

GROW YOUR OWN VEGETABLE SEEDS

- **What is a seed?**
- **Why better not use pesticides?**
- **How do vegetables produce seeds?**
- **What can we do to save seed diversity?**

Frank Adams, Market gardener, seed artisan,
teacher and trainer, Luxembourg, November 2024



WHAT IS A SEED?

Physically speaking...

A seed consists of

- A seedling (embryo)
- A nutritive tissue (albumen)
- A seed coat (testa)

Genetically speaking...

A seed contains

- Genetic information (DNA)
- Epigenetic information



THE PLANT IN ITS ECOSYSTEMIC CONTEXT

Sunlight (energy)

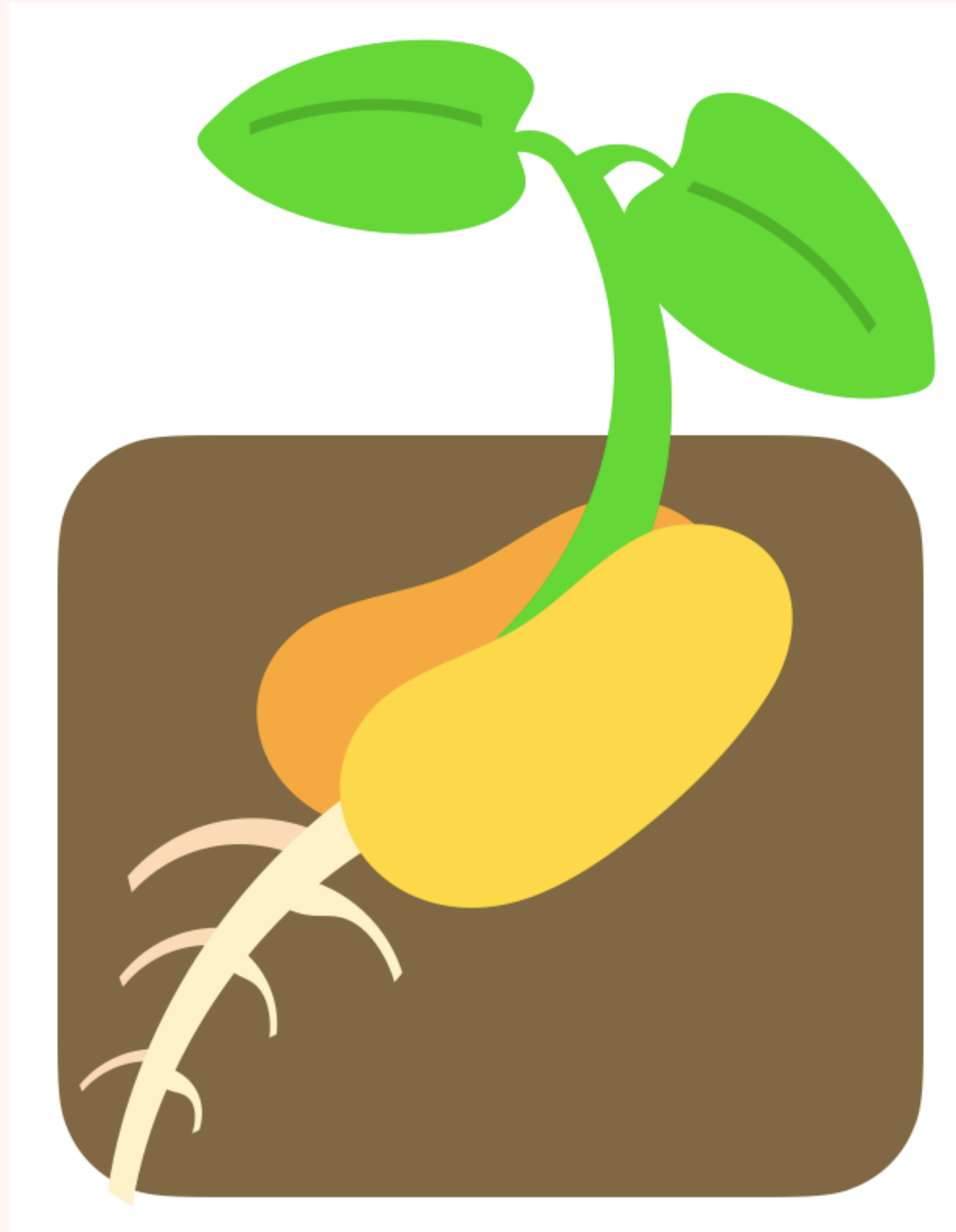
Pests

Diseases

Humus

Weeds

Soil life



Water

O₂ / CO₂

Climate

Nutriment

Soil quality

Cultural practices

THE PLANT IN ITS ECOSYSTEMIC CONTEXT

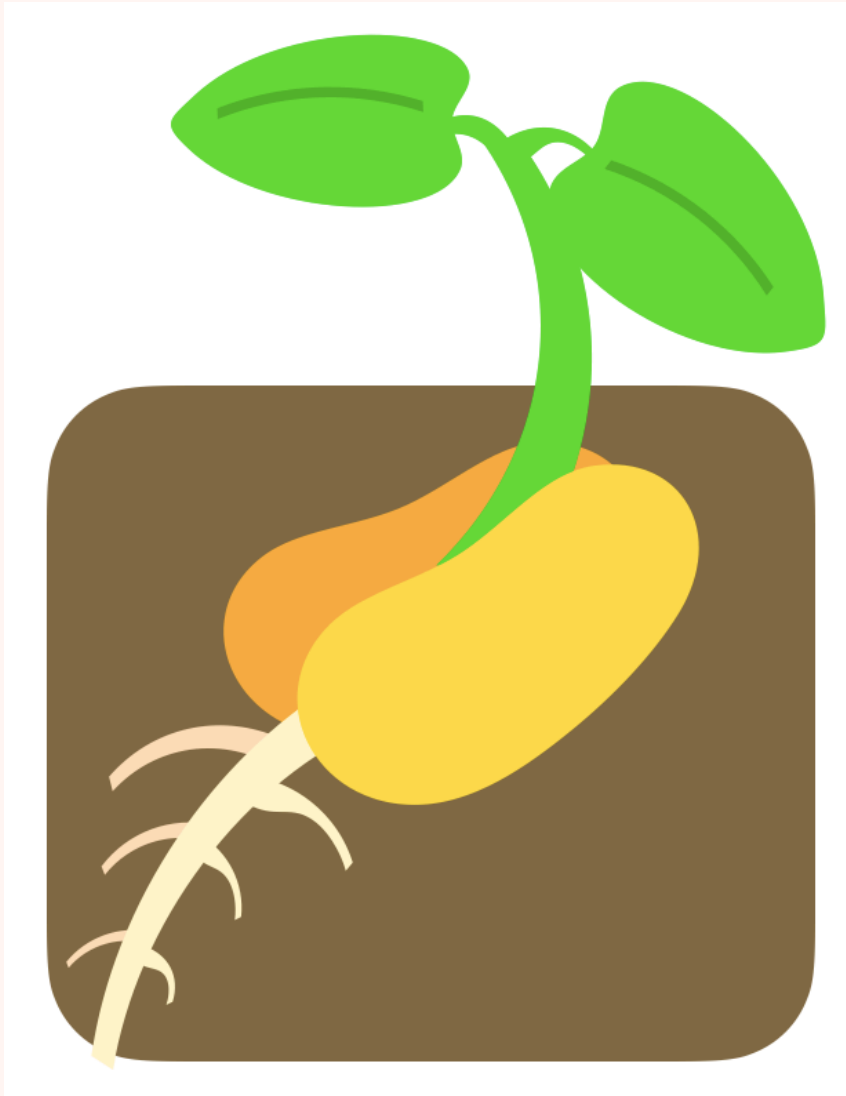


Plants interact with their environment and they have different "strategies of survival". For example, they use several tools to defend themselves against stresses.

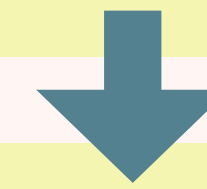
However, when farmers or gardeners use pesticides, these natural mechanisms are impeded, sometimes even resulting in pesticide resistant pests and diseases.

