain.

47



The Food Systems We Don't Know We Don't Know.

Fifty years ago, at the first World Food Congress in June 1963, the UN was told that, “*We have the means, we have the capacity, to wipe hunger and poverty from the face of the earth in our lifetime –we need only the will.*” These words have been the mantra of every food conference since. Yet governments still face major gaps in their knowledge about our food supply and consumption. This became horribly apparent in 2007 when governments failed to recognize that a global food crisis was at hand. Fifty years after policymakers committed to end hunger they need to sort out why governments don't have the *means*, the *capacity*, or the *will* to end hunger.

The Peasant Web:

Provides >70% of total food eaten by people: 15-20% via urban agriculture; 10-15% from hunting and gathering; 5-10% from fishing; and 35-50% from farms (harvests 60-70% of food crops from 20-30% of arable land); accounts for <20% of fossil fuel and 30% of water used in agriculture; nurtures and sustainably uses diversity and dominates the 85% of the world's food grown and consumed within national borders; is the major (often sole) provider of the food that reaches the 2 billion hungry and undernourished.



The Food Systems We Don't Know We Don't Know.

Fifty years ago, at the first World Food Congress in June 1963, the UN was told that, “*We have the means, we have the capacity, to wipe hunger and poverty from the face of the earth in our lifetime –we need only the will.*” These words have been the mantra of every food conference since. Yet governments still face major gaps in their knowledge about our food supply and consumption. This became horribly apparent in 2007 when governments failed to recognize that a global food crisis was at hand. Fifty years after policymakers committed to end hunger they need to sort out why governments don't have the *means*, the *capacity*, or the *will* to end hunger.

The Peasant Web:

Provides >70% of total food eaten by people: 15-20% via urban agriculture; 10-15% from hunting and gathering; 5-10% from fishing; and 35-50% from farms (harvests 60-70% of food crops from 20-30% of arable land); accounts for <20% of fossil fuel and 30% of water used in agriculture; nurtures and sustainably uses diversity and dominates the 85% of the world's food grown and consumed within national borders; is the major (often sole) provider of the food that reaches the 2 billion hungry and undernourished.

2. Who produces more food per hectare?

The Industrial Chain:

In a normal year and on good soils, high-yielding varieties of any major commercial crop monoculture will produce more marketable mass of that crop per ha than peasant-bred varieties of the same crop –but at much greater cost including health, livelihood and environmental damages; organic farming, for example, could increase global crop yields by 132%.

8

The Peasant Web:

Sees cultural diversity as inherent and central to agricultural diversity. If these cultures are lost, our generation may be the first generation in history to lose more knowledge than it gains.

45

2. Who produces more food per hectare?

The Industrial Chain:

In a normal year and on good soils, high-yielding varieties of any major commercial crop monoculture will produce more marketable mass of that crop per ha than peasant-bred varieties of the same crop –but at much greater cost including health, livelihood and environmental damages; organic farming, for example, could increase global crop yields by 132%.

8

The Peasant Web:

Sees cultural diversity as inherent and central to agricultural diversity. If these cultures are lost, our generation may be the first generation in history to lose more knowledge than it gains.

45

20. Who encourages cultural diversity?

The Industrial Chain:

Regards cultural diversity as an obstacle to market monopoly and is contributing to the projected wipeout of an estimated 3,500 of the world's 7,000 languages (and cultures) in this century (e.g. one-third of South American soils have no inhabitant speaking an indigenous language).

44

The Peasant Web:

In a normal or abnormal year, on good or poor soils, multi-cultures bred by women and men of diverse crops, fish and livestock (intercropping) will produce more food per ha, which is also more nutritious, than any Chain monoculture, at a fraction of the cost and with employment and environmental benefits; adopting new agro-ecology tools in the 1990s, 9 million peasants in 52 countries increased crop yields 93% –not counting gains from fish ponds and household livestock.

9

20. Who encourages cultural diversity?

The Industrial Chain:

Regards cultural diversity as an obstacle to market monopoly and is contributing to the projected wipeout of an estimated 3,500 of the world's 7,000 languages (and cultures) in this century (e.g. one-third of South American soils have no inhabitant speaking an indigenous language).

