



## Soybean seed production

High quality seed is the basis for successful soybean cultivation. If the conditions at sowing are optimal, even poor seed quality can lead to sufficient stands. However, as soon as germination is hampered by cold weather or incorrect planting depth, high-quality, vital seeds are indispensable.

With the expansion of soybean cultivation in Germany, the area for soybean seed production has also grown. Table 1 shows the development in Baden-Wuerttemberg and Bavaria, the two main growing regions in Germany.



Fig. 1: High-quality seed is the basis for a uniform soy stand and maximum yields. Photo: Taifun

Table 1: Area of soybean seed production

Bundesland	2020	2019	2018
Baden-Wuerttemberg	373 ha	309 ha	228 ha
Bavaria	453 ha	315 ha	180 ha

Sources: Bundessortenamt.de 2020-12-04.

Soybeans quickly lose their ability to germinate if treated incorrectly along the process chain. Poor germination capacity is one of the most important reasons for rejection of soy seed. To ensure that seed production is successful, some details must be considered during cultivation, transport, drying, cleaning and storage. Furthermore, legal regulations on technical purity and possible diseases must be observed. In the opinion of the author, however, parts of the legal regulations are in need of reform (cf. "Seed regulation under discussion" below).

### Legal regulations

The procedure for soybean seed production in Germany is regulated by law

- at EU level in Directive 2002/57/EC on the marketing of seed of oil and fodder plants
- at federal level in the Seed Marketing Act ('Saatgutverkehrsgesetz') and the Seed Act ('Saatgutverordnung', details mainly in Annex 3)

Involved in the production of soybean seeds are **breeders** registered with the Federal Plant Variety Office ('Bundessortenamt') as well as registered **seed production organizations, farmers and processors**. The official recognition procedure follows a multi-stage process and is controlled by the technical authorities of the federal states. In the following, only the production of **certified seed** is described. Separate regulations apply to basic seed and other pre-basic seed.

## 1. Registration of seed production

The seed production organization reports its soybean seed production to the authority until the 15th of May. The processors and producers are to be named. Information must also be provided on the parcels of land and the seed used. The minimum area for soybean seed production is 0.5 ha.

## 2. Field inspection

A representative of the certification authority visits the farmer during the flowering period to inspect the seed production area and check whether the following requirements are met (Seed Act 2016, Bauch 2015):

- The minimum distance to other combinable crops is 40 cm. This minimum distance must also be maintained to other soybean fields.
- Maximum 30 plants with seed-transmitted viral diseases per 150 m<sup>2</sup>
- Maximum 30 plants with seeds that are difficult to clean out of soy seed (field beans, peas, lupine, tare) per 150 m<sup>2</sup>. Exceptions are possible for up to 60 plants per 150 m<sup>2</sup> (§ 8 (2) of the seed regulation).
- Maximum 15 plants of another soy variety per 150 m<sup>2</sup>. No margins in case of exceedance.

## 3. Quality testing in the seed laboratory of the certification authority and notification

After successful certification in the field, an approved sampler takes a sample from the harvested crop which is analyzed in the seed laboratory. The following criteria must be met for certification:

- Germination capacity minimum 80%
- Humidity maximum 15%
- Technical purity minimum 98%.
- Seeds of common wild oat and dodder shall not occur
- A maximum of 15 % of the grains may bear spores of the fungus *Diaporthe phaseolorum*
- The maximum allowance for other species (e.g. cereals) or distinguishable other soy varieties is 5 grains in 1000g **(1)**
- Maximum 0,3 % harmless impurities (e.g. broken soy grains) **(1)**

**(1)** These very stringent requirements are currently being discussed and reviewed within the competent authorities concerned in Germany. See also "Seed regulation under discussion" in the next section.

Finally, the authority draws up a notification by which the lot is accepted or rejected. Disqualified lots may be further improved - e.g. by drying or cleaning - and re-sampled and presented for approval.

## Seed regulation under discussion

Some of the regulations on soybean seed production in the German Seed Regulation are much stricter than in the higher-level European law and, in the author's view, technically questionable. This is probably also because the regulations were introduced at a time when soy cultivation in Germany was not yet economically significant.

A recent example was the regulation of the **moisture content** of the seed. EU seed legislation does not provide for any rules on the moisture content of soy seed. Until 2009, however, the German Seed Act required a maximum level of 12% seed moisture. Lots with 12.5% seed moisture were rejected. Only after the Taifun-Tofu GmbH complained about the technically absurd regulation to the Federal Office of Plant Varieties, the maximum moisture content was increased to 15% in the amendment to the Seed Act on 15.06.2010.

Further regulations that are, in the view of the author (Miersch 2015), unnecessarily strict and technically absurd are fortunately also currently being critically reviewed within the German technical authorities and worked towards amendments:

- **Varietal purity:** EU law tolerates up to **1% foreign soy varieties** in the quality testing. In Germany, however, there is a maximum of 15 plants per 150 m<sup>2</sup> in the field inspection corresponding to approx. 0.2% foreign soy varieties (Bauch 2015). In the quality inspection even only a maximum of 5 grains of a foreign variety per 1 kilogram of soy is accepted. This corresponds to approx. **1 per thousand foreign soy varieties** (with a thousand-seed-weight of 200 g)!

- **Harmless impurities:** The German Seed Act permits a **maximum of 0.3% harmless impurities** in soy during the quality test. Usually, the harmless impurities are broken or half soy grains. In the case of lupines, field beans and field peas, **up to 2% harmless impurities** are accepted. In Canada 2% are considered good industrial practice.

