Planting

Variety selection
FSA13, 14, 17, 18

Genetically modified organisms (GMOs)
FSA16, 18

Invasive species
FSA15

Variety selection

Best practice :

- Selecting the best varieties available for your biotic and abiotic conditions.
- Managing disease and genetic purity issues by getting planting material from reputable sources.
- Using the optimum seed rate or planting density.
- Maintaining records of growing material as part of your comprehensive recording system.

FSA13	When selecting and using varieties, do you make an informed choice?
FSA14	Have you ensured that your new planting material and/or grafting material is of high quality and from trustworthy sources?
FSA18	Do you keep records of planting and/or grafting material used?
FSA17	Do you take into account the optimum seed rate or plant population for your local situation and crop?

Variety selection

The choice of growing material will be determined by several factors that can improve profitability and reduce environmental impacts. It is important that the material grown is the best available and the most suitable for your growing conditions. Using modern breeding techniques, plant breeders have developed commercially available varieties that have incorporated many different traits to help improve crop performance such as:

- Resistance or tolerance to commercially important pests and diseases
- Increased tolerance to environmental conditions, such as water availability, drought, salinity and extreme temperatures
- Plant height
- Increased yield
- Improved quality, such as increased nutrition, flavour and appearance
- Controlling ripening for longer storage period of the harvested crop

Most countries have regulatory processes in place to help ensure that new crop varieties entering the marketplace are both safe and meet farmers' needs (e.g. variety registration, seed schemes and regulatory authorizations for GM plants). These are a good sources of information to help you make informed choices as to the best material to grow on your farm.

Variety selection

- Avoid genetically uniform crops being planted across large areas
- Create a priority list of things you are looking for in a variety to help make comparisons with the information available to help you select the varieties most suitable for your growing conditions. Traits for consideration may include:
  - Pest and disease resistance/ tolerance
  - Agronomic traits (e.g. plant height, time to flowering etc.)
  - Yield and quality
  - Tolerance of environmental pressures (e.g. Temperature, drought etc.)
- Where available use a list of recommended varieties. Establishing a vigorous crop starts with selecting good quality planting material/ seeds. You do not want to be introducing disease, pests or invasive weeds onto your farm in poor quality seed or planting material and if the genetic purity of the stocks is low you run the risk of the buyer rejecting your crop
- Use a map of your farm to help identify fields and record what varieties have been planted in your field records
- Optimal seed rate is determined by several factors such as seed quality, growing environment, yield/ quality requirements, tillage and sowing methods and planting date. Look at the links in the toolbox for guidance on this

How to answer YES

Show that crop cultivars/varieties with genetic resistance or tolerance of pests or diseases are used when available (FSA13).

Show you have sought information about the varieties available and be able to create a case for your selection against other available varieties (FSA13).

Be able to explain where planting material is sourced, and what quality indicators are considered (FSA14).

Make sure seeds and planting material have relevant certification to guarantee quality and to show they are free of pests, disease and weed seeds. Have the records available to demonstrate the material is of the best quality available (FSA14, 18).

Keep records of the varieties being grown as part of the field's history (FSA18).

Know what the optimum seed rate or plant population is for your local situation and keep a record of numbers planted/ seed rate and add any comments on quality etc. to the record of the field's history (FSA17).

FSA FARM SUSTAINABILITY ASSESSMENT BY SAI PLATFORM

Variety selection

An accurate and comprehensive recording system must cover all the relevant information and be simple to complete. Below is an example of the information that can be recorded for the activities that occur in a particular field over a season. This information will provide useful evidence of the activities undertaken and the reasoning for the activity.