44

The Peasant Web:

In a normal or abnormal year, on good or poor soils, multi-cultures bred by women and men of diverse crops, fish and livestock (intercropping) will produce more food per ha, which is also more nutritious, than any Chain monoculture, at a fraction of the cost and with employment and environmental benefits; adopting new agro-ecology tools in the 1990s, 9 million peasants in 52 countries increased crop yields 93% –not counting gains from fish ponds and household livestock.

9

3. Who will feed us tomorrow (2030)?

The Industrial Chain:

With “agribusiness as usual”: urban share of global population rises to 70%; obesity doubles; meat and dairy production rise 70%; total food demand grows 50% and water demand grows 30%; agricultural GHG emissions increase 60%.

10

The Peasant Web:

Is the primary provider of the food that does reach the hungry and undernourished; avoids crop and livestock monocultures and encourages genetic diversity; nutrient-rich dietary diversity is the safest, most affordable way (could save the world up to \$4 trillion per annum) to overcome micronutrient deficiencies; crop nutritional values, due to genetic diversity, can vary 1000-fold (e.g. 200g of rice per day can represent 25% or >65% of protein requirement; 1 banana can provide 1% or >200% of daily vitamin A requirement).

43

3. Who will feed us tomorrow (2030)?

The Industrial Chain:

With “agribusiness as usual”: urban share of global population rises to 70%; obesity doubles; meat and dairy production rise 70%; total food demand grows 50% and water demand grows 30%; agricultural GHG emissions increase 60%.

10

The Peasant Web:

Is the primary provider of the food that does reach the hungry and undernourished; avoids crop and livestock monocultures and encourages genetic diversity; nutrient-rich dietary diversity is the safest, most affordable way (could save the world up to \$4 trillion per annum) to overcome micronutrient deficiencies; crop nutritional values, due to genetic diversity, can vary 1000-fold (e.g. 200g of rice per day can represent 25% or >65% of protein requirement; 1 banana can provide 1% or >200% of daily vitamin A requirement).

43

19. How much food goes “to waist”?

The Industrial Chain:

Despite cost and waste, 2 billion people have micronutrient deficiencies (868 million are hungry) and 1.4 billion are overweight (500 million are obese); meat consumption in rich countries (with high energy use, GHG emissions and land costs) is almost 2.2 times the recommended level; obesity will double by 2030; the lost productivity and health care costs of malnutrition and overconsumption exceed \$4 trillion per annum, or more than half of the global food retail market.

42

The Peasant Web:

With land and rights: rural population holds at 50% or increases; nutrition and food availability doubles; obesity rates drop; GHG emissions cut by at least 60% and water demand by 50%; agricultural fossil fuel-use reduced by 75-90%.

11

19. How much food goes “to waist”?

The Industrial Chain:

Despite cost and waste, 2 billion people have micronutrient deficiencies (868 million are hungry) and 1.4 billion are overweight (500 million are obese); meat consumption in rich countries (with high energy use, GHG emissions and land costs) is almost 2.2 times the recommended level; obesity will double by 2030; the lost productivity and health care costs of malnutrition and overconsumption exceed \$4 trillion per annum, or more than half of the global food retail market.

42

The Peasant Web:

With land and rights: rural population holds at 50% or increases; nutrition and food availability doubles; obesity rates drop; GHG emissions cut by at least 60% and water demand by 50%; agricultural fossil fuel-use reduced by 75-90%.

11

4. What policy changes will get us there?

The Industrial Chain:

Accelerate land-grabs; strengthen agribusiness-biased trade agreements; accept broader patent monopolies; acquiesce to cartel practices (e.g. 3 companies account for >50% of commercial seed sales and 10 companies control 95% of the pesticide market); end seed-saving; access to cheaper fossil fuels; transfer more food-safety costs to consumers and peasants.

