

The market of legumes in France

First results of the EU-projet LegValue



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List of abbreviations

CAP: Common Agricultural Policy

EAGGF: European Agricultural Guidance and Guarantee Fund

EEC: European Economic Community

EFA: Ecological Focus Areas

EU: European Union

MGQ: Maximal Guaranteed Quantities

MGS: Maximal Guaranteed Surface

PDO: Protected Designation of Origin

PGI: Protected Geographical Indication

VCS: Voluntary Coupled Support



English version:

This report was written by the branch organization of plant oil and proteins. It describes the French market of grain legumes harvested dry and dehydrated alfalfa based on quantitative and qualitative data (production, imports, exports, national uses and prices from 2013 to 2017).

French production of legumes is diverse including field pea (36% of the French legume surface area between 2013 and 2017), soybean (23%), field bean (18%), dehydrated alfalfa (15%), lentil (5%), chickpea (2%) and lupin (1%) crops. Organic production is important.

Field pea and field bean surface areas were stable between 2016 and 2017 (200 000 hectares ; 80 000 hectares) while soybean surface area reached 142 000 hectares. Lentil and chickpea surface areas experienced a strong increase over this same time period (+62% and +105%).

The national feed market is important for the three main species (26%, 55%, 74% of the uses in 2017). Grains are processed into functional ingredients and food products on the national food market. The imports of soybean for the national feed market are important while the national food market is supplied by French produced beans. Food export of field pea depend on the export opportunities while food export of field bean is affected by the bad visual appearance of bruchid field beans.

Version française:

Ce rapport est établi par l'interprofession des huiles et protéines végétales, Terres Univia, et décrit le marché français des légumineuses à graines et de la luzerne déshydratée en se basant sur des données quantitatives et qualitatives (production, imports, exports, utilisations nationales et prix entre 2013 et 2017).

La production diversifiée comprend du pois (36% de la surface française de légumineuses entre 2013 et 2017), du soja (23%), de la féverole (18%), de la luzerne déshydratée (15%), de la lentille (5%), du pois chiche (2%) et du lupin (1%). La part de production biologique est importante.

Les surfaces de pois et de féverole étaient stables entre 2015 et 2017 (200 000 hectares ; 80 000 hectares) alors que la surface de soja a atteint 142 000 hectares. Les surfaces de lentilles et de pois chiche ont connu une forte augmentation entre 2016 et 2017 (+62% et +105%).

L'alimentation animale est importante pour les trois principales cultures (26% ; 55% ; 74% des utilisations en 2017).

Les graines sont transformées en ingrédients fonctionnels et en produits alimentaires sur le marché nationale de l'alimentation humaine. Si les imports de soja sont importants pour l'alimentation animale, l'alimentation humaine est approvisionnée en soja français. Dans ce même secteur de l'alimentation humaine, les exports de pois dépendent des opportunités d'export et de la compétition internationale tandis que les exports de féverole sont pénalisés par la mauvaise qualité visuelle des graines de féverole bruchées.



French production of legumes is diverse but limited compared to cereal and oilseed crops. This diversity provides a complementarity between each of these crops to the agroclimatic and agricultural practices of each French regions.

This study is part of the work package 3 of the European Union (EU) research project LegValue that focuses on an economic analysis of European legumes markets including a description of legume market heterogeneity in the EU.

This study describes the market of legumes grown in France focusing on their production, imports, exports, national uses and prices from 2013 to 2017. It includes field pea, field bean, soybean, lupin, lentil, chickpea and alfalfa crops. It is based on quantitative and qualitative data coming from the French interbranch organization of plant oil and proteins, Terres Univia, and from other organizations as well as expert statements.

Description of the legume market

Field peas

Production

France was the seventh world producer and the first European producer of field pea in 2016. It was far behind main world producers Canada (4 836 000 tons), Russia (2 200 000 tons), China (1 194 000 tons), India (1 020 000 tons) and Ukraine (745 000 tons) with an annual production of 582 000 tons. (Terres Univia).

Field pea is the most produced grain legume in France. It has been grown for millennia and some grains have even been found on archeological sites of the Rhine valley. It was eaten in France and through all Europe as whole grains or in the form of flour incorporated to bread during the medieval period. (Terres Univia).

French field pea surface area fluctuated in the past.

The American soy embargo of 1973 underlined the dependence of European breeding farms to the imports of soy meals. The European Economic Community (EEC) thus supported European production of protein-rich plants such as field pea guaranteeing a minimum price for farmers and compensating the difference between minimum price and market price for feed producers in 1978. (Schneider, 2015). French field pea surface area increased from 100 000 hectares in 1982 to a 750 000 hectares record in 1993. (Terres Univia). It then decreased because of the weather conditions (dried springs and high temperatures), the spread of *Aphanomyces Euteiches* in field pea main producing regions and the implementation of Common Agricultural Policy (CAP) measures such as the Maximal Guaranteed Quantities (MGQ)¹ in 1988, the Maximal Guaranteed Surface (MGS) in 1993, the loss of subsidies for irrigated crops² in 2000 and the support of biofuel production starting in 1992. (Schneider, 2015).

France launched a “Plan Protéines végétales 2014-2020” to improve the protein independence of French breeding farms and to promote the agronomic and environmental benefits of protein-rich plants. It supported the production of protein-rich plants through the implementation of CAP measures such as the Ecological Focus Areas (EFA) and the diversification measure of the greening part of the direct payments as well as the Voluntary Coupled Support (VCS) accorded to protein-rich plants³ in 2015. Field pea surface area increased from 118 000 hectares in 2013 to 164 500 hectares in 2015. It then stabilized around 200 000 hectares in 2016 and in 2017. (FranceAgrimer). The European crop protection product ban on EFA in 2018 should have a negative impact on protein-rich plant surface areas in 2018 and later.

Public support had an impact on the French field pea surface area but did not guarantee the long-term development of the French field pea sector.

¹ When the production was exceeding the MGQ set at 3.5 Mt at the European level, the amount of subsidies decreased according to the level of the excess production in order to reduce the costs of the European Agricultural Guidance and Guarantee Fund (EAGGF).

² Subsidies for irrigated crops encouraged the increase of the surface of irrigable crops such as field pea.

