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Benefit more from faba bean production by protecting native pollinators

Farming with Alternative Pollinators (FAP)

ICARDA/INRA field guide for farmers in high rainfall areas and mountainous areas of Morocco

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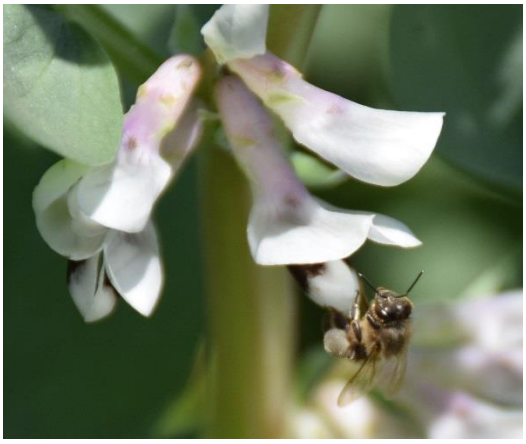
Farmers all over the world invest much in fertilizer, fuel, tractors, seeds and chemicals for plant protection – and a lot of their time and energy in ploughing, seeding, weeding, harvesting.

Most farmers in all continents forget a very important production factor for many high income and high value crops: pollinators. Unpaid little insects create millions of income for farmers every year.



Wild bees, flies, wasps, butterflies and other wild pollinators provide 85% of the pollination services.

However, in such landscape they don't find nectar and pollen to cover their needs during the whole year. They also do not have nesting material and sites, shelter against wind etc. Often, they are exposed to insecticides. Globally, more and more species go extinct and consequently farmers, nature and mankind lose their services.

Honeybees need 15°C and fine weather to provide pollination service. They cannot fly, if the weather is dark, rainy or cold – even if the beekeeper brings the hives close to your field.

Wild pollinators are a free safety net for farmers. Many wild pollinators can fly and pollinate crops also during rough weather.

In the course of climate change, seasonal abnormalities will increase. Already, late frost, late and strong rain or cold endanger in particular the pollination of early flowering crops by honeybees.

Wild pollinators need forage (nectar and pollen) around the year and nesting sites and material.

In Morocco, the landscape still offers many options for habitat enhancement as plant corridors e.g. by cactus still exist.

Below corridors of cactus many valuable wild pollinator find safe nesting sites in the soil, because farmers will not do tillage so close to cactus.

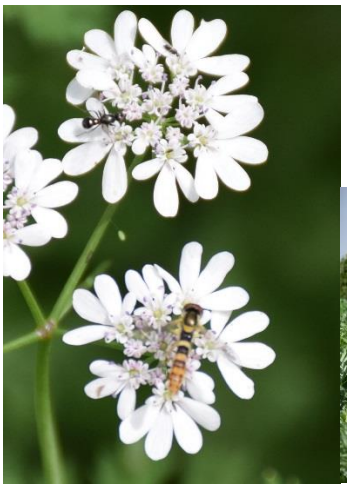
You can enhance these corridors by seeding e.g. a narrow strip of coriander, canola or sunflower along the cactus to provide a forage corridor for wild pollinators. You can harvest before harvesting cactus.

Or plant e.g. rosemary once – and pollinators and your farm will benefit on long term. Or plant blackberry and produce very healthy jam.

Strips and field edges with plants attracting a high diversity of pollinators and natural enemies can increase your yield and sustain pollinator diversity.

Coriander attracts very high diversity of pollinators and natural enemies, but often flowers after faba bean. Canola flowers very early, at the same time as faba bean.

Currently, the team conducts field trials in Sefrou with different habitat enhancement plants, which match better with the seeding time of faba bean.



We call enhanced fields “FAP-fields” and compare them with control fields producing only faba bean – a monoculture. Control fields attract less pollinators and natural enemies.

High diversity of pollinators causes more movements of pollinators from flower to flower and thus enhances pollination and yields.
In our trials FAP-fields had on average **5-8 different pollinator species.**
Control-fields on average **0-1 pollinator species** (usually honeybee).