12

The Peasant Web:

80% of households in rural South (often led by women) grow some food; 2.6 billion people depend on farming, fishing and pastoralism; organic farms employ 30% more workers than non-organic farms; although the number and size of peasant farms is not well documented, peasant farming is more productive and produces more nutritious food (e.g. a peasant-bred Peruvian potato has 28 times more cancer-fighting phytonutrients than its industrial cousin). Tortillas made from indigenous varieties of blue maize contain >20% more protein and are more easily digested than tortillas made from commercial corn.

41

4. What policy changes will get us there?

The Industrial Chain:

Accelerate land-grabs; strengthen agribusiness-biased trade agreements; accept broader patent monopolies; acquiesce to cartel practices (e.g. 3 companies account for >50% of commercial seed sales and 10 companies control 95% of the pesticide market); end seed-saving; access to cheaper fossil fuels; transfer more food-safety costs to consumers and peasants.

12

The Peasant Web:

80% of households in rural South (often led by women) grow some food; 2.6 billion people depend on farming, fishing and pastoralism; organic farms employ 30% more workers than non-organic farms; although the number and size of peasant farms is not well documented, peasant farming is more productive and produces more nutritious food (e.g. a peasant-bred Peruvian potato has 28 times more cancer-fighting phytonutrients than its industrial cousin). Tortillas made from indigenous varieties of blue maize contain >20% more protein and are more easily digested than tortillas made from commercial corn.

41

18. Who protects our work and health?

The Industrial Chain:

Has reduced the number of family farms in industrialized countries by at least half in the last half-century; has slashed wages for agricultural workers in the UK by 39% over the last 30 years; pesticides cause 3 million severe illnesses and 220,000 deaths every year; for every \$1 spent in sub-Saharan Africa on pesticides, the region loses another >\$3 (\$6.3 billion per annum) on medical costs and lost productivity caused by pesticide illnesses.

40

The Peasant Web:

Food Sovereignty, encompassing: right to land and water; restoration of the right to exchange and breed seeds and livestock; repatriation of seeds; elimination of regulations blocking local markets and diversity; fair trade; reorientation of public R&D to promote agro-ecology and address peasants' needs.

13

18. Who protects our work and health?

The Industrial Chain:

Has reduced the number of family farms in industrialized countries by at least half in the last half-century; has slashed wages for agricultural workers in the UK by 39% over the last 30 years; pesticides cause 3 million severe illnesses and 220,000 deaths every year; for every \$1 spent in sub-Saharan Africa on pesticides, the region loses another >\$3 (\$6.3 billion per annum) on medical costs and lost productivity caused by pesticide illnesses.

40

The Peasant Web:

Food Sovereignty, encompassing: right to land and water; restoration of the right to exchange and breed seeds and livestock; repatriation of seeds; elimination of regulations blocking local markets and diversity; fair trade; reorientation of public R&D to promote agro-ecology and address peasants' needs.

13

5. Who will breed our food crops?

The Industrial Chain:

Grows 150 crops but 12 species are key
(e.g. 45% of seed-related R&D focused on maize);
>80,000 varieties bred since 1960s (59% ornamentals);
average cost to develop a GM variety is \$136 million;
yet only 10-20% of the South's seeds come from commercial sector.
*NB: commercial emphasis is on breeding with 700 wild relatives
of major crops to adapt to climate change.*

14

The Peasant Web:

'Wide-tech' system applies macro-solutions to micro-environments
(landscape multi-dimensional changes for farm ecosystem);
non-proprietary; benefiting from shared research
and traditional knowledge systems.

39

5. Who will breed our food crops?

The Industrial Chain:

Grows 150 crops but 12 species are key
(e.g. 45% of seed-related R&D focused on maize);
>80,000 varieties bred since 1960s (59% ornamentals);
average cost to develop a GM variety is \$136 million;
yet only 10-20% of the South's seeds come from commercial sector.
*NB: commercial emphasis is on breeding with 700 wild relatives
of major crops to adapt to climate change.*

14

The Peasant Web:

'Wide-tech' system applies macro-solutions to micro-environments
(landscape multi-dimensional changes for farm ecosystem);
non-proprietary; benefiting from shared research
and traditional knowledge systems.