³ It represented 187 €/ha in 2015, 112 €/ha in 2016 and 111.5 €/ha in 2017.

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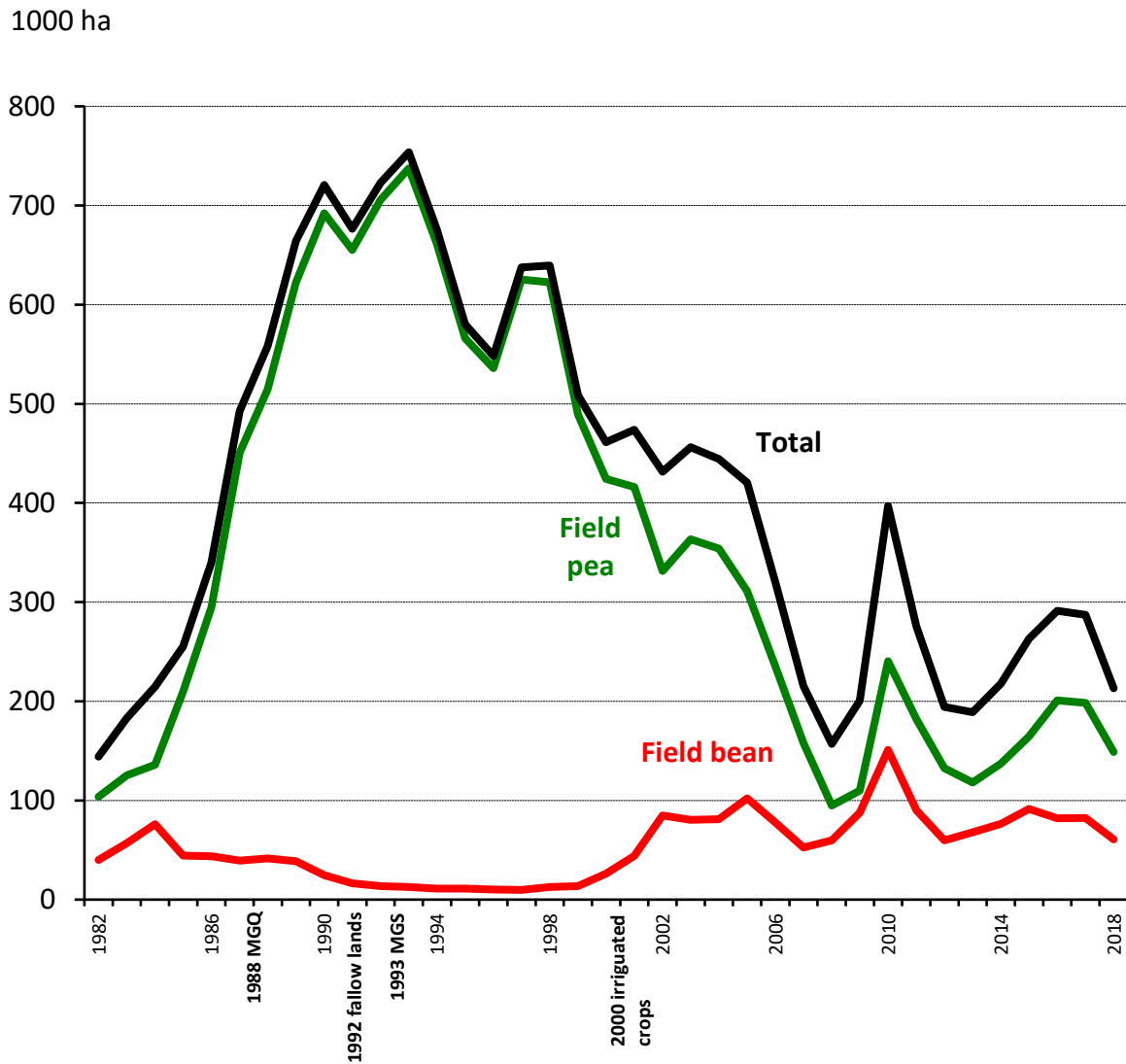


Figure 1 : field pea and field bean surface areas (1 000 ha) in France. (Terres Univia).

FIELD PEA
SURFACE AREA 2017
198 500 ha

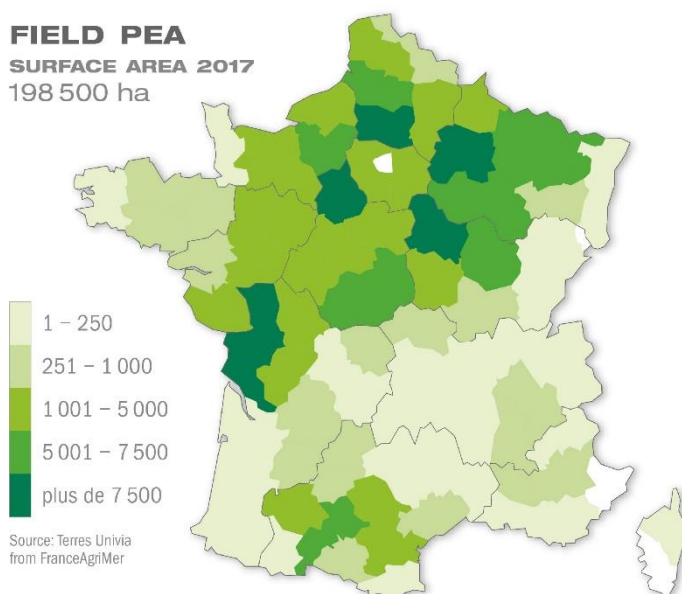


Figure 2: map of field pea surface area in 2017. (Terres Univia from FranceAgrimer).

Field pea was grown in cereal producing regions such as Grand Est (22 %), Centre Val de Loire (15 %), Nouvelle-Aquitaine (15 %) and Hauts-de-France (11 %) in 2017. (FranceAgrimer).

Spring field peas represented 77 % of the surface area. In another hand, the contribution of winter field pea to the surface area increased from 16 % in 2013 to 23 % in 2017 (FranceAgrimer) after experiencing some genetic improvements these past years. Winter field pea varieties are recommended in dried regions and shallow soils because their flowering period come earlier than the flowering period of spring field pea varieties reducing water stress.

