Chapter 6 “To Farm or not to Farm”
Why did humans develop agriculture around 8500 B.C. and not before?
Agriculture didn’t “spring up” fully formed
Guns, Germs, and Steel

Humans slowly developed agriculture through trial and error
Humans slowly developed agriculture through trial and error.

How do you say “trial and error” in Japanese?
Humans slowly developed agriculture through trial and error

How do you say “trial and error” in Japanese?
Guns, Germs, and Steel

Some people were both hunter-gatherers and agriculturalists
Guns, Germs, and Steel

Some people were both hunter-gatherers and agriculturalists.

Hunter-gatherers sometimes adopted agriculture for a while and then returned to their old practices.
Guns, Germs, and Steel

It was a long time after 8500 B.C. before any society’s food sources were entirely agricultural.
Guns, Germs, and Steel

It was a long time after 8500 B.C. before any society’s food sources were entirely agricultural.

In the last 10,000 years, it’s become increasingly difficult to be a hunter-gatherer.
Wild foods have become less available
Guns, Germs, and Steel

Wild foods have become less available

Most of the world's large mammal species have gone extinct
Guns, Germs, and Steel

Wild foods have become less available

Most of the world’s large mammal species have gone extinct

Also...
Guns, Germs, and Steel

Agriculture can support larger populations
Guns, Germs, and Steel

Agriculture can support larger populations

humans were motivated to experiment with agriculture because it promised to feed them enough to survive
Agriculture depended upon the existence of technologies
Agriculture depended upon the existence of technologies

(like the hoe (___))
Agriculture depended upon the existence of technologies

(like the hoe (鍬))
Agriculture depended upon the existence of technologies (like the hoe (鎬) and the awl (______))
Agriculture depended upon the existence of technologies

(like the hoe (鉬) and the awl (突き錐))
These technologies didn’t exist before about 10,000 years ago.
These technologies didn't exist before about 10,000 years ago.

Gradually, environmental changes and the rise of human technology and population density motivated people to pursue agriculture.
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Gradually, environmental changes and the rise of human technology and population density motivated people to pursue agriculture.
Hunting and gathering! That's all we do!
I'm tired of it! Why can't we try some
of that agriculture that the Hill Tribe
keeps talking about?
The decision to pursue agriculture instead of hunter-gatherer practices was motivated by practicality more than anything else.
The decision to pursue agriculture instead of hunter-gatherer practices was motivated by *practicality* more than anything else.

Hunting and gathering! That’s all we do! I’m tired of it! Why can’t we try some of that agriculture that the Hill Tribe keeps talking about?
Humans realized that their best chance of feeding themselves involved growing crops, not killing large (wild) mammals.
Hunting-Gathering

Advantages of Hunter-Gatherers
Advantages of Hunter-Gatherers

- Hunter-gatherers would not have to rely on soil fertility and rain patterns to get food.
- Sometimes there is plenty of prey, therefore allowing easy hunting.
- Pretty balanced diet.
Hunting-Gathering

Disadvantages of Hunter-Gatherers
Disadvantages of Hunter-Gatherers

- Food is constantly moving.
- Sometimes food is scarce.
- Hunting is a major time commitment, so societies cannot develop other technology.
Agriculture

Advantages of Agriculture

For the most part, there is a constant food supply. Less time is spent on gathering more food, so more time can be used for new things. More food is grown, so there can be a higher population.
Agriculture

Advantages of Agriculture

- For the most part, there is a constant food supply.
  
  Less time is spent on
  - gathering more food, so more time can be used for new things
  
- More food is grown, so there can be a higher population.
Agriculture

Disadvantages of Agriculture
Agriculture

Disadvantages of Agriculture

- Food supply is directly related to rain patterns and soil fertility.
- During a drought, farming would be a non-reliable food source.
- Un-balanced diet.
Guns, Germs, and Steel

Chapter 7 “How to Make an Almond”
One of the most important aspects of agriculture is the domestication of crops.
One of the most important aspects of agriculture is the domestication of crops.
One of the most important aspects of agriculture is the domestication of crops.
By the way, how do you say “domesticate” in Japanese?

domesticated
By the way, how do you say “domesticate” in Japanese?

。。。を栽培可能にする、慣らすこと、順応

domesticated → Cultivated
Wild
Who came up with the idea to domesticate a crop?
Who came up with the idea to domesticate a crop?

Many animals select the kinds of plants they want to eat unintentionally by:
Who came up with the idea to domesticate a crop?

Many animals select the kinds of plants they want to eat unintentionally by:

Eating them ——>
Who came up with the idea to domesticate a crop?

Many animals select the kinds of plants they want to eat unintentionally by:

spreading them to other places (by walking or flying) —>
Who came up with the idea to domesticate a crop?

Many animals select the kinds of plants they want to eat unintentionally by:

Planting them in the earth again (by defecating) ——>
Result:
Result:

Most plant seeds have evolved to survive being digested by most animals
The earliest farmers didn’t fully understand their domestication practices.
They just understood that if they planted certain seeds, they would get certain kinds of crops.
The almond was once dangerous to eat.
The almond was once dangerous to eat.