39

17. Whose technologies will feed us?

The Industrial Chain:

'High-tech' system deploys micro-inventions to macro-environments (e.g. lab or genetic changes for global crops) via monopolies, resulting in high uniformity and disease vulnerability.

38

The Peasant Web:

>2.1 million varieties of 7,000 species bred since 1960s (some ornamentals); no commercial costs to produce new varieties; 80-90% of seeds are sourced outside commercial markets.
NB: has access to 50,000-60,000 species of wild crop relatives.
Chain values crop wild relatives at \$115 billion a year.

15

17. Whose technologies will feed us?

The Industrial Chain:

'High-tech' system deploys micro-inventions to macro-environments (e.g. lab or genetic changes for global crops) via monopolies, resulting in high uniformity and disease vulnerability.

38

The Peasant Web:

>2.1 million varieties of 7,000 species bred since 1960s (some ornamentals); no commercial costs to produce new varieties; 80-90% of seeds are sourced outside commercial markets.
NB: has access to 50,000-60,000 species of wild crop relatives.
Chain values crop wild relatives at \$115 billion a year.

15

6. Who will breed our livestock?

The Industrial Chain:

Works with 5 species and <100 breeds; fewer than a dozen corporate breeders dominate R&D in livestock (poultry, swine and cattle) genetics (e.g. 4 companies account for 97% of poultry genetics R&D; 4 companies account for >65% of pig genetics R&D); Europe and North America have the highest proportion of endangered livestock breeds.

16

The Peasant Web:

Conserves agricultural microbial diversity with healthy soils and diverse livestock and crops; gastrointestinal microbes, varying between breeds and feeds, support feed efficiency and reduce methane emissions.

37

6. Who will breed our livestock?

The Industrial Chain:

Works with 5 species and <100 breeds; fewer than a dozen corporate breeders dominate R&D in livestock (poultry, swine and cattle) genetics (e.g. 4 companies account for 97% of poultry genetics R&D; 4 companies account for >65% of pig genetics R&D); Europe and North America have the highest proportion of endangered livestock breeds.

16

The Peasant Web:

Conserves agricultural microbial diversity with healthy soils and diverse livestock and crops; gastrointestinal microbes, varying between breeds and feeds, support feed efficiency and reduce methane emissions.

37

16. Who safeguards microbial resources?

The Industrial Chain:

Genetically-uniform crops and livestock, combined with synthetic fertilizers and pesticides, have decimated beneficial agricultural microbes –damaged soils, hindered feed efficiency and weakened animals; in response, industry is collecting and conserving ex-situ 1.4 million microbial strains; less than 2% of microbial diversity has been identified.

36

The Peasant Web:

Breeds with 40 species and maintains >7,000 local breeds; 640 million peasant farmers and 190 million pastoralists are guardians of the world's livestock diversity; two-thirds of rural livestock keepers are women; rural and urban South households earn between one-third and one-half of their income from livestock.

17

16. Who safeguards microbial resources?

The Industrial Chain:

Genetically-uniform crops and livestock, combined with synthetic fertilizers and pesticides, have decimated beneficial agricultural microbes –damaged soils, hindered feed efficiency and weakened animals; in response, industry is collecting and conserving ex-situ 1.4 million microbial strains; less than 2% of microbial diversity has been identified.

36

The Peasant Web:

Breeds with 40 species and maintains >7,000 local breeds; 640 million peasant farmers and 190 million pastoralists are guardians of the world's livestock diversity; two-thirds of rural livestock keepers are women; rural and urban South households earn between one-third and one-half of their income from livestock.

17

7. Who will conserve our aquatic harvest?

The Industrial Chain:

Catches 363 marine species and 600 species raised in captivity (but 101 breeding programs focus on just 25 species); overfishing has driven 20% of freshwater species to extinction; 30% of ocean fish stocks are overexploited and an additional 57% are at maximum exploitation; today's trawlers catch just 6% of what their counterparts caught 120 years ago.

18

The Peasant Web:

71 of world's 100 major food crops are bee-pollinated (primarily wild bees); wild pollinators are protected by peasants partly dependent on the same habitats for food and medicine.