The yield had been decreasing over the years. This could be explained by a combination of factors including the spread of *Aphanomyces Euteiches* (high yield potential regions replaced field pea with other crops that is now sown in limited yield potential regions), the weather conditions (low rainfalls and hot temperatures over the flowering period) and the varietal selection (concentrated on the standing ability to the detriment of grain size). (Expert). The yield was estimated at 38.2 q/ha from 2013 to 2017. It was limited to 29 q/ha in 2016 and to 35.8 q/ha in 2017. (Arvalis/Terres Inovia/SSP).

With an increasing surface area and a stable yield, the annual production increased from 533 000 tons in 2013 to 646 000 tons in 2015. It then decreased at 582 000 tons in 2016 because the increasing surface area did not compensate the low yield. It reached 707 000 tons in 2017. (Terres Univia).

Table 1: field pea surface area (ha), yield (q/ha) and production (t). (Terres Univia, FranceAgrimer and Arvalis/Terres Inovia/SSP).

	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
Surface area (ha)	118 000	137 200	164 500	200 800	198 400
Yield (q/ha)	45.2	42	39.3	29	35.8
Production⁴ (t)	533 000	576 000	646 000	582 000	707 000

⁴ The production is an estimation based on the CAP notification of sowings and an estimation of the yield. This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement N°727672

Grain resource is based on the production, the imports and the stocks. Grain resource increased from 602 000 tons in 2013 to 839 000 tons in 2017 due to increases in production, import and stock over this time period. (Terres Univia). This increase in the stocks could be linked to the implementation of custom barriers in India impacting the French export market.

Grain resource is used on various markets nationwide and worldwide. The exports represented the first market (261 000 tons) followed with the national feed market (198 000 tons) and the national food market (124 000 tons) that will all be detailed in the next chapters. ⁵ (Terres Univia, Eurostat).

Table 2: field pea grain resource and uses (1 000 tons) from 2013/2014 to 2017/2018. (Terres Univia, FranceAgrimer and Eurostat).

	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
Production	533	576	646	582	707
Initial stock	58	45	65	66	76
Imports	11	7	9	78	56
Resource	602	628	720	726	839
National consumption	363	390	320	345	386
Feed ⁶	211	232	154	169	222
Food ⁷	120	120	120	130	130
Seeds ⁸	32	38	46	46	34
Exports	194	173	334	305	297
UE countries	149	137	118	120	176
Non-EU countries	45	36	216	185	122
<i>Feed to non-EU countries</i>	22	14	0	0	2
<i>Food to non-EU countries</i>	23	22	216	185	120
Final stock	45	65	66	76	156
Uses	602	628	720	726	839

⁵ Averages calculated from 2013/2014 to 2017/2018.

⁶ The national feed consumption is an estimation based on the difference between grain resources and grain stocks, exports, the estimated food use and the estimated seed use. It tends to be overestimated.

⁷ The national food consumption is an estimation based on expert statement.

⁸ The national seed consumption of a year is an estimation based on the multiplication a sowing rate of 0.23 t/ha with the surface area of the next year.

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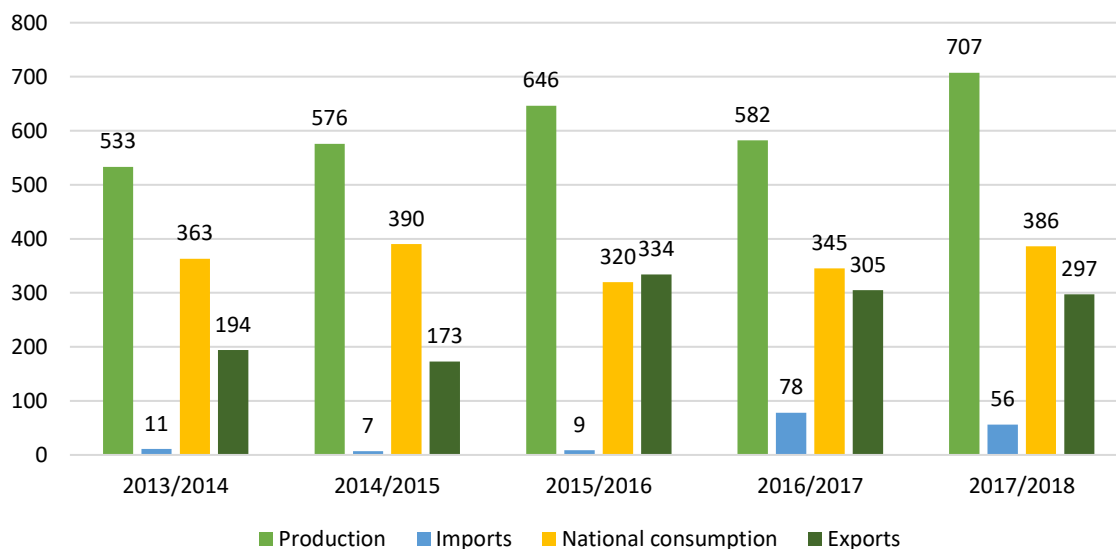


Figure 3: supply balance of field pea (1 000 tons) from 2013/2014 to 2017/2018.⁹ (Terres Univia and Eurostat).