Domestication made the almond edible and tasty.
Humans chose almond crops without poisonous seeds and planted them, until domesticated almonds (non-bitter and non-poisonous) outnumbered wild almonds.
This is natural selection
This is natural selection

Natural selection, in a nutshell:

Yum! Green beetles! Our favorite!

Birds eat the green beetles
This is natural selection

Fewer green beetles...
This is natural selection

Brown beetles flourish (繁盛する)
The agricultural revolution began in the Fertile Crescent of Mesopotamia.
stalk

(茎)

くき
Seeds that remain in their stalks (茎) are evolutionarily useless - they just die without producing a new generation of plants.
However, these “useless” seeds became useful for humans.
Farmers removed the seeds from their stalks and planted them in the ground.
The result (after many thousands of years)
Domesticated plants have evolved to only produce seeds that remain in the stalk.
Humans prefer grains that grew quickly and could be harvested easily.
Self-fertilization

What does “Self-fertilization” mean?
What does “Self-fertilization” mean?

自己受精
Self-fertilization is an important way crops have developed over thousands of years.
Self-fertilization is an important way crops have developed over thousands of years.

Self-fertilization was once the minority case.
Self-fertilization is an important way crops have developed over thousands of years.

Self-fertilization was once the minority case.

Self-fertilization has an evolutionary advantage over ordinary plant fertilization.
Self-fertilization is an important way crops have developed over thousands of years.

Self-fertilization was once the minority case.

Self-fertilization has an evolutionary advantage over ordinary plant fertilization.

Self-fertilizing crops eventually outstripped the “normal” crops.
Ancient farmers didn’t really understand this concept; they just planted the crops they liked.
Ancient farmers didn’t really understand this concept; they just planted the crops they liked.

The original domesticated crops were …
Ancient farmers didn’t really understand this concept; they just planted the crops they liked.

The original domesticated crops were …
Ancient farmers didn’t really understand this concept; they just planted the crops they liked.

The original domesticated crops were ... wheat and barley.
Wheat and Barley
Wheat and Barley probably because they were...
Wheat and Barley probably because they were... fast-growing
Wheat and Barley probably because they were... fast-growing and easy to harvest.
Wheat and Barley probably because they were...

- fast-growing
- easy to harvest
- self-pollinating
Wheat and Barley probably because they were...

fast-growing easy to harvest

self-pollinating

What does “self-pollinating” mean?
Wheat and Barley
probably because they were...

- fast-growing
- easy to harvest
- self-pollinating

What does “self-pollinating” mean?
Wheat and Barley probably because they were...

- fast-growing
- easy to harvest
- self-pollinating

What does “self-pollinating” mean?

自家受粉
Humans learned to domesticate different plants at different times
Humans learned to domesticate different plants at different times

Humans learned to domesticate fast-growing, easy-to-harvest crops first
Humans learned to domesticate different plants at different times

Humans learned to domesticate fast-growing, easy-to-harvest crops first

Slow-growing crops later on (if at all)
Ancient Romans (2000 years ago)
Ancient Romans (2000 years ago)

Most of the world’s leading crops (wheat, corn, rice…) were being grown somewhere in the world.
Ancient Romans (2000 years ago)

Most of the world’s leading crops (wheat, corn, rice...) were being grown somewhere in the world.

Certain qualities make plants easy or hard to domesticate.
Acorns have never been domesticated because...
they’re slow-growing
they’re slow-growing squirrels eat many acorns
they’re slow-growing squirrels eat many acorns

It’s hard to “breed out” (genetically complex) bitterness in an acorn
they’re slow-growing squirrels eat many acorns

It’s hard to “breed out” (genetically complex) bitterness in an acorn

苦味を“繁殖”させることは大変
This shows the thoroughness of ancient agriculture
This shows the thoroughness of ancient agriculture

Ancient farmers domesticated pretty much everything that could be domesticated
This shows the thoroughness of ancient agriculture

Ancient farmers domesticated pretty much everything that could be domesticated

Domestication of crops is evolution in action
Domestication of crops is evolution in action

The evolution of maize (corn)

- The wild ancestor
- Domestication
- The adaptation to Europe
- Extension of corn crop areas

- America
- Mexico
- South of Europe introduction
- First creation of hybrids in France
Agriculturalists prefer crops with certain characteristics (taste, ease of harvest, etc.)
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Rice
Agriculturalists prefer crops with certain characteristics (taste, ease of harvest, etc.)

Rice
Agriculturalists prefer crops with certain characteristics (taste, ease of harvest, etc.)

Rice

Wheat
Agriculturalists prefer crops with certain characteristics (taste, ease of harvest, etc.)
Agriculturalists prefer crops with certain characteristics (taste, ease of harvest, etc.)

- Rice
- Wheat
- Corn
Agriculturalists prefer crops with certain characteristics (taste, ease of harvest, etc.)

Eventually these crops are the “fittest” for their environment and come to outnumber other kinds.