- **They can warn each other when pests or diseases start spreading**
- **They can produce chemical compounds of defense (secondary metabolites)**
- **They can pass on epigenetic information to the next generation through their seeds**

THE PLANT IN ITS ECOSYSTEMIC CONTEXT

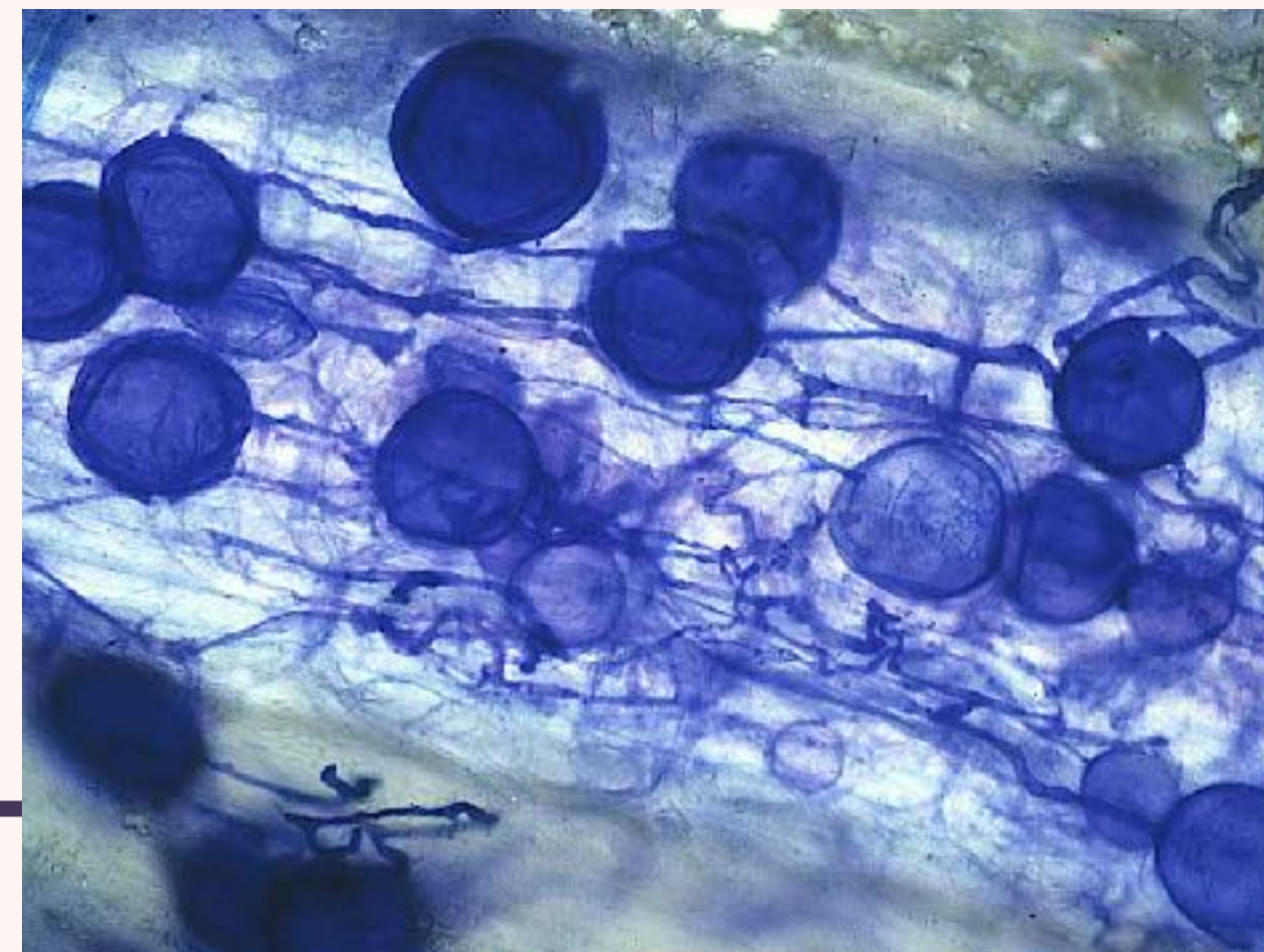


There are also several mechanisms of symbiosis in the life of a plant.

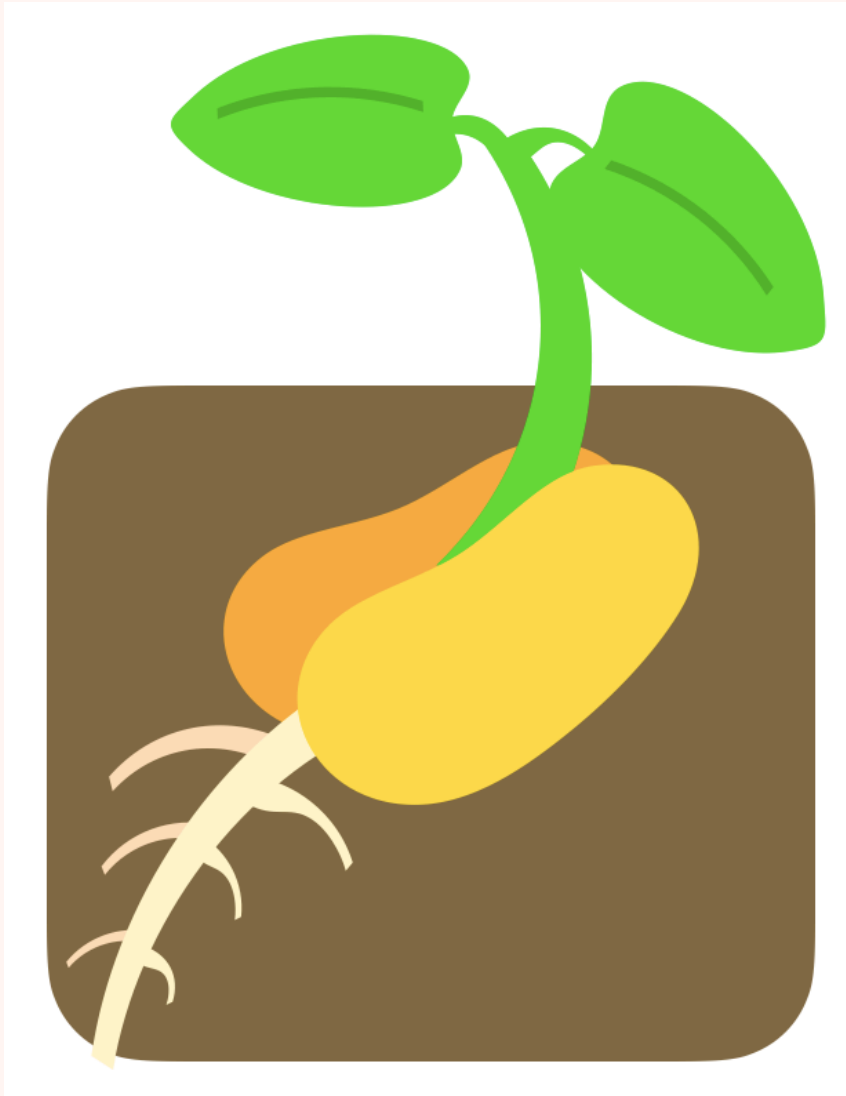


- **Symbiosis with fungi (mycorrhiza and others) and bacteria (rhizobium and others)**
- **But plants also live in symbiosis with... viruses!**