If you cannot avoid use of chemicals, apply them before sunrise or after sunset – when less beneficial insects are in the field. Use friendly insecticides with pollinators. Avoid the use of systemic insecticides that can kill the beneficial pollinators.

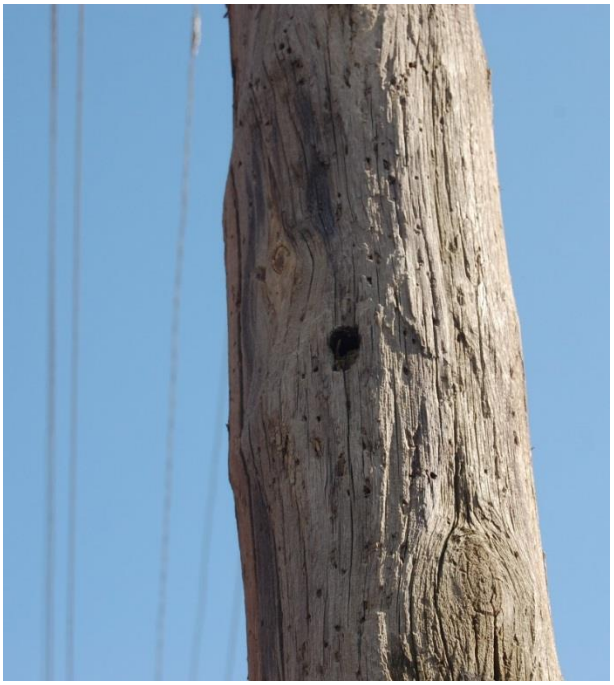
You might benefit from keeping some weeds.

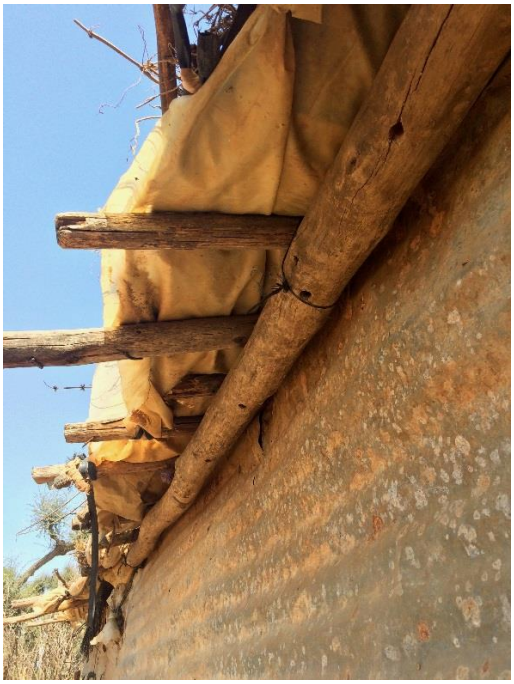
In the area with adequate rainfall, e.g. in Kenitra and Skhirat, carpenter bees (*Xylocopa*) are the most effective pollinators for faba bean.

Carpenter bee (*Xylocopa*), found in the fields FAP 1 Skhirat (farmer Mohamed Daha)

Carpenter bee (*Xylocopa),* found in the fields FAP 1 Kenitra (farmer Laaroussi Touil)

Carpenter bees need old and crumbly dead wood to make their nests. Close to smallholders' fields, these bees use stables or old trees, they also use wooden pillars for electricity.





In large fields nesting sites and material get rare – and this effective pollinator might locally disappear. You can easily enhance the situation by adding some wood, which is already a bit rotten a bit elevated (at least around 2 m high).

Valuable Pollinators from Skhirat

Flower fly (Syrphidae), FAP 3
(farmer El Miloudi Chigga)

Leafcutter bee (*Lithurgus*), FAP 2
(farmer Abderrahim Kamoun)

Digger bee (*Anthophora*), FAP 4
(farmer Bouchaib Kaabi)

Sand bee (*Andrena*), FAP 1
(farmer Mohamed Daha)

Valuable pollinators from Kenitra

Leafcutter bee (*Megachile*), FAP 2
(farmer Bouchti Skouef)

Digger wasp (Scoliidae), FAP 1
farmer (Laaroussi Touil)

Long-horn bee (*Eucera*), FAP 5
(farmer Mohamed Samih)

Sand bee (*Andrena*), FAP 4
(farmer Boughaba Laghrarba)

In mountainous regions of Morocco (Sefrou), the diversity of effective pollinators of faba bean is higher than in coastal areas.