Field name / No.				Crop			Fertiliser use				
Soil type				Variety			Date	Rate	N:P:K		
Area				Seed treatment							
Sowing date				Previous crop							
Date	Product name	Amount of product used	Trigger for spraying	Reason for treatment	water volume	Area sprayed	Spray time	Field re-entry interval	Harvest interval	Weather	Wind speed & direction

Further reading and examples:

- FAO: Optimizing plant population, crop emergence and establishment
- Wheat School: Wheat Seeding Rates for Max Yield — What's the Ideal?
- Using 1,000 Kernel Weight for Calculating Seeding Rates and Harvest Losses
- International Seed Testing Association – ISTA

FSA FARM SUSTAINABILITY ASSESSMENT BY SAI PLATFORM

Genetically modified organisms (GMOs)

Best practice :

- Aware of all legal responsibilities with regard to genetically modified crops and can provide copies of the required licences and permits.
- Maintain records of crops grown and any relevant certification.
- Monitor fields post-harvest to prevent contamination of future crops and the environment.

FSA16

When planting genetically modified varieties, do you comply with all regulations of the country where they are grown and the requirements of the buyer of the produce, where they exist?

FSA18

Do you keep records of planting and/or grafting material used?

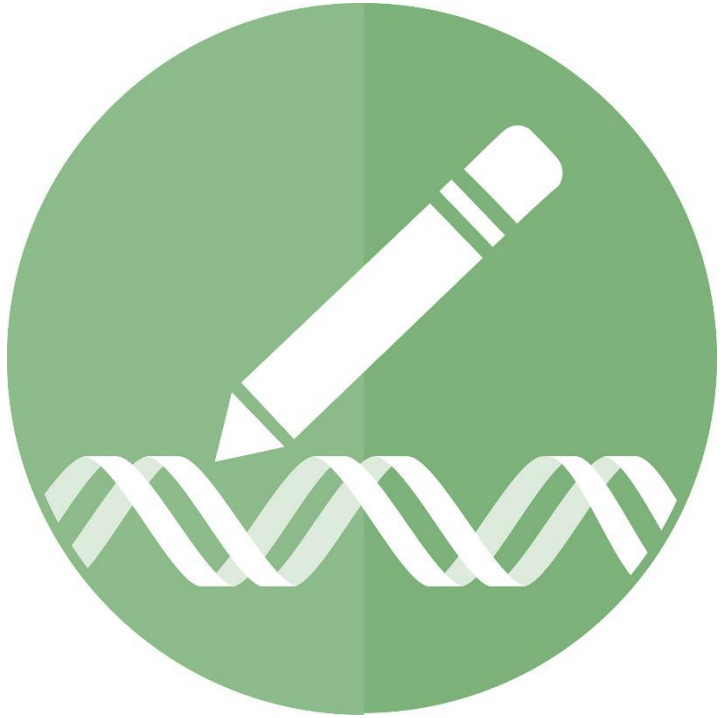
Genetically modified organisms (GMOs)

The goal of both conventional breeding and genetic modification (GM) is to produce crops with improved characteristics by changing their genetic composition. In traditional breeding crosses are made between closely related plants and thousands of genes are rearranged. When using GM it is possible to make changes to specific genes or groups of genes to develop material that has desirable characteristics. It can involve:

- Adding genetic material from closely related plants, plants from a different species or any other organism (such as microorganisms) or
- Stopping or modifying genes within the plant suppressing the genes activity.

Several products have been commercialized using GM including insect-resistant varieties of cotton and corn, herbicide-tolerant soybean, corn, canola, and alfalfa, virus-resistant papaya and squash and reducing toxins in cassava. The development of GM crops does raise moral and ethical concerns and there is a good deal of public opposition to GM crops. As such if planning to grow a GM crop it is important to clearly understand:

- What is the local availability of GM material?
- What laws and regulations apply to GM production in your region?
- Which government body regulates GM crop production?
- What are the laws and regulations of the country to which you are looking o export your crop?



Genetically modified organisms (GMOs)

There remains a high level of public concern around the risks of growing and eating genetically modified organisms (GMOs) and so measures to ensure they are separated from conventional crops are important.

- If you use GMOs to produce genetically modified materials, ensure all materials are labelled stating that they are from a GMO source
- Ensure all GMO seeds are segregated from hybrid, heirloom or saved seed
- Ensure all plants grafted from GMOs are appropriately managed
- Post-harvest field inspections must continue for many years after harvest to ensure future crops and the environment are not contaminated by GMO material

How to answer YES

Demonstrate that you have a clear understanding of the laws and regulations for growing GMOs in your region and you hold all of the relevant permits and licences, including ensuring all varieties planted are approved for cultivation (FSA16).