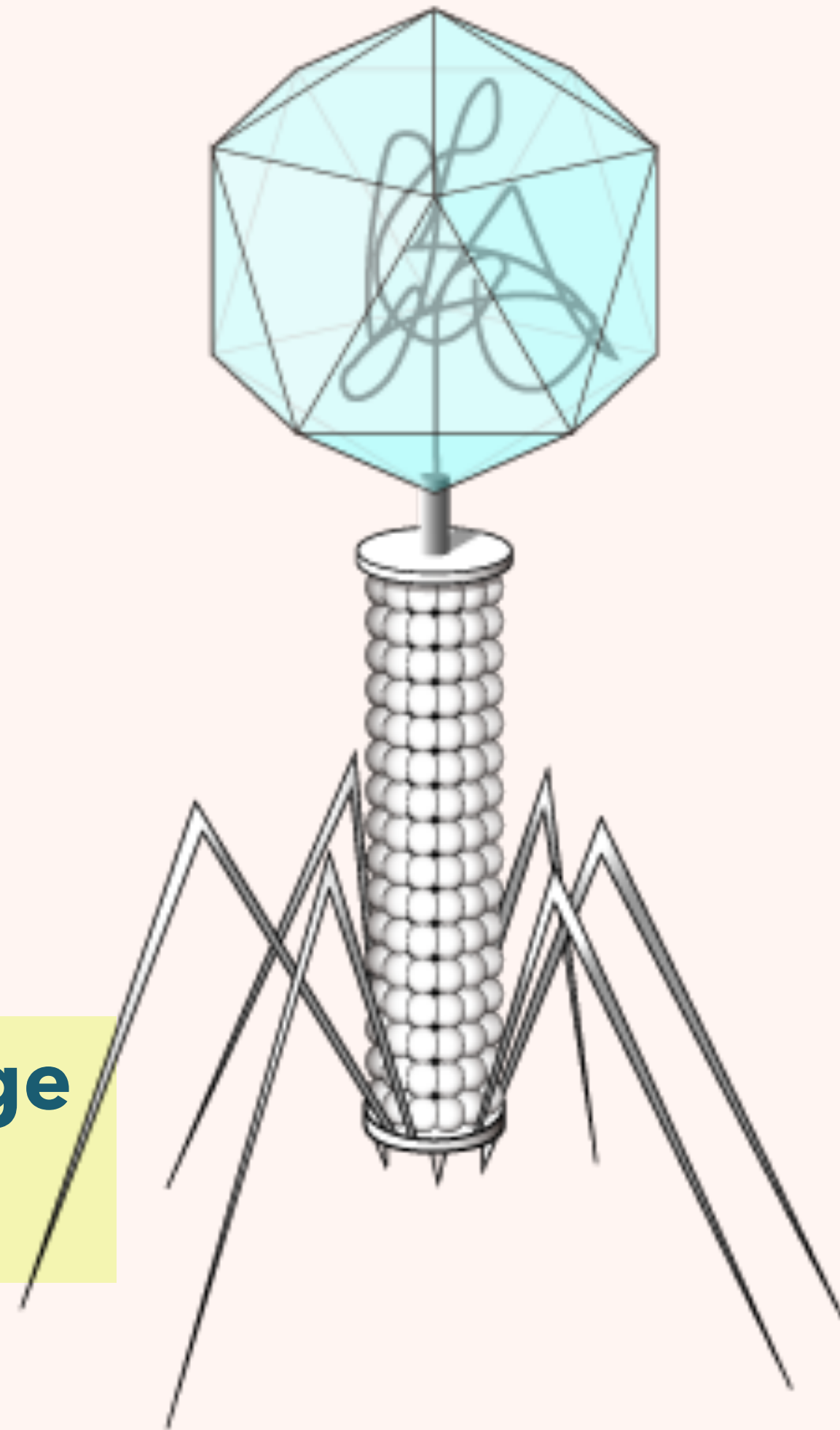
Left: Mycorrhiza fungus inside a plant root
Right: Rhizobium nodules on a plant root



THE PLANT IN ITS ECOSYSTEMIC CONTEXT



**Bacteriophage
virus**

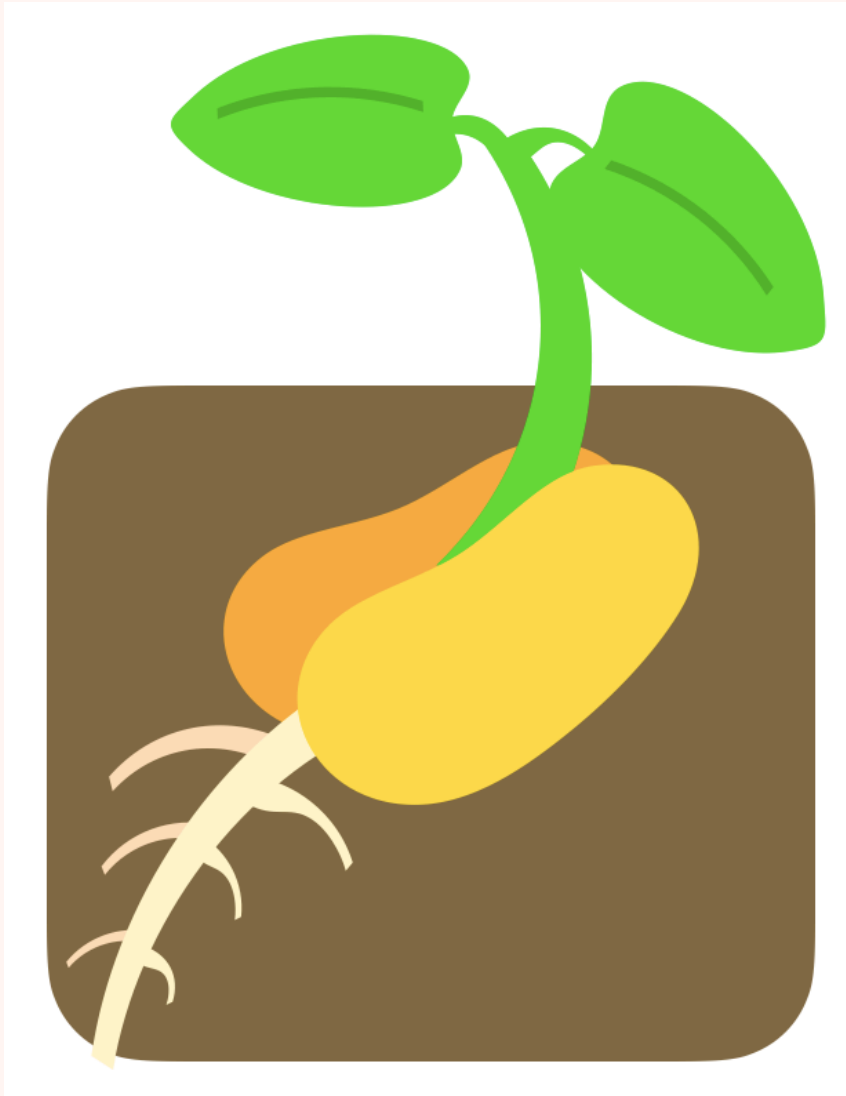


There are viruses that help the plant by "eating bacteria" (bacteriophages). They are part of the plant's "immune system".

Another type of virus interacting with plants is of pathogenous nature causing viral diseases.

These diseases are generally quite "virulent" and there are no pesticides to stop them.

THE PLANT IN ITS ECOSYSTEMIC CONTEXT



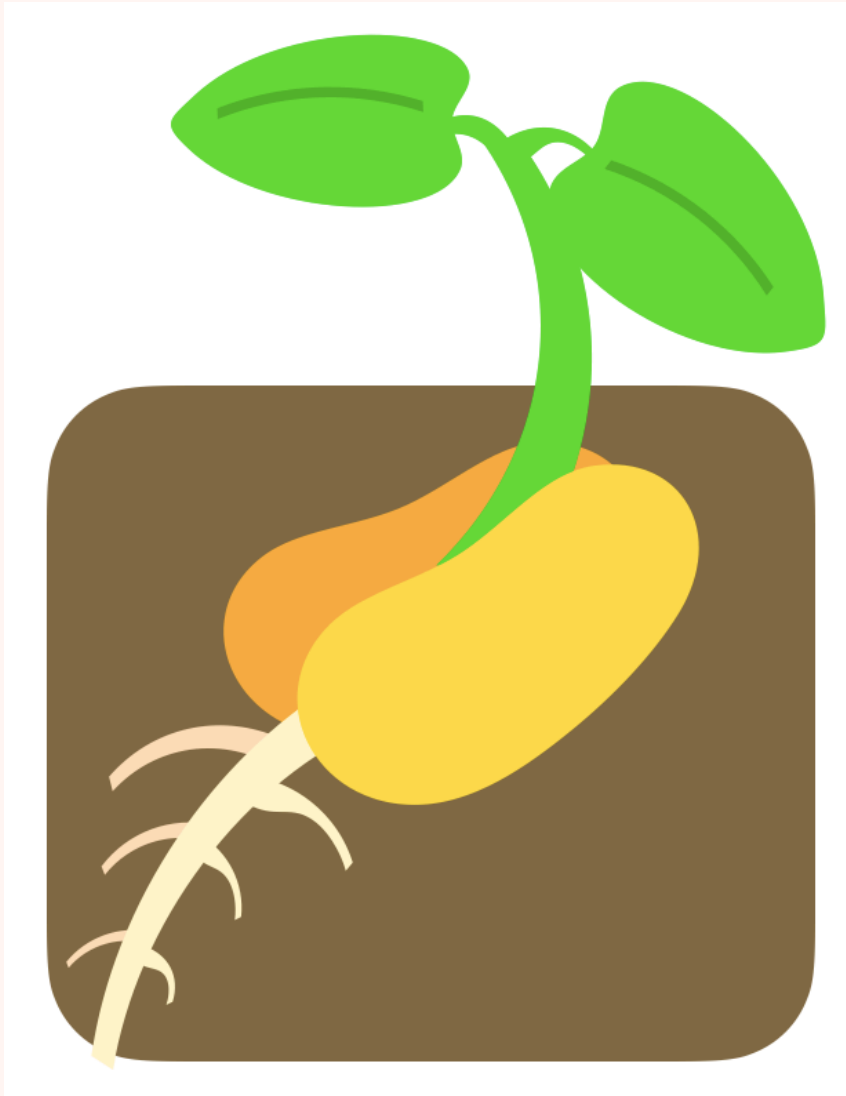
According to the ecosystemic approach in plant and seed cultivation diseases are phenomena of natural selection and genetic evolution:

- **Some plants will wither**
- **Others will survive**
- **Some will develop new "features" in a process of genetic evolution**

Bean plant with symptoms of a viral disease



THE PLANT IN ITS ECOSYSTEMIC CONTEXT



**Virus symptoms
still visible on the
older leaves**

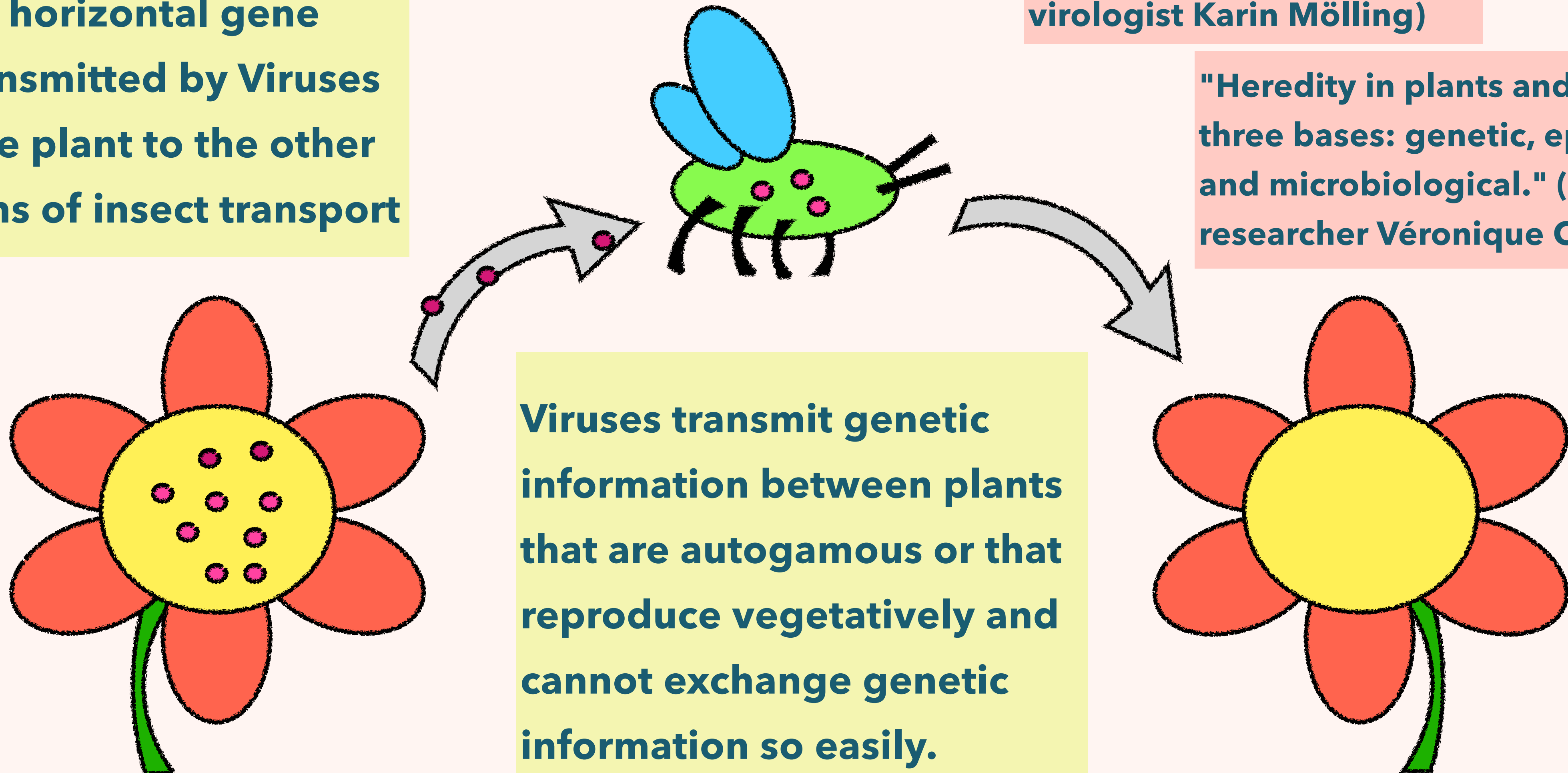
While certain plants are "killed" by the virus, others outgrow the virus. In this process, the virus may integrate its genetic information into the plant's genome. This mechanism is far from being well understood. It is called Horizontal Gene Transfer (HGT).

**Photos from the same patch:
Left: Dying plants
Right: Plants outgrowing
the virus**

THE PLANT IN ITS ECOSYSTEMIC CONTEXT

Horizontal Gene Transfer:

Asexual horizontal gene flow transmitted by Viruses from one plant to the other by means of insect transport



"Sex can be replaced by viruses." (German virologist Karin Mölling)

"Heredity in plants and animals has three bases: genetic, epigenetic and microbiological." (INRAe researcher Véronique Chable)

Viruses transmit genetic information between plants that are autogamous or that reproduce vegetatively and cannot exchange genetic information so easily.

THE PLANT IN ITS ECOSYSTEMIC CONTEXT

According to the ecosystemic approach diseases and pests are part of the system. They are not the problem, but a symptom of a lack of balance or vitality.

If we choose to use pesticides we should at least understand about ecosystemic mechanisms.



Why did the cabbage white butterfly only "choose" five plants out of 300 in the stand?