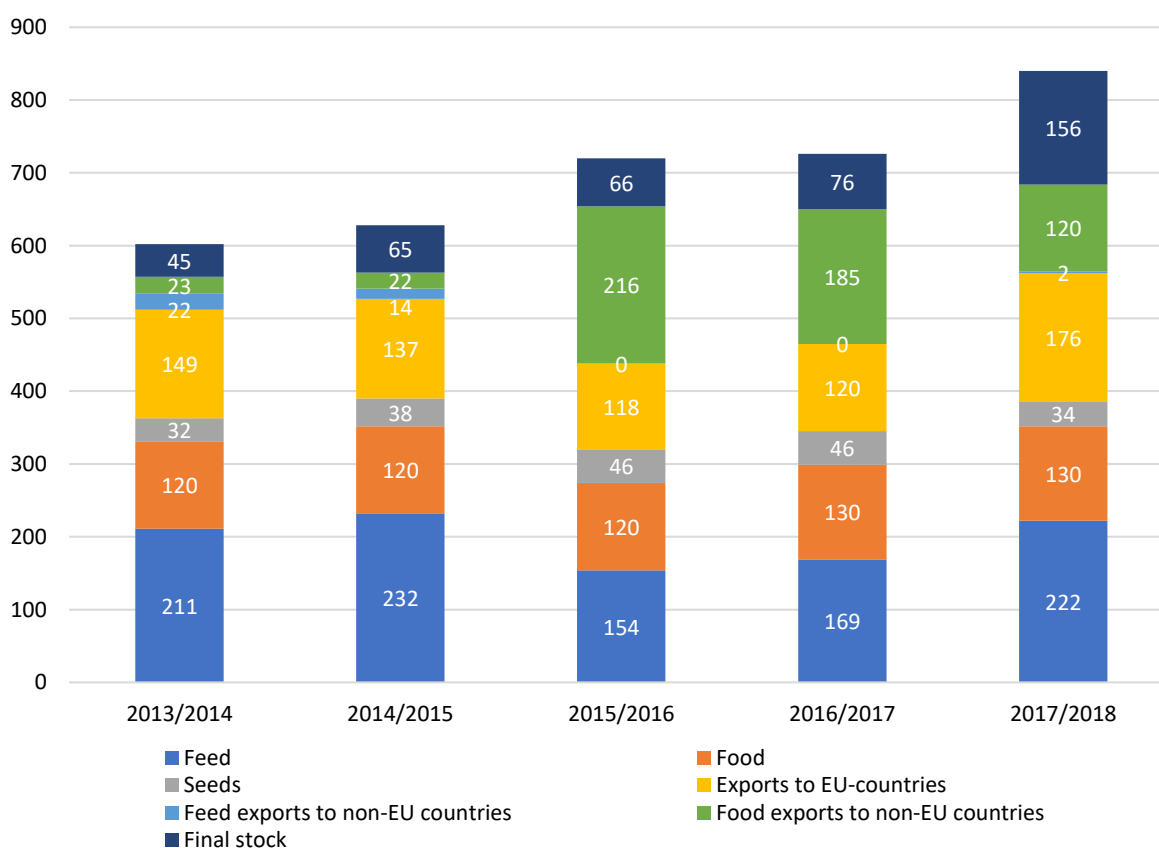


Figure 4: uses of field pea (1 000 tons) from 2013/2014 to 2017/2018. (Terres Univia, FranceAgrimer and Eurostat).

⁹ This figure does not represent the initial and final stocks.

- **The import**

Imports increased from an insignificant 9 286 tons (1 % of the grain resource) in 2015 to 77 567 tons (11 %) in 2016 and to 56 283 tons (7%) in 2017. The main difference between the 2016/2017 and the 2017/2018 campaigns lies in the origin of the imports. For the first one, imports came from non-EU countries (49 295 tons; 63 % of the imports) such as main world producer Canada (47 932 tons; 61 %) and in smaller proportion from EU countries such as Sweden (15 140 tons; 19 %). For the second one, imports came from EU countries (46 981 tons; 84 % of the imports) such as Sweden (25 178 tons; 45 %) and Lithuania (14 455 tons; 26 %). (Eurostat). Imports from Lithuania corresponded to the unloaded merchandise of a boat that could not moor in India because of the implementation of custom barriers. (Expert).

Most of the imports are used on the food sector. There is no precise information about the part of the imports used in the food sector and the part of the imports used in the feed sector. (Expert). The increasing imports could be linked to the increasing activity of a Roquette factory, the main actor of the field pea functional ingredient sector. (Expert).

Tableau 1: imports of field pea (t) to France between 2013/2014 and 2017/2018. (Eurostat).

	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
Imports	11 059	6 821	9 286	77 567	56 283
UE countries	4 748	3 008	7 760	28 272	46 981
Belgium	1 333	737	1 140	5 460	1 165
Hungary	1 161	621	725	648	769
Sweden	0	0	2 725	15 140	25 178
Netherlands	579	207	483	1 010	212
Germany	154	436	838	1 119	645
Italy	354	399	413	1 215	761
Spain	313	76	265	1 366	562
Lithuania	6	48	24	1 288	14 455
Non-UE countries	6 311	3 813	1 526	49 295	9 302
Canada	3 231	1 826	160	47 932	7 854
Madagascar	1 255	415	894	369	316
USA	1 271	789	377	625	477

- **The export markets**

Exports decreased in terms of tonnage from 193 691 tons (32 % of the grain uses) in 2013 to 173 089 tons (28 %) in 2014 and jumped at 333 634 tons (46 %) in 2015. Exports then decreased again in terms of tonnage to reach 304 783 tons (42 %) in 2016 and 297 242 tons (35 %) in 2017. Exports to EU countries were stable (139 981 tons¹⁰) while exports to non-EU countries followed the same path as the overall exports. (Eurostat).

¹⁰ Average calculated between 2013/2014 and 2017/2018.

Belgium is a main importer of French grains (76 615 tons¹¹) and a part of the grains exported to Belgium is used by Cosucra (around 100 000 tons of field pea annually processed) factory that produces field pea functional ingredients. (Expert).

Feed exports to Norwegian fishing farms represented 22 000 tons of grains in 2013 and 14 000 tons of grains in 2014 but the market closed over the 2015/2016 and the 2016/2017 campaigns. There were 2 000 tons of grains exported as feed to Norway in 2017. (Terres Univia).

Food exports to non-EU countries such as India jumped from 22 000 tons in 2014 to 216 000 tons in 2015 before decreasing at 185 000 tons in 2016 and 120 000 tons in 2017 (Terre Univia) as it depends on the export opportunities to India and worldwide competition. (Expert).

There are several criteria to meet for the grains to be exported as food to India (expressed in maximum percentage per grain lot) including the grain moisture content (15 %), the grain dockage (2 %), the level of different colored grains (3%), the level of broken grains (8 %) and the level of grains damaged by insects (3%)¹². (Terres Univia).

Terres Inovia¹³ (2018b) conducted an annual survey on the quality of the grains¹⁴ and evaluated that the moisture content was around 13.5 % in 2017. Moreover, it calculated that 70 % of the grain lots had less than 1 % of dockage before grain sorting, 91 % of them had less than 1 % of different colored grains, 75 % of them had less than 1 % of broken grains and 96 % of them had less than 1 % of grains damaged by insects in 2017. Budworm impacted the grains produced in Northern regions while weevils affected the grains produced in Southern regions. However, their distribution areas tend to spread and some weevils were found in grain lots coming from Grand Est, Hauts de France and Normandie regions for example.