35

7. Who will conserve our aquatic harvest?

The Industrial Chain:

Catches 363 marine species and 600 species raised in captivity (but 101 breeding programs focus on just 25 species); overfishing has driven 20% of freshwater species to extinction; 30% of ocean fish stocks are overexploited and an additional 57% are at maximum exploitation; today's trawlers catch just 6% of what their counterparts caught 120 years ago.

18

The Peasant Web:

71 of world's 100 major food crops are bee-pollinated (primarily wild bees); wild pollinators are protected by peasants partly dependent on the same habitats for food and medicine.

35

15. Who protects crop pollinators?

The Industrial Chain:

Commercial beehives service one-third of the crops in industrialized countries; dramatic declines in honeybee populations linked to insecticide-use threaten \$200 billion in productivity.

34

The Peasant Web:

Harvests >15,000 freshwater species and unknown thousands of marine species; 1.5 billion people (one-fifth of world population) depend on fish as primary protein source; women make up 33% of the rural aquaculture workforce in China, 42% in Indonesia and 80% in Viet Nam.

19

15. Who protects crop pollinators?

The Industrial Chain:

Commercial beehives service one-third of the crops in industrialized countries; dramatic declines in honeybee populations linked to insecticide-use threaten \$200 billion in productivity.

34

The Peasant Web:

Harvests >15,000 freshwater species and unknown thousands of marine species; 1.5 billion people (one-fifth of world population) depend on fish as primary protein source; women make up 33% of the rural aquaculture workforce in China, 42% in Indonesia and 80% in Viet Nam.

19

8. Who will protect our forest foods?

The Industrial Chain:

\$186 billion market for all primary wood products focuses R&D on 0.5% (450 species) of known forest species (e.g. in Central America, land conversion for feed and fodder destroyed almost 40% of forests in 40 years; 75% of deforested land in the Brazilian Amazon is occupied by cattle ranchers); up to 90% of the tropical timber trade is conducted illegally.

20

The Peasant Web:

Household food waste in sub-Saharan Africa and South Asia is 6-11 kg per person (less than 10% of the losses in industrialized states); losses and waste add up to 120-170 kg per person in sub-Saharan Africa and Southeast Asia, in contrast to 280-300 kg per person in Europe and North America; much of the crop and food waste fertilizes soils or goes to fish ponds and livestock feed.

33

8. Who will protect our forest foods?

The Industrial Chain:

\$186 billion market for all primary wood products focuses R&D on 0.5% (450 species) of known forest species (e.g. in Central America, land conversion for feed and fodder destroyed almost 40% of forests in 40 years; 75% of deforested land in the Brazilian Amazon is occupied by cattle ranchers); up to 90% of the tropical timber trade is conducted illegally.

20

The Peasant Web:

Household food waste in sub-Saharan Africa and South Asia is 6-11 kg per person (less than 10% of the losses in industrialized states); losses and waste add up to 120-170 kg per person in sub-Saharan Africa and Southeast Asia, in contrast to 280-300 kg per person in Europe and North America; much of the crop and food waste fertilizes soils or goes to fish ponds and livestock feed.

33

14. Where is the waste?

The Industrial Chain:

33-40% of the Chain's food is lost or wasted during production, transportation, processing and through household waste; 25% lost through over-eating; per capita food waste in Europe and North America is 95-115 kg/year; despite this, less than 5% of agricultural R&D addresses post-harvest losses; industrial fishing fleets throw out about 7 million tonnes per annum, not including the 40 million sharks killed each year for their fins.

32

The Peasant Web:

80,000 species are important to 80% of people in the South for purposes other than timber and fuel; forests and savannas provide 10-15% of the world's food; 1.6 billion people depend on forests for their livelihoods and so-called "underutilized" lands generate approx. \$90 billion per annum. Half the world's farmland is at least 10% forest with vital role in conservation and GHG storage.