THE PLANT IN ITS ECOSYSTEMIC CONTEXT

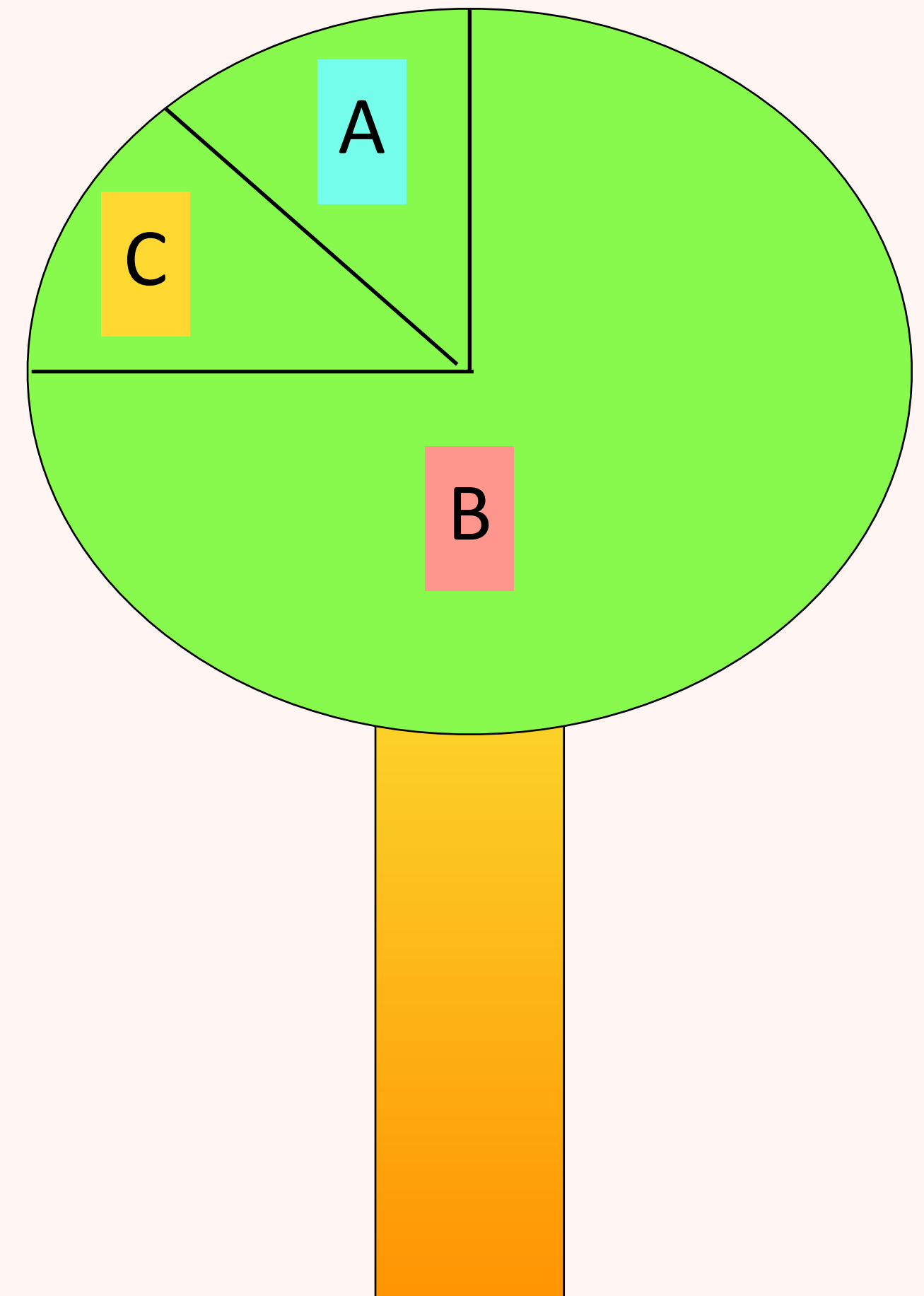
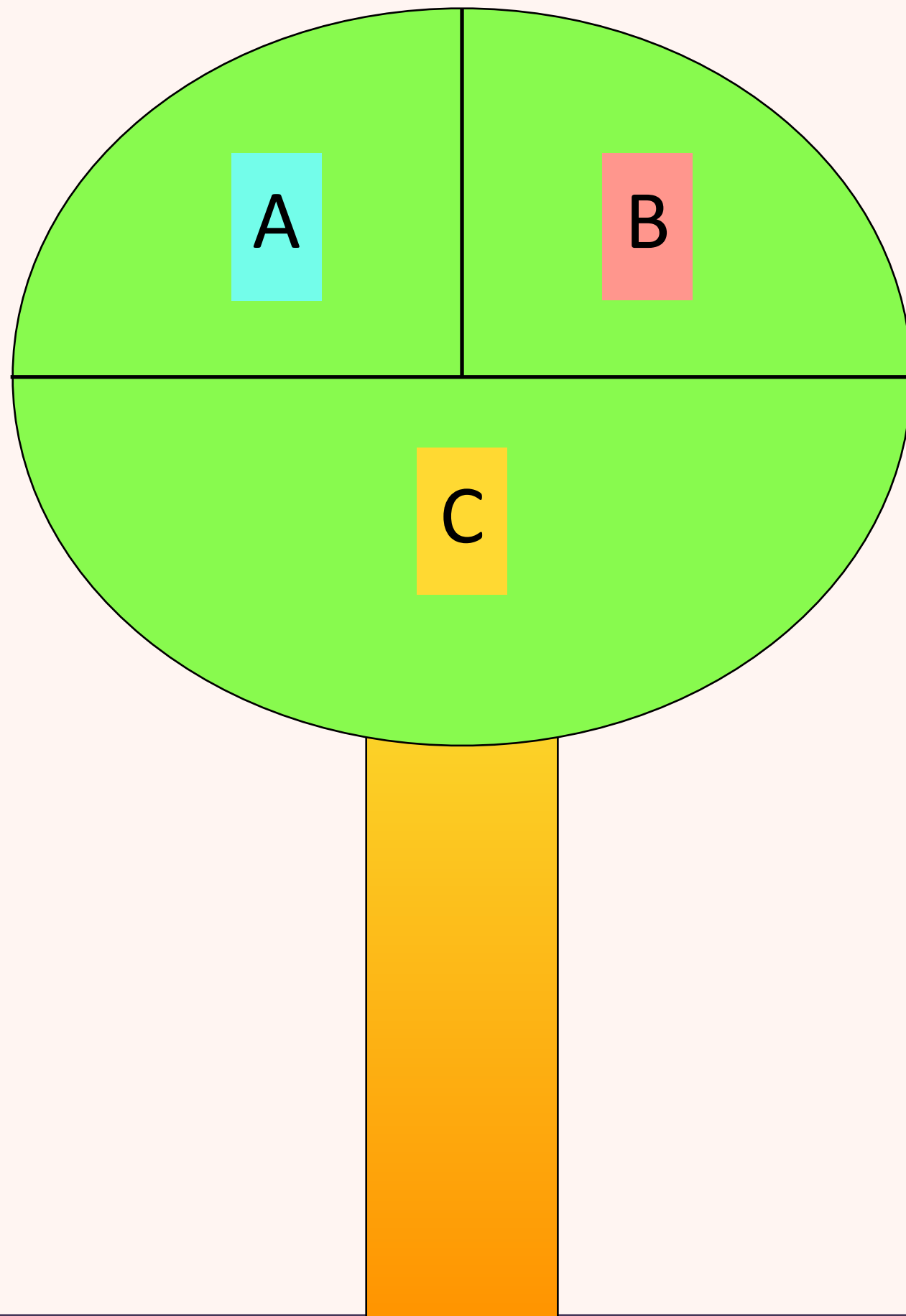
Fruit tree with its insect ecosystem

Tree some time after pesticide use

A Beneficial Insects
B Harmful insects
C Neutral insects

The vicious circle of pesticides:
"Fighting the enemy, but promoting its resistance?" Pesticides kill all insects, but the ones that feed on the fruit are the first to come back and multiply. If pesticides are used regularly, the harmful insects develop a resistance to the poison and multiply even more.

Source : Hans Steiner "Nützlinge im Garten",
Ulmer 1985 (simplified graphic)