¹¹ Average calculated between 2013/2014 and 2017/2018.

¹² These numbers may be slightly different depending on the contract.

¹³ Terres Inovia is the technical institute of the sector of the vegetable oils and proteins.

¹⁴ This study is based on 68 samples collected through all the country.

Tableau 2: exports of French field pea (t) between 2013/2014 and 2017/2018. (Eurostat).

	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
Exports	193 691	173 089	333 634	304 783	297 242
UE countries	149 184	137 155	117 968	120 007	175 593
Belgium	85 290	61 807	64 400	69 799	101 779
Denmark	2 031	9 500	196	239	204
Germany	17 335	11 687	10 827	6 654	6 828
Italy	9 777	26 957	22 118	24 679	22 122
Portugal	741	826	1 388	1 198	2 016
Spain	8 795	9 934	5 299	6 759	11 353
Netherlands	15 542	9 727	9 601	6 077	28 997
UK	8 728	5 918	3 071	2 688	1 252
Non-UE countries	44 507	35 934	215 666	184 776	121 649
China	0	1 040	7 197	780	30 000
Egypt	5 684	0	0	130	151
India	0	3 532	189 772	172 442	78 900
Morocco	1 421	1 410	1 578	1 374	801
Nepal	0	1 038	4 191	732	0
Norway	21 743	14 106	12	5	2 184
Pakistan	0	2 435	4 420	1 716	24
Switzerland	15 203	12 002	4 753	6 243	7 886
USA	0	14	2 292	13	0

- **The national feed markets**

The national feed market decreased from 232 000 tons (37 % of the grain uses) in 2014 to 154 000 tons (21 %) in 2015 before reaching 222 000 tons of grains (26 %) in 2017. (Terres Univia).

Some of the grains are produced and consumed on the farm which can reduce the feeding cost and decrease the feed market dependence of farmers while another part of the grains is processed into compound feedstuff for pigs and in smaller proportion for poultry and ruminants. Terres Univia obtains information about the collected tonnage of oilseeds and protein crops such as field peas collecting the mandatory and voluntary contribution from collectors¹⁵. It gives an estimation of the part of the production used on the farm (feed and seeds) subtracting the produced and the collected tonnages. The part of the production used on the farm represented 35 % of the overall annual production at its highest in 2014 and 22 % of the overall annual production at its lowest in 2017. On another side, Agrosynergie (2018) estimated based on a case study that there were 23 % of the production used on the farm in 2015.

¹⁵ The mandatory and voluntary contribution is collected from farmers, collectors and first buyers, oil extractors and oilseeds users in order to finance projects of mutual interests and benefits for all the actors of the oilseed and protein-rich plant sector.

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Agreste¹⁶ (2017) conducted a survey among feed producers about the amount of each raw material processed into compound feedstuff¹⁷ in 2015. There were thus 40 100 tons of field pea grains processed into compound feedstuff in 2015 which is small compared to the overall tonnage used in the feed sector. The share of field pea in compound feedstuff was limited to 0.2% far behind cereals (48.2 %) and oilseed meals (29.6 %) because pulses such as field pea have a high interest price compared to oilseed meals. In other words, the price that allows the raw material to be incorporated into compound feedstuff is higher for pulses than for oilseed meals. Their low and variable supplies do not encourage feed producers to increase their incorporation rate in the feed products. Their low and variable supplies result in higher costs of logistics that prevent feed producers from getting them even when their price is low. Furthermore, feed producers tend to prefer using raw material with a specialized nutritional profile such as cereals and oilseed meals facilitating compound feedstuff formulation.

There are several criteria to meet for the grains to be sold on the national feed sector (expressed in maximum percentage per grain lot) including grain moisture content (16 %), grain dockage (4 %), the level of broken and weevilled grains (10 %)¹⁸. (Terres Univia). Moreover, the nutritional profile of the grains including their protein content is more important in the feed sector than in the food sector expecting it to be high. (Expert). Terres Inovia (2018b) conducted an annual survey on the quality of the grains¹⁹ and evaluated that the protein content was around 22.4 % of dry matter in 2017 compared to an average of 22.6 % of dry matter between 2013 and 2017.

There is no information about the use of field pea grains in the pet food segment but it would be interesting to know more about it.

- **The national food markets**

Field peas can be used as whole grains or processed into food products and functional ingredients. Proteins coming from protein-rich plants such as field pea can be turned into functional ingredients that are used in processed food. Functional proteins are used for their nutritional profile (more proteins and less saturated fat) and their functional properties (binding, emulsion and water retention). Co-products coming from functional ingredients production can be processed into industrial paper and glue. (Expert).

The national food market represented 120 000 tons in 2013 (20 % of the grain uses), 2014 (19 %) and 2015 (17 %) and 130 000 tons during the next campaigns (Terres Univia) as the production of functional ingredients increased. (Expert).

Out of the 130 000 tons of grains used on the national food market, Terres Univia estimated that 15 000 tons were used in the form of “broken peas” while the other 115 000 tons of the grains were processed into functional ingredients in Roquette and Sotexpro factories.

¹⁶ Agreste is the statistics department of the French Ministry of Agriculture.

¹⁷ Agreste conducted a survey in 2015 among all the French feed producers that had an annual compound feedstuff production superior to 5 000 tons (representing 99 % of the French compound feedstuff production) and got a response rate of 98.9 %.

¹⁸ These numbers may be slightly different depending on the contract.

¹⁹ This study is based on 68 samples collected through all the country.

There are several criteria to meet for the grains to be processed into functional ingredients (expressed in maximum percentage per grain lot) including the grain moisture content (15 %), the grain dockage (2 %), the level of different colored grains (2 %), the level of broken grains (5 %) and the level of weevilled grains (3 %)²⁰. (Terres Univia).

The “Groupe d’Études et de Promotion des Protéines Végétales” or GEPV (2018) referenced all the processed food products containing vegetable functional proteins (4 635 food products) in 15 food stores in 2017. Field pea proteins accounted for 8 % of the overall vegetable functional proteins found in processed food products behind wheat (68 %) and soy (21 %) in 2017. They were mainly found in the meat and fish section (36 %), the frozen food section (29 %) and the “salted food products” shelf.