Demonstrate that you are aware of the laws and regulations relating to GMOs of the country you are looking to export to (FSA16).

Demonstrate that you keep accurate records of all fields used for growing GMOs (FSA16, 18).

Show that you carry out an inspection programme of the field and surrounding area to ensure that any residual crop left in the field (e.g. seed spilt or tubers left in the ground etc.) during harvest does not contaminate later crops grown in the fields and demonstrate that you carry out remedial action to remove GMO volunteers (FSA16).

Genetically modified organisms (GMOs)

Recording GMO use on the farm and post-harvest inspections

Year	Field name	Crop	Variety	Post harvest inspection		
				Year 1		Year 2 etc.
				Number of plants found	Notes	

1. The post-harvest inspection should include the immediate area around the field and any area where seed (tubers/ rhizomes) might have been lost.
2. Volunteer GMO plants should be destroyed with a suitable herbicide or removed by cultivation.
3. Make a note of when the inspection was made, the number of plants found and how they were disposed of.
4. Seeds (or tubers/ rhizomes) can remain viable for many years so it is important to continue the inspections until you are confident the area is free of GMO plants

Further reading and examples:

- Live Science: GMOs: Facts About Genetically Modified Food
- Center for food safety: About Genetically Engineered Foods
- What are GMOs?
- WHO: Frequently asked questions on genetically modified foods

Invasive species

Best practice :

Know the measures available to avoid introduction, cultivation and use of invasive species.

Assess the invasiveness of a species before use.

FSA15 Do you avoid the cultivation and use of invasive species?

Invasive species

Whatever their means of arrival invasive species can harm both the natural resources in an ecosystem as well as threaten human use of these resources. They are capable of causing extinction of native plants and animals, reducing biodiversity, competing with native organisms for limited resources, and altering habitats. This can result in a huge economic impact and cause fundamental disruption to the ecosystem on your farm and in the local community. For example, the damage and control cost of invasive species in the U.S. alone amounts to more than $138 billion annually[1].

Since invasive species are considered one of the top five drivers of biodiversity loss and species extinction in the world it is important to assess the invasiveness of a species before use and then manage the crop to prevent it becoming an environmental and economic problem .

A large proportion of important crops are grown in areas outside their natural distribution for economic reasons, to diversify national agriculture, and as a safer way to feed the world population by spreading the risks of disease outbreaks. If a new alien crop is introduced in an environment without its natural pests, this species can be especially productive and profitable. On the other hand these crops can pose a risk to biodiversity when they naturalise and penetrate conservation areas.

Silverleaf whitefly is a major invasive pest, attacking over 600 plant species including many vegetables and cotton.

Soybean rust has been a serious disease in Asia for many decades. Appeared in Africa in 1997, and in the Americas in 2001.

Parthenium is native to South America. It has been accidentally introduced to several countries and now a severe threat in Africa, Australia and Asia

1. Update on the environmental and economic costs associated with alien-invasive species in the United States

Invasive species

A risk assessment will determine the likelihood of a successful introduction of an invasive species and the potential biological and economic consequences of establishment.