The acceptability for spores of the fungus *Diaporthe phaseolorum* (max. 15% of grains) is regulated at EU level. This regulation was incorporated into national law without being made more restrictive. In the opinion of the author, even the regulation in EU law is not comprehensible. The reasoning of the legislator is not known. In the USA and Canada, for example, there are no legal regulations on Diaporthe in soybean seed. This is technically comprehensible as the laboratory tests for spores adhering to the grain surface. These spores have no influence on the germination capacity of the soybean seed. Only if the Diaporthe fungus has already been able to spread massively in the stand and grow into the soy seed its ability to germinate may be reduced. However, as massively infested grains are usually also deformed and lighter they are removed during cleaning or cause a rejection of the lot because of the reduced germination capacity. Even phytosanitary considerations cannot be decisive for a regulation in seed law, because the fungal spores of Diaporthe are present on the harvest residues of soy and in the soil anyway and germinate under favorable conditions.

## Information on soybean seed production for farmers

When choosing the area for soybean seed production, ensure a good **water supply**. Unless you have exceptionally deep soils with high usable field capacity, irrigation should be possible.

Only use **varieties** that ripen safely and as early as possible at your location - i.e. by around mid-September. In soy stands that repeatedly receive rain in autumn, the Diaporthe fungus often spreads rapidly. Pay attention to the plant height when selecting the variety. Particularly long-stalked varieties should only be propagated in rather summer-dry locations. In case of heavy summer precipitation long-stalked varieties tend to lodging.

Check the **basic seed** immediately after delivery for obvious defects such as presence of seeds of other varieties. When filling the seed drill, it is too late for a confident reaction. Give the soybean sowing a high priority and use the first possible date with good weather forecast. Only an early sown crop matures in time.

**At the combine harvesting things get serious. Here, all the previous work can be destroyed.** Keep a constant eye on the seed moisture content of the maturing soy stand. In hot, windy weather, you should measure the seed moisture content daily. Ideally, the harvesting moisture should be between **13 and 16%**. If soybeans are threshed too dry, the proportion of broken grains and grains with damaged seed coats increases sharply and the germination capacity "goes through the floor." Adjust the combine properly and never empty the grain tank completely. This is because a discharge screw that only runs under partial load is a first-rate destroyer of germination capacity. You can find all the information you need about the gentle harvesting of soy on the website of the German Soybean Association ([www.sojafuerring.de](http://www.sojafuerring.de)). Especially recommended is the short movie "Soja richtig dreschen".

Agree with your customer on a **payment according to germination capacity at the time of the harvest acceptance**. Losses of germination capacity caused by errors during processing should not be at your expense.

### Avoid mechanical impact!

Mechanical stress in combination with low grain moisture can easily damage soy grains. These damages range from invisible injuries of the seed coat (micro cracks) to visible cracks, flaking of the seed coat and breakage of the soy grains. As a result of the injuries, air penetrates the seed interior and leads to fat spoilage and loss of germination capacity. Critical process steps where breakage and shell damage can occur are combine-harvesting, conveying equipment, drop heights and drying.

The quick soaking test is a simple method to make injuries of the seed coat visible and is an important aid for process control and process optimization. After ten minutes in water, soybeans with seed coat injuries inflate like balloons. Undamaged beans on the other hand do not change their shape. Details can be found in the Taifun Soy-Info No. 4.



## Notes for processors

When accepting and processing soybean seed, the main concern is to avoid mechanical stress:

- Choose a grain-protecting conveyor technology already at the time of the acceptance. Ideal are conveyor belts as shown in Fig. 2.
- Avoid drop heights.
- Move the soybeans as little as possible. Ideally, you should fill the crop directly into drying boxes and leave them there until final preparation and bagging (Fig. 3). A precondition is a sufficiently pre-cleaned crop by optimal combine settings.
- Do not move the soybeans in frosty conditions.
- Weigh the benefits of an additional cleaning - e.g. by a weight separator - against the loss of germination capacity due to the additional mechanical stress.



Fig. 2: Gentle soybean acceptance with the conveyor belt.  
Photo: Taifun



Fig. 3: A well threshed soybean propagation can be transferred from the field directly into drying boxes. Photo: Taifun

## Dry gently!

Soybeans are very sensitive to high temperatures during drying. Too warm drying air quickly leads to seed coat injuries and breakage. For a gentle drying of the seed, the relative humidity of the drying air should not fall below 55% (see also Table 2). This means drying with outside air (cold air) or, if necessary, slight heating. The grain temperature should not exceed 37 °C. In general, high air rates are just as important as heating the drying air.

Table 2: Seed coat damage and breakage during soybean drying as a function of the relative humidity of the drying air (according to Hellevang, K., 2012)

Rel. air humidity Drying air	Proportion of damaged shells	Proportion of breakage
50 %	5 %	0 %
40 %	15 %	0 %
30 %	30 %	0 %
20 %	50 %	8 %
10 %	70 %	25 %

## Storage

Regarding the maintenance of the germination capacity, soybeans are considered to have poor storage properties (Table 3). The ability to germinate and the seed vigor decrease rapidly with storage for more than a year. Long-term storage of soybean seeds is not recommended. Detailed information on the storage of soybeans can be found in [Taifun Soy Info No. 11](#).

Table 3: Seed shelf life of selected crops (from Kruse, 2008, shortened)

Shelf life	Species
Well	Lentil, flat pea, flax, vetch, field bean
Average	Peas, wheat, barley, rye, oats, corn, rape
Bad	Soya bean, sunflower

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**For comprehensive information on all aspects of soy cultivation visit:**

[www.sojafoerderring.de](http://www.sojafoerderring.de)

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