These are very effective pollinators from Sefrou

Digger bee (*Amegilla*), FAP 2
(farmer Assou Sediri)

Sand bee (*Andrena*), FAP 6
(farmer Mouloud Aghjoul)

Bumble bee (*Bombus*), FAP 6
(farmer Mouloud Aghjoul)

Flower fly (Syrphidae), FAP 4
(farmer Boubker Mrabet)

Long-horn bee (*Eucera*), FAP 6
(farmer Mouloud Aghjoul)

Leaf cutter bee (*Megachile*), FAP 1
(farmer Fatima Sahel)

Photos of other valuable pollinators in Sefrou

Digger wasp (Scoliidae), FAP 6
(farmer Mouloud Aghjoul)

Weevil wasp (*Cerceris*), FAP 2
(farmer Assou Sediri)

Many very effective wild pollinators have their nests in the soil, e.g. bees, solitary bees and also bees developing a colony. Some use the hole of a mouse or other small rodents, some a snail shell or a piece of old wood with an already existing hole.

Exclude some small parts of the field from tillage and do not clean up the field too thoroughly. If you have small stone walls, keep them for nesting. Be aware: Wild pollinators don't have a beekeeper providing them with a hive.

Wild species need place and material close to or on your field to build a nest: a little clay wall, dead wood, or hard soil.





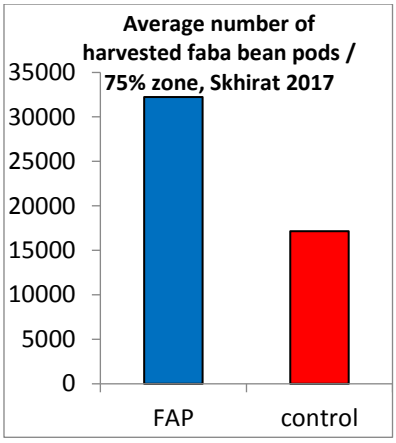
They want to drink and benefit from shelter against wind (e.g. from sunflower, blackberry or currant)

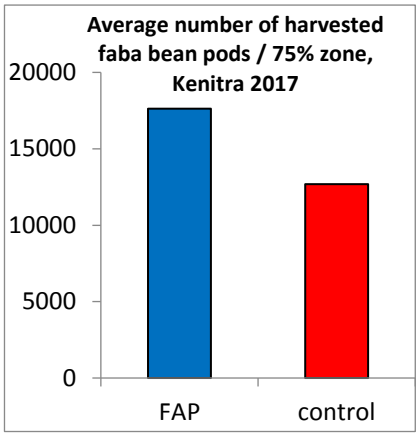

Higher crop diversity helps you to attract many beneficial pollinators and also predators and parasitoids, which help to control pests attacking faba bean.

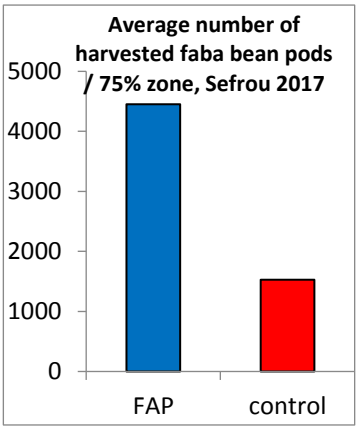
FAP reduces pests due to higher abundance and diversity of predators, concerning faba trials by around 5-10 %.