21

14. Where is the waste?

The Industrial Chain:

33-40% of the Chain's food is lost or wasted during production, transportation, processing and through household waste; 25% lost through over-eating; per capita food waste in Europe and North America is 95-115 kg/year; despite this, less than 5% of agricultural R&D addresses post-harvest losses; industrial fishing fleets throw out about 7 million tonnes per annum, not including the 40 million sharks killed each year for their fins.

32

The Peasant Web:

80,000 species are important to 80% of people in the South for purposes other than timber and fuel; forests and savannas provide 10-15% of the world's food; 1.6 billion people depend on forests for their livelihoods and so-called "underutilized" lands generate approx. \$90 billion per annum. Half the world's farmland is at least 10% forest with vital role in conservation and GHG storage.

21

9. Will processed foods harm or help us?

The Industrial Chain:

Processing was to prevent spoilage but the commercial goal is to homogenize, transport and concentrate ingredients in \$1.37 trillion market; since 1950, intensification of food processing has lowered nutritional profiles, homogenized diets, reduced diversity, and increased rates of obesity-related chronic diseases.

22

The Peasant Web:

Peasants are vastly more energy efficient: It takes 2.7 Mcal of external energy for the Chain to produce a kg of rice but only 0.03 Mcal for the Web (e.g. for maize, the energy cost for the Chain is 1.4 Mcal; 0.04 Mcal for the Web). It takes 33% less energy per ha to grow organic maize and 56% less for biodynamic maize in temperate regions.

31

9. Will processed foods harm or help us?

The Industrial Chain:

Processing was to prevent spoilage but the commercial goal is to homogenize, transport and concentrate ingredients in \$1.37 trillion market; since 1950, intensification of food processing has lowered nutritional profiles, homogenized diets, reduced diversity, and increased rates of obesity-related chronic diseases.

22

The Peasant Web:

Peasants are vastly more energy efficient: It takes 2.7 Mcal of external energy for the Chain to produce a kg of rice but only 0.03 Mcal for the Web (e.g. for maize, the energy cost for the Chain is 1.4 Mcal; 0.04 Mcal for the Web). It takes 33% less energy per ha to grow organic maize and 56% less for biodynamic maize in temperate regions.

31

13. Who needs more energy?

The Industrial Chain:

Consumes large amounts of fossil carbon (for fuel, fertilizer and pesticides) contributing to environmental degradation and GHG emissions (e.g. chemical fertilizers and pesticides account for half of the energy used to grow wheat; the manufacture of synthetic nitrogen accounts for 90% of the energy used in the fertilizer industry).

30

The Peasant Web:

Continues to process/preserve food for local consumption, with 2 billion people in the South relying on local artisanal food fermentation/processing for an important part of their food supply.

23

13. Who needs more energy?

The Industrial Chain:

Consumes large amounts of fossil carbon (for fuel, fertilizer and pesticides) contributing to environmental degradation and GHG emissions (e.g. chemical fertilizers and pesticides account for half of the energy used to grow wheat; the manufacture of synthetic nitrogen accounts for 90% of the energy used in the fertilizer industry).

30

The Peasant Web:

Continues to process/preserve food for local consumption, with 2 billion people in the South relying on local artisanal food fermentation/processing for an important part of their food supply.

23

10. Who has the land, and how is it used?

The Industrial Chain:

Land-grabbed 15% of farmland since 2001 and another >2% of farmland for biofuels; uses 70-80% of arable land; uses 176 million tonnes of nutrients in synthetic fertilizer per year and loses 75 billion tonnes of soil at a cost of \$400 billion; 78% of agricultural land is used for livestock production (feed, fodder, pasture); 80% of synthetic fertilizer is used for meat production –to fertilize crops/pastures that feed livestock– but less than half of applied fertilizer reaches the crops.

24

The Peasant Web:

The amount of nitrates leaching into groundwater is four times less on non-chemical farms; 20 million ha are irrigated with urban waste water in 50 countries; roughly 1 billion people consume agricultural products initially grown with waste water; water from a city of 1 million can irrigate 1,500-3,500 ha of semi arid land (e.g. 15-20% of global food supply comes from urban areas); vegetarian diet requires about 5 times less water than meat-based diet.