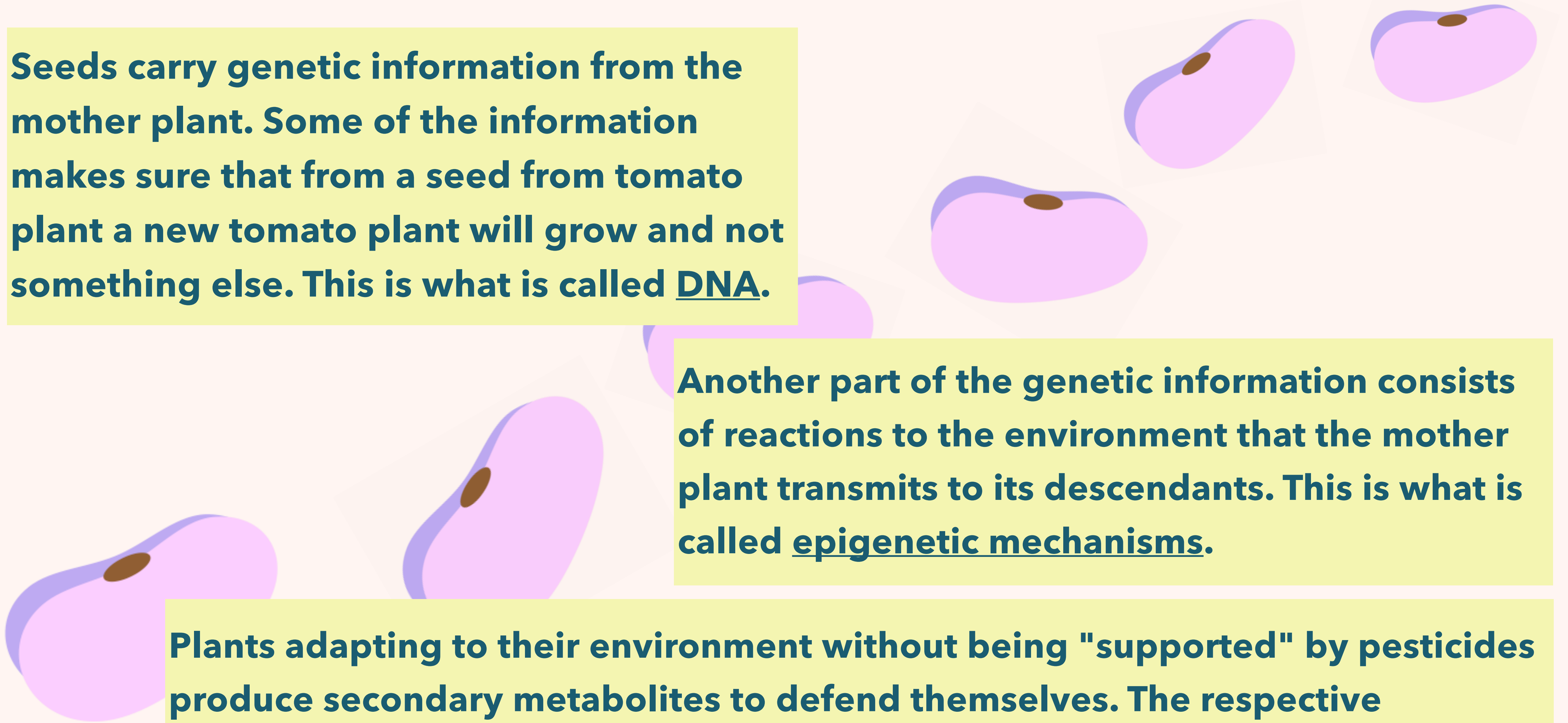


THE ROLE OF SEEDS

Seeds carry genetic information from the mother plant. Some of the information makes sure that from a seed from tomato plant a new tomato plant will grow and not something else. This is what is called DNA.

Another part of the genetic information consists of reactions to the environment that the mother plant transmits to its descendants. This is what is called epigenetic mechanisms.

Plants adapting to their environment without being "supported" by pesticides produce secondary metabolites to defend themselves. The respective information and mechanisms are passed on through the seeds.





SEED DIVERSITY

From the beginning of the 20th century, seeds gradually became an anonymous commodity produced by professional seed companies.

The process of industrialisation led on the one hand to standardised seeds in a centralised and privatised production and on the other hand to the loss of traditional regional varieties.

The FAO has been warning since the 1980s that the "genetic erosion" of our food crops is a threat to sustainable food security. Amateur gardeners can contribute to the preservation of diversity by harvesting, passing on and exchanging seeds from their own gardens. Apart from being a useful service to the common good, harvesting your own seeds is an enriching activity and actually not that difficult.

BEAN

Seed cultivation:
level: easy

Botanical aspects:
annual, autogamous,
pollinated by insects
and wind



Seed maturation

BEAN



Seeds

TOMATO

Seed cultivation:
level: easy

Botanical aspects:
annual, autogamous,
pollinated by insects
and wind

Fruit maturation



**Selected
seed bearers**

TOMATO



Seeds

LETTUCE

Seed cultivation:
level: easy

Botanical aspects:
annual, autogamous,
pollinated by insects
and wind

Going to seed

Seed maturation



LETTUCE



Seeds

SPINACH

Seed cultivation:
level: easy

Botanical aspects:
annual, allogamous,
pollinated by wind

**Going to
seed**

Seed maturation



SPINACH



Seeds

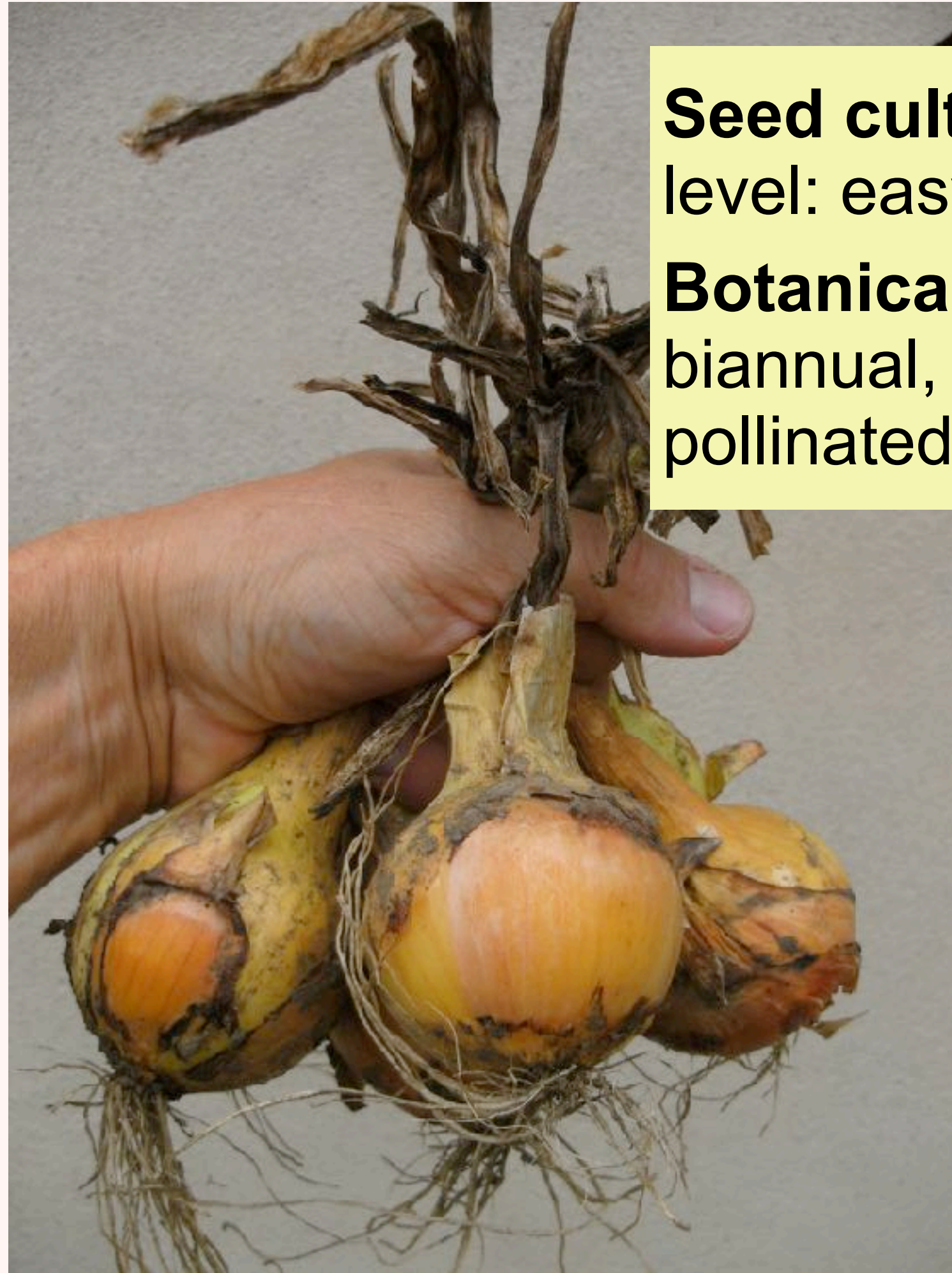
ONION

Seed cultivation:

level: easy

Botanical aspects:

biannual, allogamous,
pollinated by insects



Selected seed bearers



**Replanted onions
sprout again**



**Onion about
to flower**

ONION



Seeds

LEEK

Seed cultivation:
level: intermediate

Botanical aspects:
biannual, allogamous,
pollinated by insects



**Selected seed bearers
at the end of winter**



**Flowering and
pollination**

LEEK



Seeds

KALE

Seed cultivation:
level: intermediate

Botanical aspects:
biannual, allogamous,
pollinated by insects



Selected seed bearers



Buds with blossom beetle



Ripening pods

KALE



Seeds

CARROT

Seed cultivation:
level: advanced

Botanical aspects:
biannual, allogamous,
pollinated by insects

Selection of seed bearers:

- Upper half: positive
- Lower half: negative



Seed bearers flowering



CARROT



Seeds

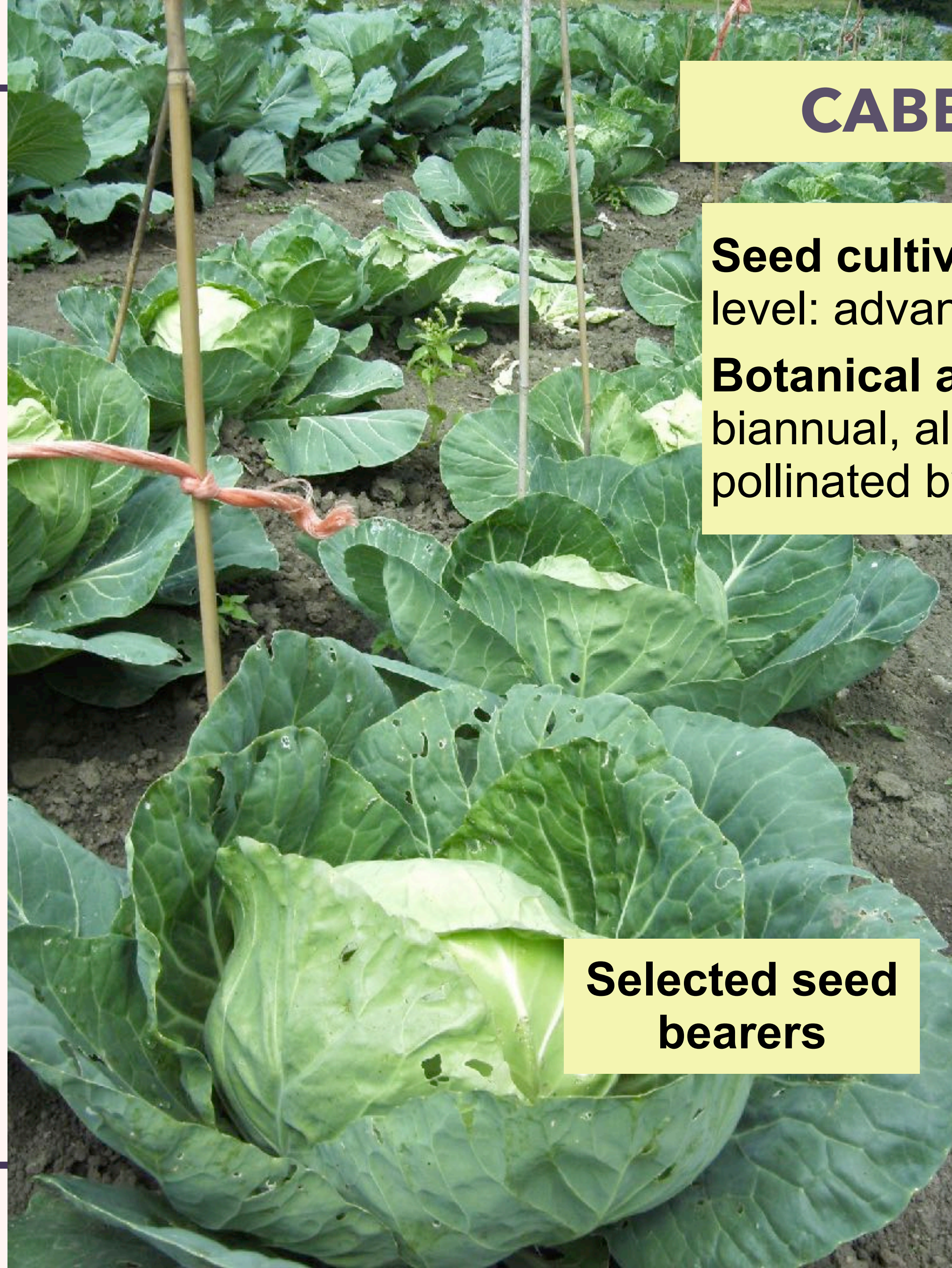
CABBAGE

Seed cultivation:
level: advanced

Botanical aspects:
biannual, allogamous,
pollinated by insects

**Selected seed
bearers**

**Hibernation of
seed bearers**



CABBAGE



Central shoot breaking through the cabbage



Seed bearers at different stages of bolting

CABBAGE



Seeds

PUMPKIN/SQUASH/MARROW/GOURD



Cucurbita maxima

- Left: Red Kuri
- Right: Green Hokkaido



Seed cultivation:
level: advanced

Botanical aspects:
annual, allogamous,
pollinated by insects

Challenge:
Varieties of the
same species
cross-pollinate !



Cucurbita moschata
Butternut



Cucurbita ficifolia
Fig-leaf gourd



Cucurbita pepo

- Left: Sweet Dumpling
- Right: Courgette Zuboda



PUMPKIN



Seeds

Initial reflection:

A majority in politics and civil society believes that local food production should be increased, preferably in an agro-ecological way.

Local seed production would make it possible to create 100% local products.

However, such production does not respond to the rules of the market; it cannot be profitable if it is limited to the local market.

Nevertheless, local vegetable seed production has a number of benefits and advantages:

- Contribution to the diversity of food plants
- Local, ecological and solidarity-based food production
- Creation of local jobs
- Increasing the rate of food self-sufficiency

The project "From Seed To Plate"

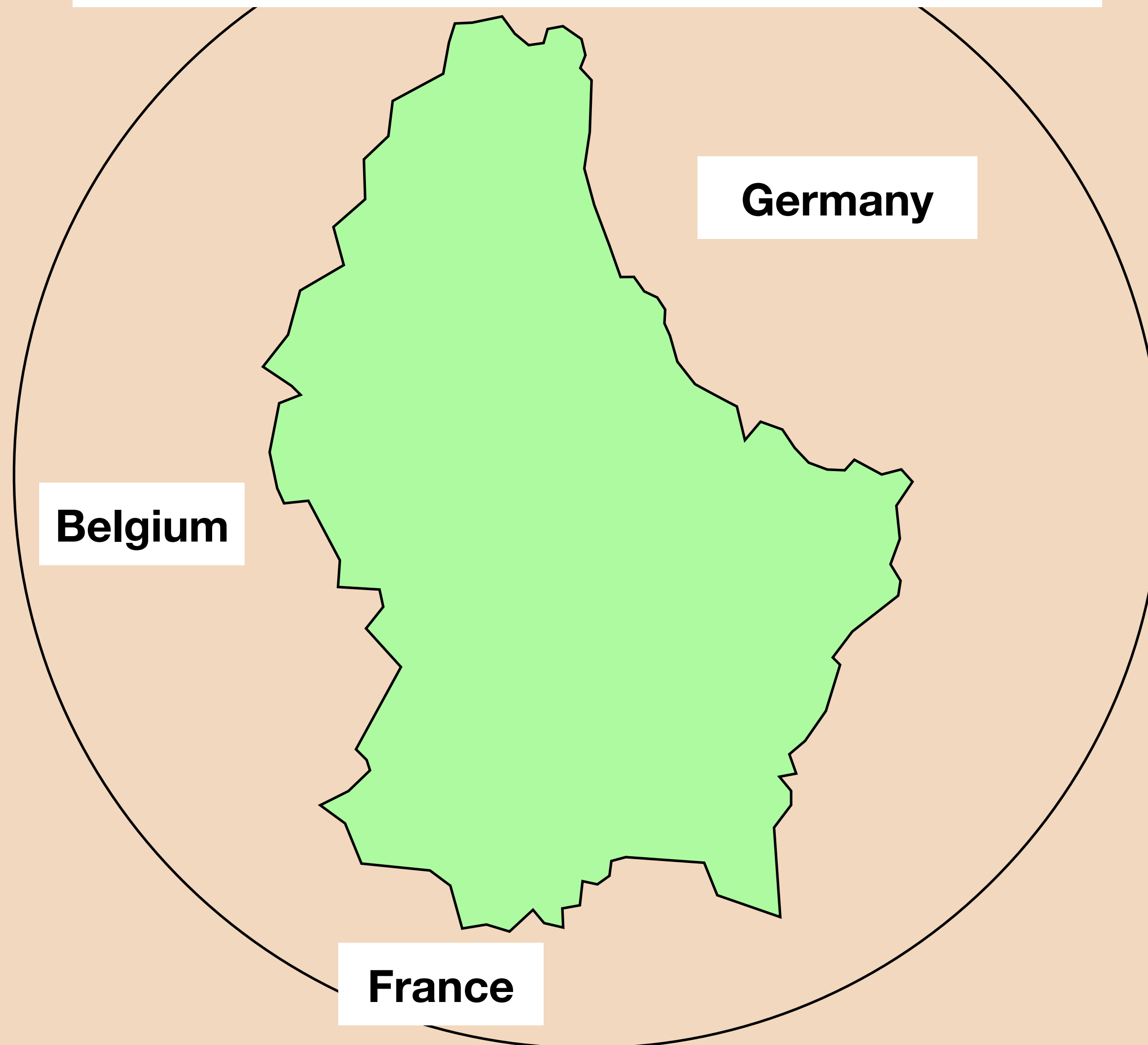


ŒUVRE

Nationale de Secours
Grande-Duchesse Charlotte



Lycée Technique
Agricole



Calculation:

How big is a region? A circle 100 km in diameter?