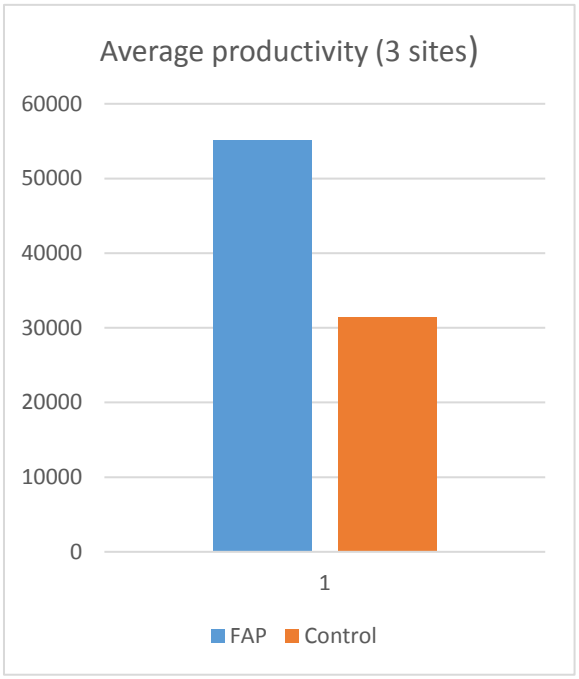
Digger wasps (Scollidae) are predators of beetle larvae

The higher diversity of pollinators increases the quality and the quantity of faba bean produce. In FAP fields, more flowers produce pods.



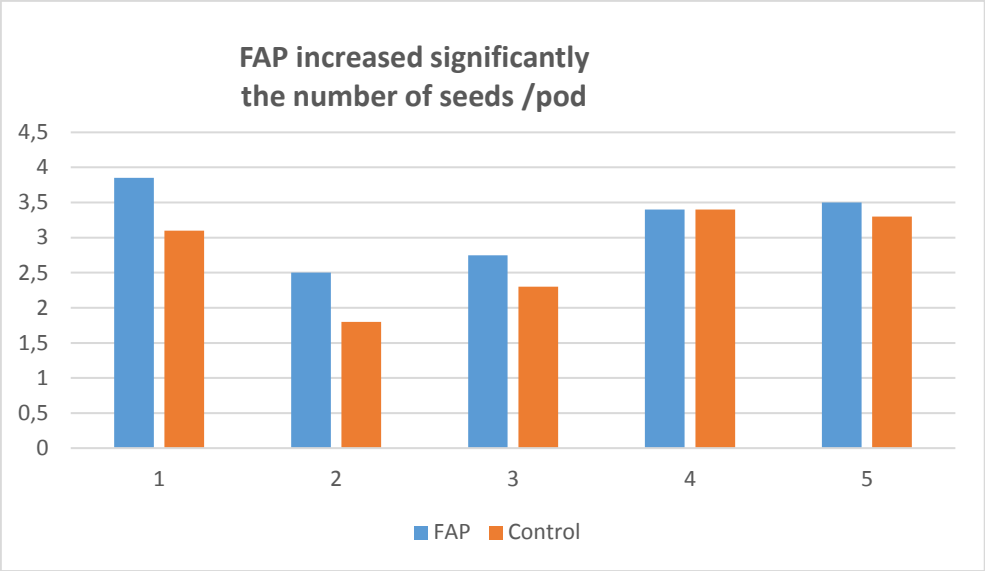






FAP fields produce more seeds per pod than control fields/ monoculture.

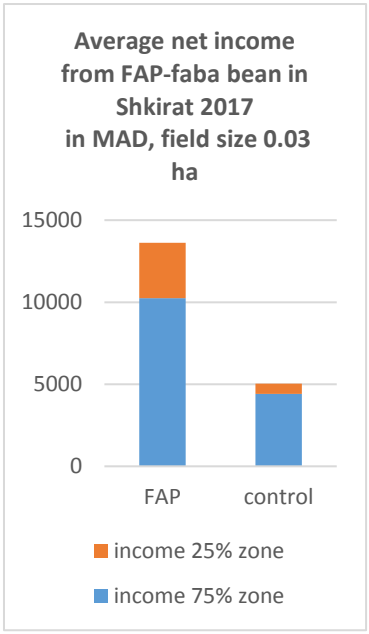
A high diversity of pollinators induces these insects to move more often from flower to flower and from plant to plant. This improves the result of pollination.