29

10. Who has the land, and how is it used?

The Industrial Chain:

Land-grabbed 15% of farmland since 2001 and another >2% of farmland for biofuels; uses 70-80% of arable land; uses 176 million tonnes of nutrients in synthetic fertilizer per year and loses 75 billion tonnes of soil at a cost of \$400 billion; 78% of agricultural land is used for livestock production (feed, fodder, pasture); 80% of synthetic fertilizer is used for meat production –to fertilize crops/pastures that feed livestock– but less than half of applied fertilizer reaches the crops.

24

The Peasant Web:

The amount of nitrates leaching into groundwater is four times less on non-chemical farms; 20 million ha are irrigated with urban waste water in 50 countries; roughly 1 billion people consume agricultural products initially grown with waste water; water from a city of 1 million can irrigate 1,500-3,500 ha of semi arid land (e.g. 15-20% of global food supply comes from urban areas); vegetarian diet requires about 5 times less water than meat-based diet.

29

12. Who's using the water?

The Industrial Chain:

76% of the water that crosses national borders was used to grow crops and to make crop-derived products (e.g. trade in soybeans account for 20% of total international water flows); trade in animal and industrial products contributed 12% each; a meat-oriented diet needs up to 5 times more water than a vegetarian diet; water used for the production and processing of food ultimately wasted could meet the domestic needs of 9 billion people.

28

The Peasant Web:

Uses 20-30% of global arable land, at least 50% farmed without synthetic fertilizers (e.g. 23% of nitrogen in mixed farming supplied by manure); mostly peasants make possible an estimated 70–140 million tonnes of nitrogen fixed by soil micro-organisms annually, equivalent to \$90 billion of nitrogen fertilizers.

25

12. Who's using the water?

The Industrial Chain:

76% of the water that crosses national borders was used to grow crops and to make crop-derived products (e.g. trade in soybeans account for 20% of total international water flows); trade in animal and industrial products contributed 12% each; a meat-oriented diet needs up to 5 times more water than a vegetarian diet; water used for the production and processing of food ultimately wasted could meet the domestic needs of 9 billion people.

28

The Peasant Web:

Uses 20-30% of global arable land, at least 50% farmed without synthetic fertilizers (e.g. 23% of nitrogen in mixed farming supplied by manure); mostly peasants make possible an estimated 70–140 million tonnes of nitrogen fixed by soil micro-organisms annually, equivalent to \$90 billion of nitrogen fertilizers.

25

11. Who can reduce agriculture's GHG emissions?

The Industrial Chain:

Livestock methane emissions are projected to increase 60% by 2030; non-organic farms emit an additional 637 kg/ha of CO₂ per annum; trawlers scrape a seabed-area equivalent to half the world's continental shelves annually, which contributes to the destruction of 1.5% of oceans' meadows and releases 299 million tonnes of carbon into the atmosphere.

26

The Peasant Web:

Maintains the pasture, breeds and microbial diversity to reduce methane and nitrous oxide emissions (e.g. organic farms in Germany store 402 kg/ha of CO₂); organic and peasant agro-ecological agriculture with soil restoration can store an additional 3-8 tons of carbon per ha, reducing up to 60% of GHGs; organic farms cut CO₂ emissions by 48% to 60%; artisanal fishers don't destroy seagrass meadows.

27

11. Who can reduce agriculture's GHG emissions?

The Industrial Chain:

Livestock methane emissions are projected to increase 60% by 2030; non-organic farms emit an additional 637 kg/ha of CO₂ per annum; trawlers scrape a seabed-area equivalent to half the world's continental shelves annually, which contributes to the destruction of 1.5% of oceans' meadows and releases 299 million tonnes of carbon into the atmosphere.

26

The Peasant Web:

Maintains the pasture, breeds and microbial diversity to reduce methane and nitrous oxide emissions (e.g. organic farms in Germany store 402 kg/ha of CO₂); organic and peasant agro-ecological agriculture with soil restoration can store an additional 3-8 tons of carbon per ha, reducing up to 60% of GHGs; organic farms cut CO₂ emissions by 48% to 60%; artisanal fishers don't destroy seagrass meadows.

27