- **The seed market**

There are 6 seed breeders of spring field peas named Agri Obtentions, RAGT, Limagrain, Florimond Desprez, KWS Momont and Unisigma. The first fourth ones also work with winter field peas. (Expert).

There are 77 varieties including 28 winter field pea varieties in 2019. (GEVES). Varietal selection is strong (several new varieties per year) in particular for winter field pea. (Expert).

The number of hectares under a contract for the multiplication of field pea seeds increased from 5 502 hectares in 2014 to 7 380 hectares in 2015 and then stabilized at 9 460 hectares in 2016 and at 9 291 hectares in 2017 such as the total surface area of field pea. The amount of certified seeds thus increased between 2014 (194 703 quintals) and 2016 (211 787 quintals) but declined in 2017 (181 212 quintals) because the amount of certifiable seeds per hectare fell at 2 239 kg/ha. (Gnis, 2019a).

The ratio between farm seeds and certified seeds is 50 % of farm seeds and 50 % of certified seeds but it can varies depending on the types of field peas and the regions. More certified seeds are in fact used for winter field peas than for spring field peas because of the last genetic improvements. Furthermore, historic producing regions tend to use more certified seeds. (Expert).

Imports increased from 3 435 quintals in 2015/2016 to 16 891 quintals in 2016/2017 before falling at 3 716 quintals in 2017/2018. (Gnis, 2019a). On another hand, exports experienced a first jump between the 2014/2015 (11 559 quintals) and the 2015/2016 (20 000 quintals) campaigns and another jump between the 2015/2016 (20 000 quintals) and the 2016/2017 (30 849 quintals) campaigns. Exports then stabilized in 2017/2018 (28 641 quintals). They were mainly directed to other EU countries in 2017/2018. (Gnis, 2019a).

Table 3: surface area (ha), production (q), imports (q) and exports (q) of certified field pea seeds from 2013 to 2017. (Gnis, 2019a).

	2014	2015	2016	2017
Surface area (ha)	5 502	7 380	9 460	9 291
Production (q)	194 703	229 692	211 787	181 212
Imports (q)	8 042	3 435	16 891	3 716
Exports (q)	11 559	20 000	30 849	28 641

²⁰ These numbers may be slightly different depending on the contract.

- **The organic market**

The number of hectares of organic field pea increased from 4 153 hectares²¹ in 2013 to 8 461 hectares²² in 2017. This represented 3.5 % in 2013 and 4.25 % in 2017 of the total cultivated area.²³ Main producing regions included Occitanie and Nouvelle Aquitaine in 2017. (AgenceBio).

Table 4: field pea surface area (ha) in conversion to organic farming and certified in organic farming from 2013 to 2017. (AgenceBio).

	2013	2014	2015	2016	2017
Certified Surface Area (ha)	3 434	3 690	4 067	4 614	4 551
Surface Area in conversion and certified (ha)	4 153	5 109	6 391	9 334	8 421

FranceAgrimer²⁴ (2018) conducted a mail survey among farmers²⁵ about organic cereal, oilseed and protein-rich plant yield and varietal distribution in 2017. For field pea, the yield was estimated at 20 q/ha in 2017 and on average at 18.83 q/ha between 2012 and 2017.

There were 22 varieties of field pea used in organic production. The most common spring field pea varieties were KAYANNE (15 % of the surface area) and MYTHIC (10 %) while the most common winter field pea varieties were AVIRON (15 %) and ENDURO (10 %). Furthermore, the association of cereals and pulses is important in organic farming and there were thus 48.5 % of the surveyed farmers producing a combination of cereals and field pea. There were 36 % of them sowing with a mix of triticale and field pea, 6 % of them sowing with a mix of barley, oat and field pea and 3 % of them sowing with a mix of wheat and field pea.

There were 13 727 tons of organic field pea on the national market over the 2016/2017 campaign including the collected tonnage (9 558 tons), the stocks (2 431 tons) and the imports (1 738 tons). Moreover, there were 7 006 tons used in feedstuff compounds and 172 tons were used as seeds. Most of the imports were used in feedstuff compounds (1 638 tons).²⁶ (FranceAgrimer, 2018).

²¹ It includes 719 hectares in conversion to organic farming.

²² It includes 3 878 hectares in conversion to organic farming.

²³ These numbers coming from a compilation of departmental data can be underestimated because of the statistical secrecy operating at the departmental level.

²⁴ FranceAgrimer is the National Establishment of Agricultural and Seafood Products.

²⁵ FranceAgrimer conducted a mail survey in 2018 among French farmers producing cereals, oilseeds and protein-rich plants which are certified in organic farming or which are in their second year of conversion to organic farming and got 1 269 questionnaires back corresponding to a response rate of 18 %.

²⁶ Provisional figures.

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The prices of field pea used as feed are compared to the prices of soymeal and feed wheat because field pea has an intermediate profile (energy and proteins) compared to soymeal (proteins) and feed wheat (energy). Field pea prices are following soymeal and feed wheat prices but soymeal experiences more price fluctuations than field pea and feed wheat. Field pea prices started to decrease in 2012. The price difference between field pea and feed wheat decreased between 2010 and 2012 and between 2017 and 2018. It was equal to 31.6 €/t between July 2017 and July 2018. Field pea became as a result more interesting on the feed market over these time periods. (Terres Univia).