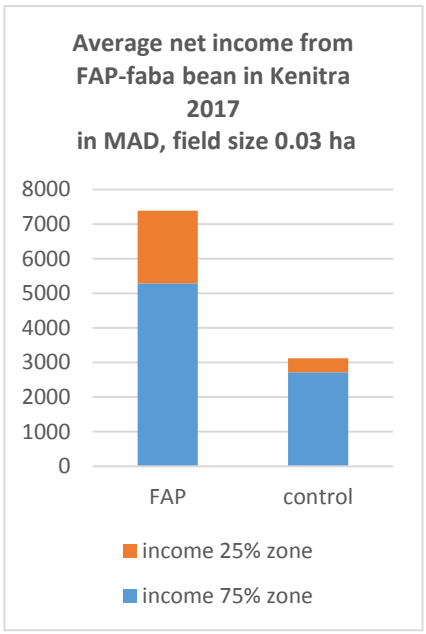


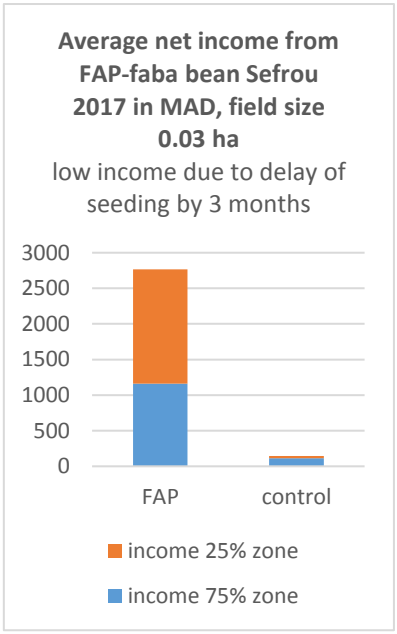
If you produce mainly for your family, we suggest this planting sketch for 0.03 ha (300m^2) for regions with adequate rainfall.

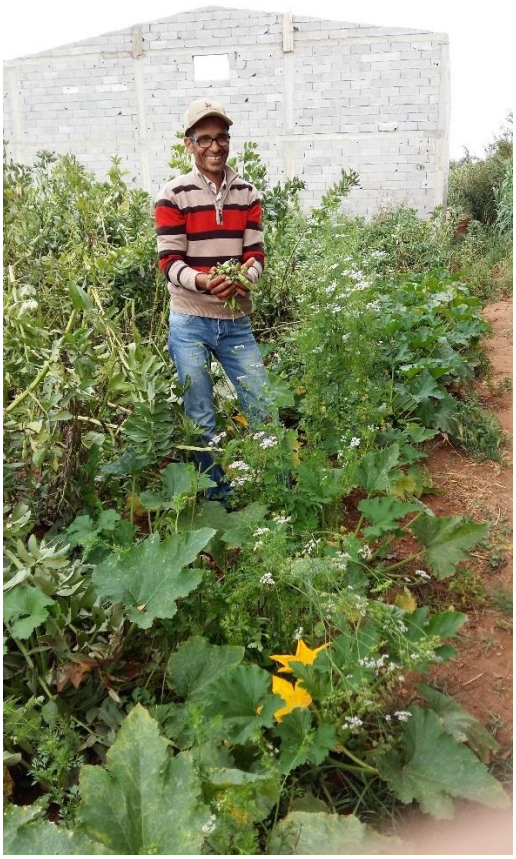
Due to external issues, we seeded too late in Sefrou in 2017 (below field sketch). In winter 2017/2018 we seeded other habitat plants according to farmers' preferences for seeding time of faba bean, end of December.

The fields with more crops and better living conditions for wild pollinators provide higher income from faba bean (blue part of the columns) and also in total. The habitat zone can buffer against income loss in case the main crop is affected by disease or pests.