That would correspond to an area of 7,850 km².

Luxembourg has an area of 2,586 km².

How many market gardeners could there be in Luxembourg?

At present, ~ 5% of the vegetables consumed in Luxembourg come from local production.

Luxembourg had a population of 672,050 on 1 January 2024.

If there were one market gardener for every 500 inhabitants, that would be 1,344 market gardeners. If there were one local seed producer for every 500 market gardeners, that would be 3 seed producers.

Citizen seed network

In 2020, the Luxembourg associations CELL and SEED launched the project for a network of citizen seeds in the Luxembourg community gardens.

The objectives are:

- To help safeguard the biodiversity of our food plant varieties
- To contribute to measures to enable cultivated plants to adapt to climate change
- To contribute to local, ecological and solidarity-based food production
- To create an opportunity for people of all ages, nationalities and social backgrounds to share and exchange seeds and ideas.

The project "Citizen Seed Network"



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Grande-Duchesse Charlotte



SEED

Som fir d'Erhalen an d'Entwécklung vun der Diversitéit



Belgium

Germany

France



RESEAU DE SEMENCES



POURQUOI UN RÉSEAU DE SEMENCES CITOYENNES?

En octobre 2020, lors du Forum annuel des Jardins, des jardinier.ères de jardins communautaires et de jardins privés se sont rencontré.es pour lancer le réseau de semences citoyennes au Luxembourg. L'idée est de créer une production de semences à côté et à l'aide des semenciers artisanaux qui font face à une forte demande du grand public mais aussi de maraîchers professionnels. Ce groupe est pour l'instant encadré techniquement par Frank Adams de SEED asbl. Pourquoi multiplier les variétés traditionnelles ? - Les plantes s'adaptent au climat et au sol. Avec le temps, on obtient des plantes qui ont développé une meilleure résistance naturelle contre les ravageurs, les maladies et les conditions climatiques de notre jardin ou de notre région - Elles se ressèment et ne perdent pas leur qualités - En connaissant la date de la récolte, nous sommes certains du taux de germination - Récolter ses propres graines signifie laisser monter les graines en fleurs et offrir aux insectes et abeilles nectar et pollen pour leur bienfait

SAVING DIVERSITY

Save old varieties, ensure
local diversity

**HOBBY
GARDENERS**

Store and preserve plant
genetic resources

SEED BANKS

Select new varieties,
ensure global distribution

SEED INDUSTRY

SEED DIVERSITY

Multiply traditional varieties,
preserve knowledge

SEED ARTISANS

Develop regional varieties,
ensure food sovereignty

**SMALLHOLDERS
IN THE SOUTH**

**ORGANIC
BREEDERS**

Save old varieties, ensure
local diversity

FURTHER INFORMATION

<https://www.arc2020.eu/luxembourg-a-good-gardener-is-a-teacher-and-politician/>



Agricultural and Rural Actors Working Together for Good Food, Good Farming and Better Rural Policies in the EU

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Luxembourg | A Good Gardener is a Teacher and Politician

🕒 September 24, 2024 👤 Hannes Lorenzen 📁 Latest from EU Member States, Main stories, Seeds4All



Eric Defourny and Frank Adams, leading gardening activities. © Frank Adams

CAP STRATEGIC PLANS



Find ARC2020's consistent analysis on the CAP reform post-2022 and the design, negotiation and approval of National CAP Strategic Plans [here](#).

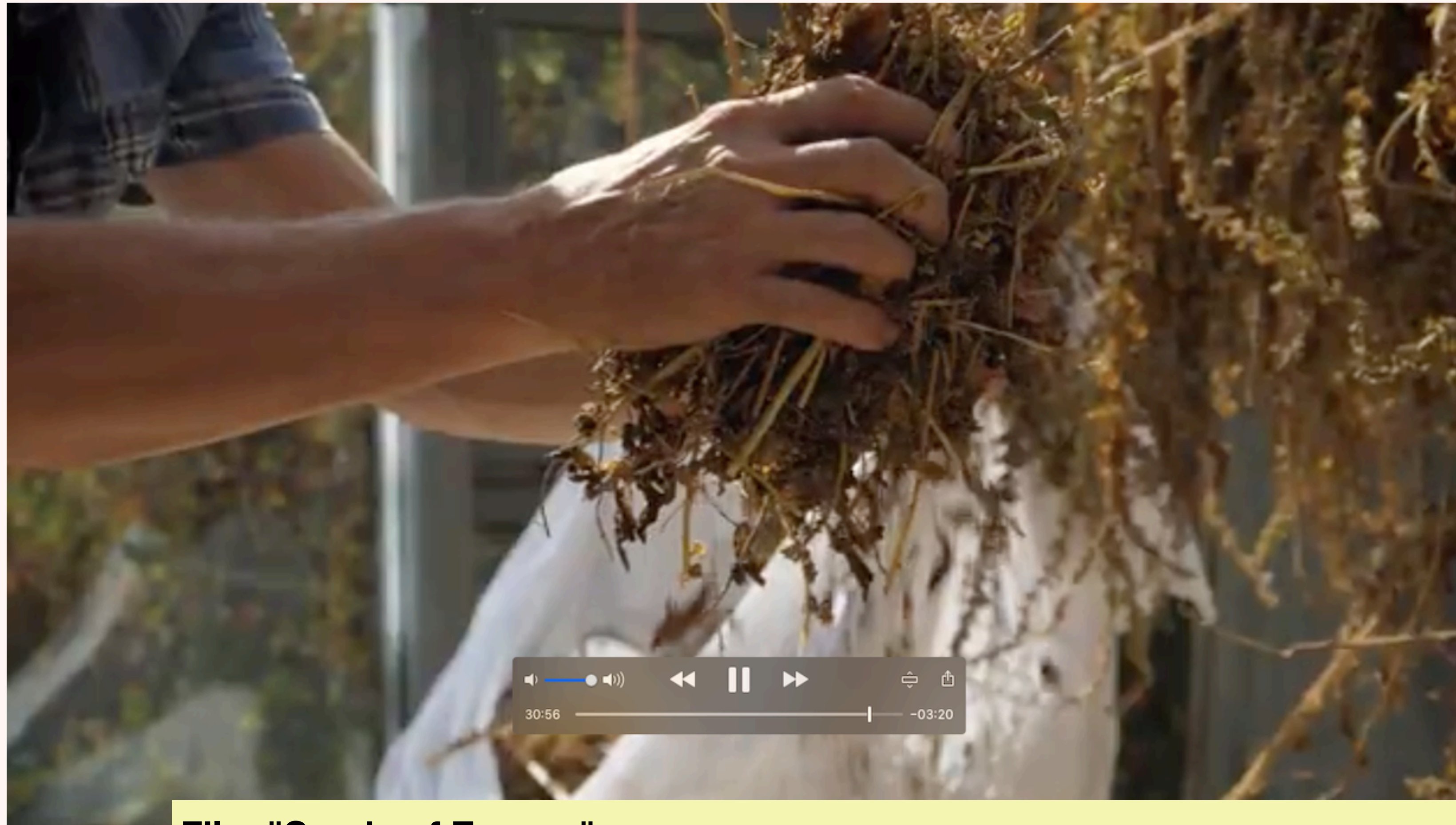
SEEDS4ALL



The Seeds4All project wants to amplify voices and connect people involved in agroecological seed production at all levels. [Find out more.](#)

RURAL RESILIENCE

FURTHER INFORMATION



30 minute
documentary:
people from 6
countries talk
about their work
to preserve
seed diversity:

- France
- Italy
- Check republic
- Austria
- Ireland
- Luxembourg

Film "Seeds of Europe"

<https://www.google.com/search?client=firefox-b-e&q=seeds+of+europe+youtube#fpstate=ive&vld=cid:d6f7cfbe,vid:hj-oyEix1Q0,st:0>