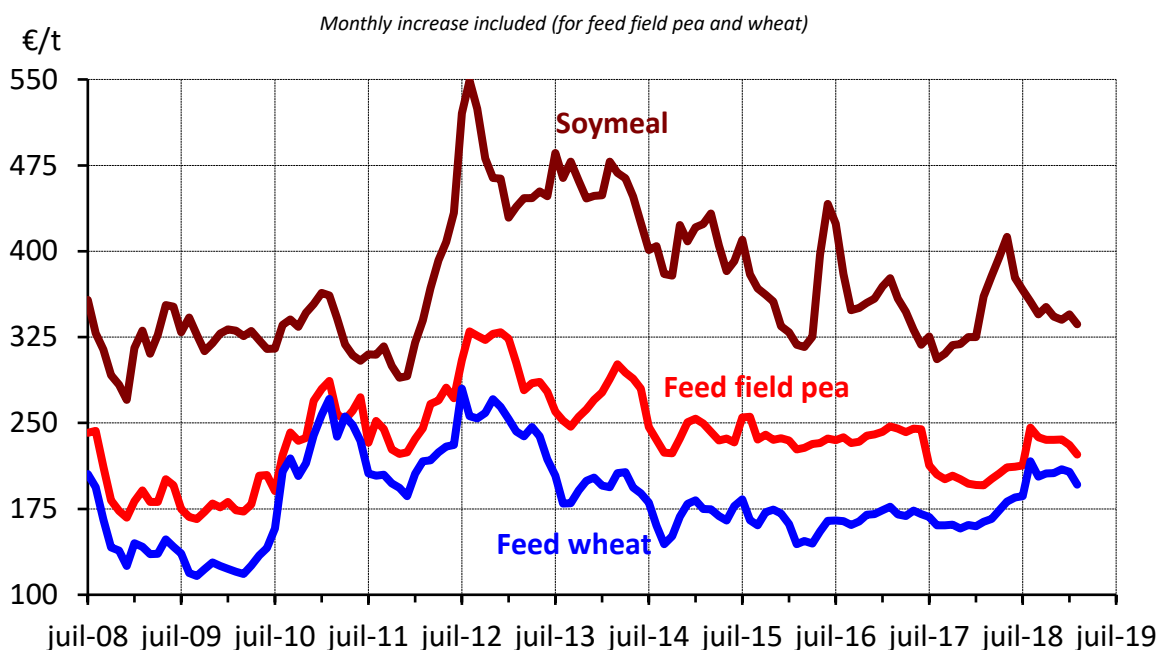


Figure 5: prices (€/t) of feed field pea (centre Bretagne) from July 2008 to July 2018. (Terres Univia).

The prices of field pea exported as food are compared to the prices of wheat. Field pea prices started to decrease in 2012. The price difference between field pea and wheat were minimal except over the 2013-2017 time period. It was equal to 33.4 €/t between July 2017 and July 2018 compared to 77.6 €/t between July 2013 and July 2017.

On another hand, price difference between feed field pea and yellow field pea was minimal at 5.6 €/t between July 2017 and July 2018 in favor to feed field pea. (Terres Univia).

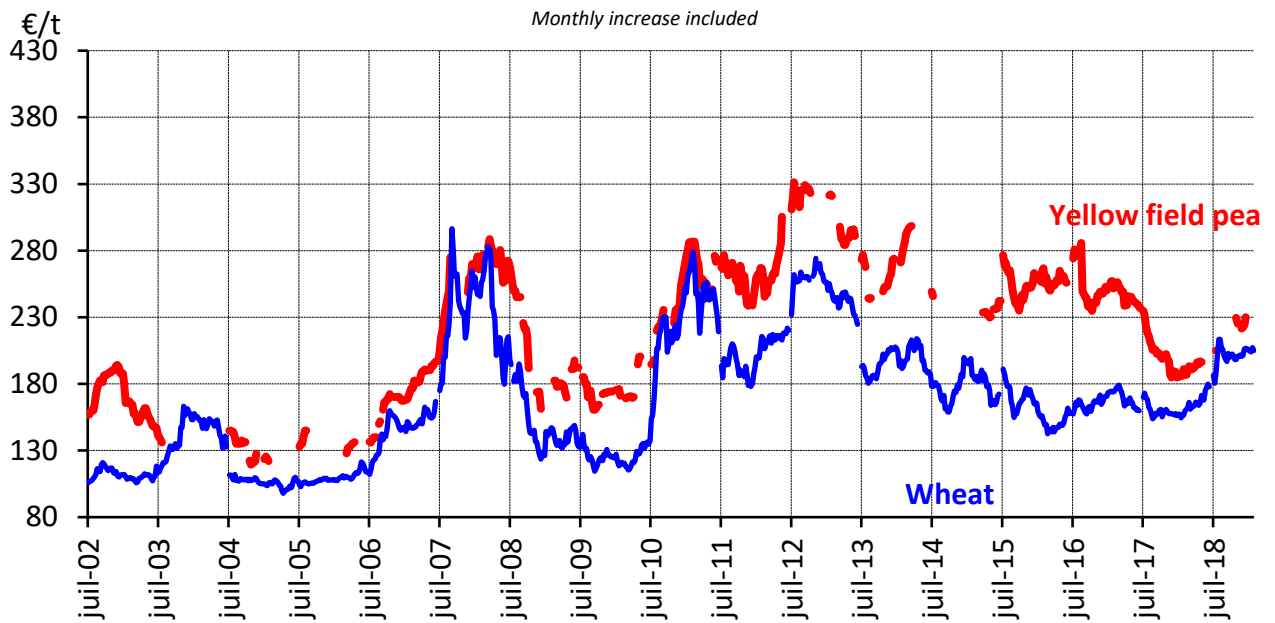
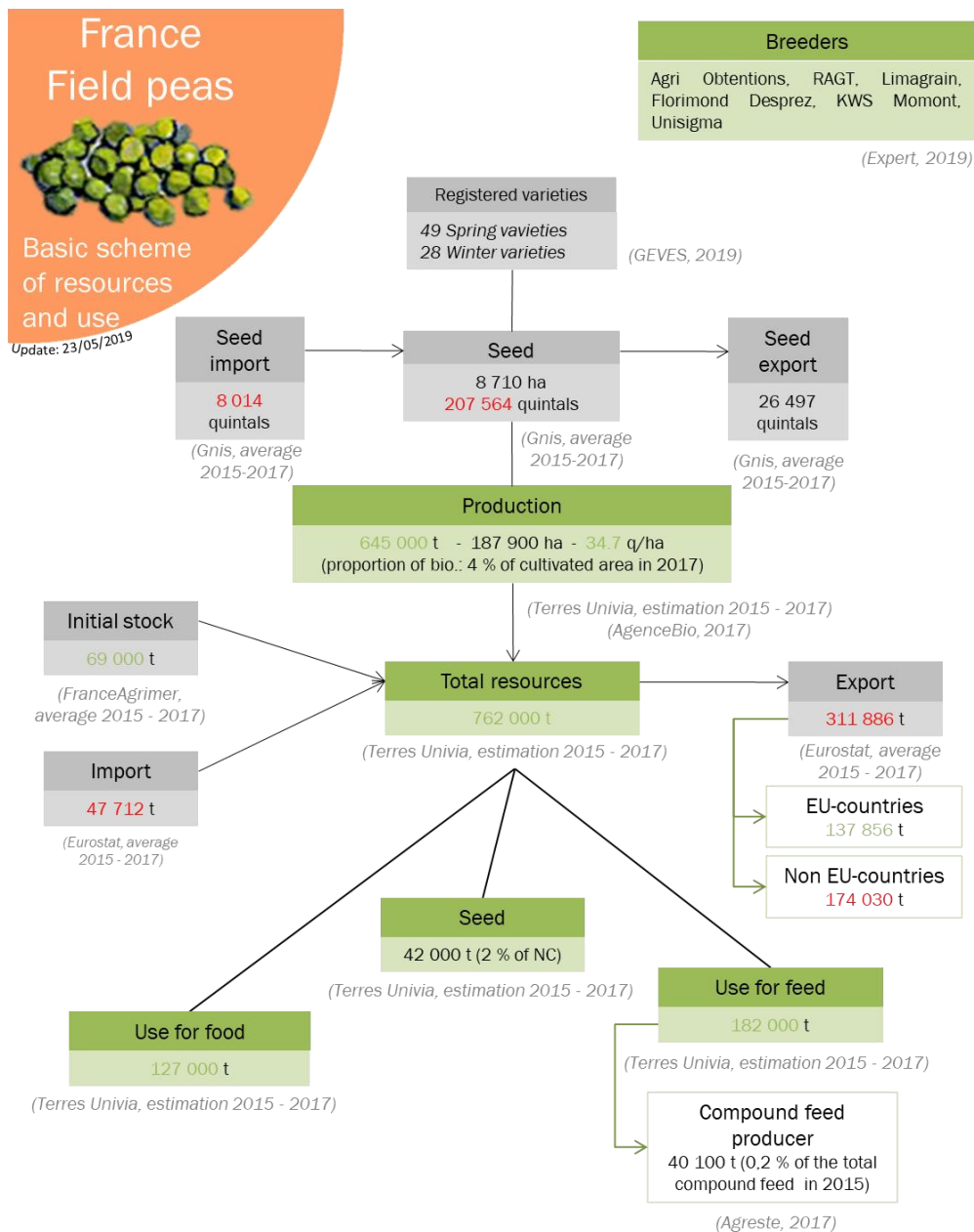