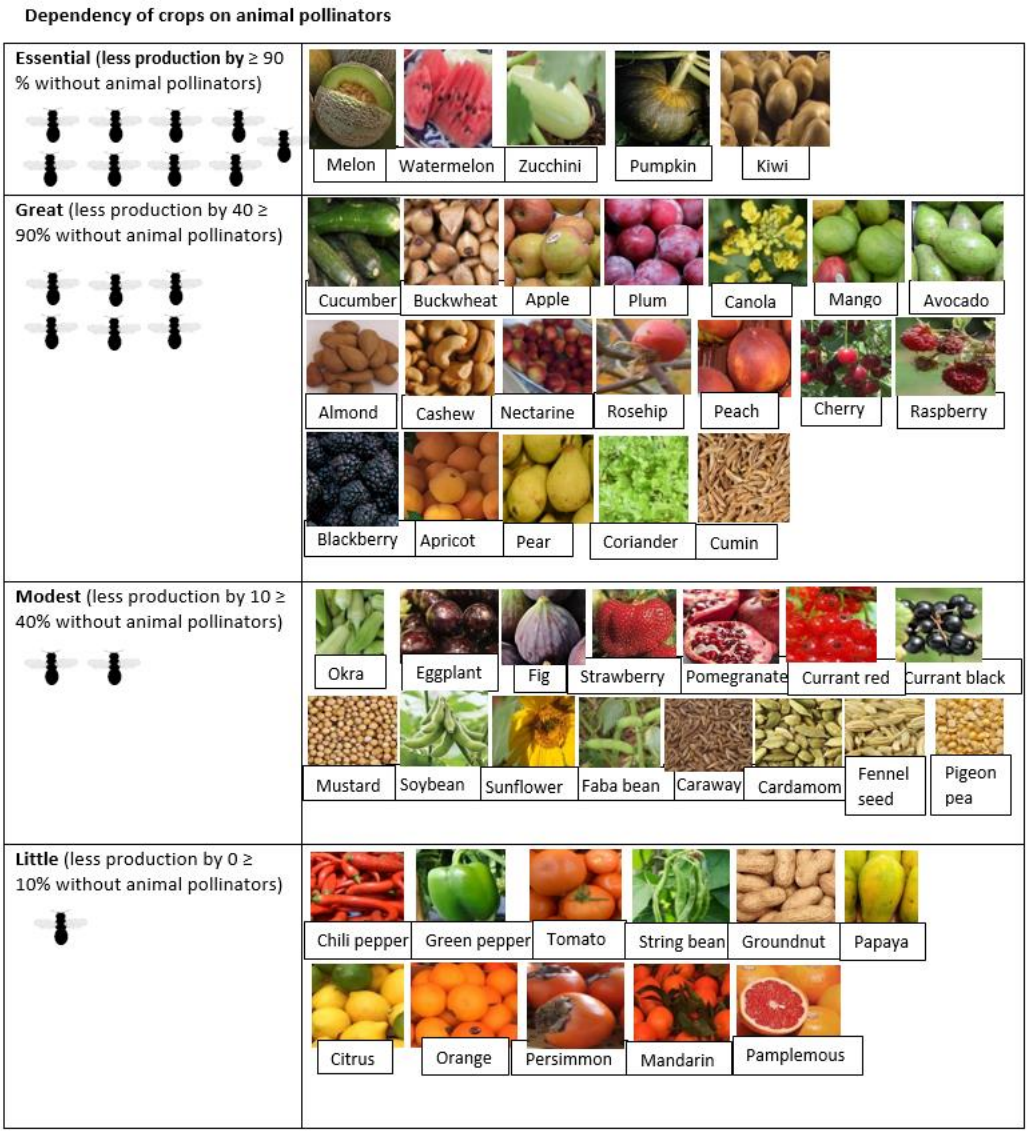








Many more crops depend on pollinators. In regions with adequate rainfall and mountainous sites in Morocco e.g. the crops in this table. Crops depend to different extent on pollinators, e.g. it is more important to have pollinators for apple or pumpkin than for green pepper.



Overview on crops based on Klein et al. 2006

If you lose these insects close to your field, you might lose harvest. Therefore, protect your pollinators and have better income.

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