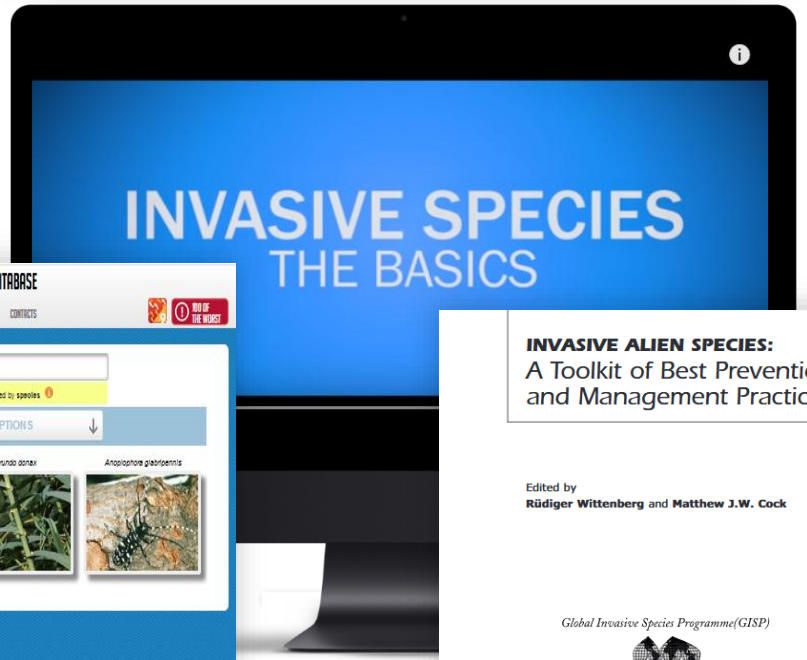
- Develop a plan to manage the introduction, cultivation and use of invasive species.
- Carry out a review of scientific and other literature, qualitative/ quantitative analysis and get expert opinion to assess:
  - Known invasiveness
  - Likelihood of entry
  - Likelihood of establishment
  - Rate of spread
  - Likely economic and environmental impact.
- Know the phytosanitary requirements for the region of operation and the country to which you are exporting crops.
- Ensure the purity of the material leaving your farm and that it is free from biological contaminants

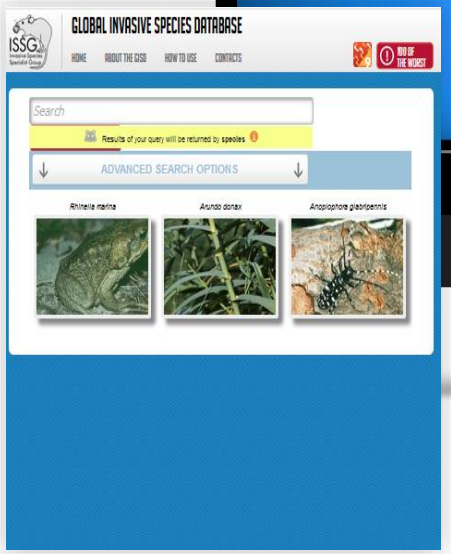
How to answer YES

Show that you have carried out an assessment of plants growing on your farm to determine the presence of any invasive species and that you are aware of potential impact to your farm, the local environment and the community (FSA15).

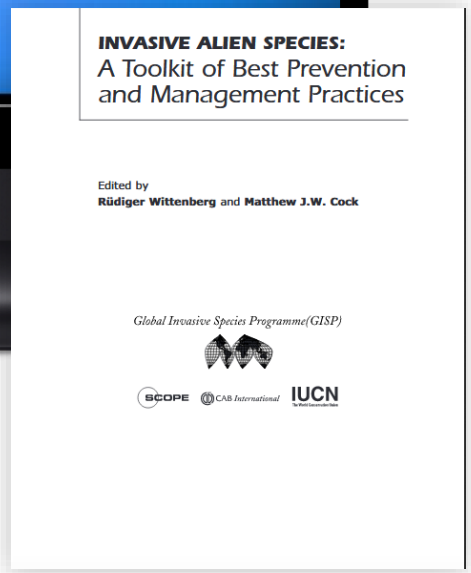
Have measures in place to avoid the introduction, cultivation and use of invasive species (FSA15).

Michigan Department of Environmental Quality, USA: Invasive species- the basics (Video)





Invasive Species Specialist Group (ISSG): Global invasive species database



Convention of Biological Diversity (CBD): Invasive alien species: A Toolkit of Best Prevention and Management Practices

Further reading and examples:

- FAO: Invasive species: impacts on forests and forestry
- Convention on Biological Diversity: Invasive alien species
- Genetically Modified Organisms (GMOs) as Invasive Species
- International Plant Protection Convention: International standards for phytosanitary measures (2005)