Figure 6: prices (€/t) of yellow field pea for exports (rendu Rouen) between July 2002 and July 2018. (Terres Univia).



Scheme modified to COSELAG

Figure 7: scheme of resources and uses of field pea. (Terres Univia, GEVES, Gnis, AgenceBio, FranceAgrimer, Eurostat, Agreste, expert).

Green number = upward trend

Red number = downward trend

Black number = constant trend

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Production

French soybean production is marginal (223 400 tons) compared to the world production (305.1 million tons) and to main world producing countries such as the USA (101 million tons), Brazil (94.9 million tons) and Argentina (53.3 million tons).²⁷ (Terres Univia).

Soybean is the second most produced legume in France. (Terres Univia).

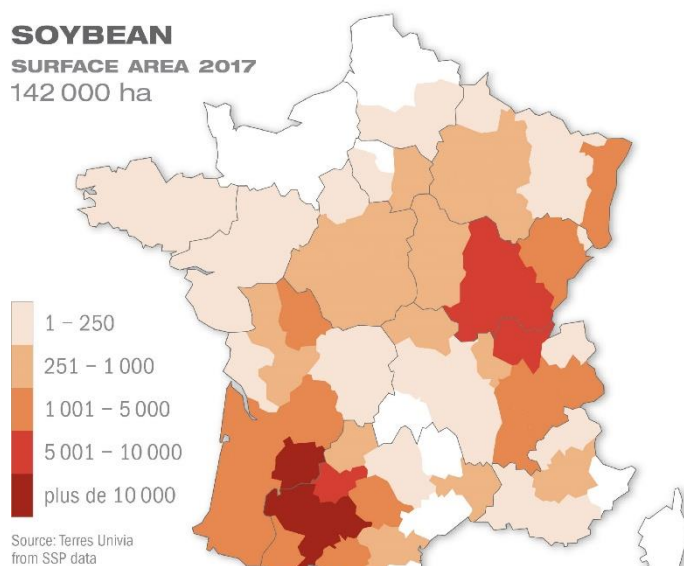


Figure 8: map of soybean surface area in 2017. (Terres Univia from FranceAgrimer).

Soybean surface area increased from 43 000 hectares in 2013 to 142 000 hectares in 2017 (FranceAgrimer) because of the will to provide French breeding farms with French produced non-GMO soy, the agronomic and environmental benefits of soybean, the implementation of CAP measures such as the EFA and the diversification measures of the greening part of the direct payments and the VCP.

Soybean was grown in south western and eastern regions such as Occitanie (51 415 hectares; 36 %), Bourgogne-Franche-Comté (31 620; 22 %) and Nouvelle-Aquitaine (30 004 hectares; 21 %) in 2017. (FranceAgrimer).

The yield was estimated at 27.4 q/ha from 2013 to 2017. It was at 29.2 q/ha in 2017 (SCEES/SSP) because of good weather conditions such as a wet weather and mild temperatures over the vegetative phase resulting in a proper seed emergence and nodulation. (Terres Inovia, 2018c).

With an increasing surface area and a stable yield, the annual production increased from 110 000 tons in 2013 to 414 000 tons in 2017. (Terres Univia).

Table 5: soybean surface area (ha), yield (q/ha) and production (t). (Terres Univia, FranceAgrimer and SCEES/SSP).

	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
Surface area (ha)	43 000	76 000	123 000	137 000	142 000
Yield (q/ha)	25.6	30	27.5	24.7	29.2
Production (t)	110 000	227 000	337 000	339 000	414 000

²⁷ Averages calculated from 2012/2013 to 2016/2017.

Most of the resources are used in a feed sector characterized by massive imports of soy meals while the food sector work with French produced soybeans.

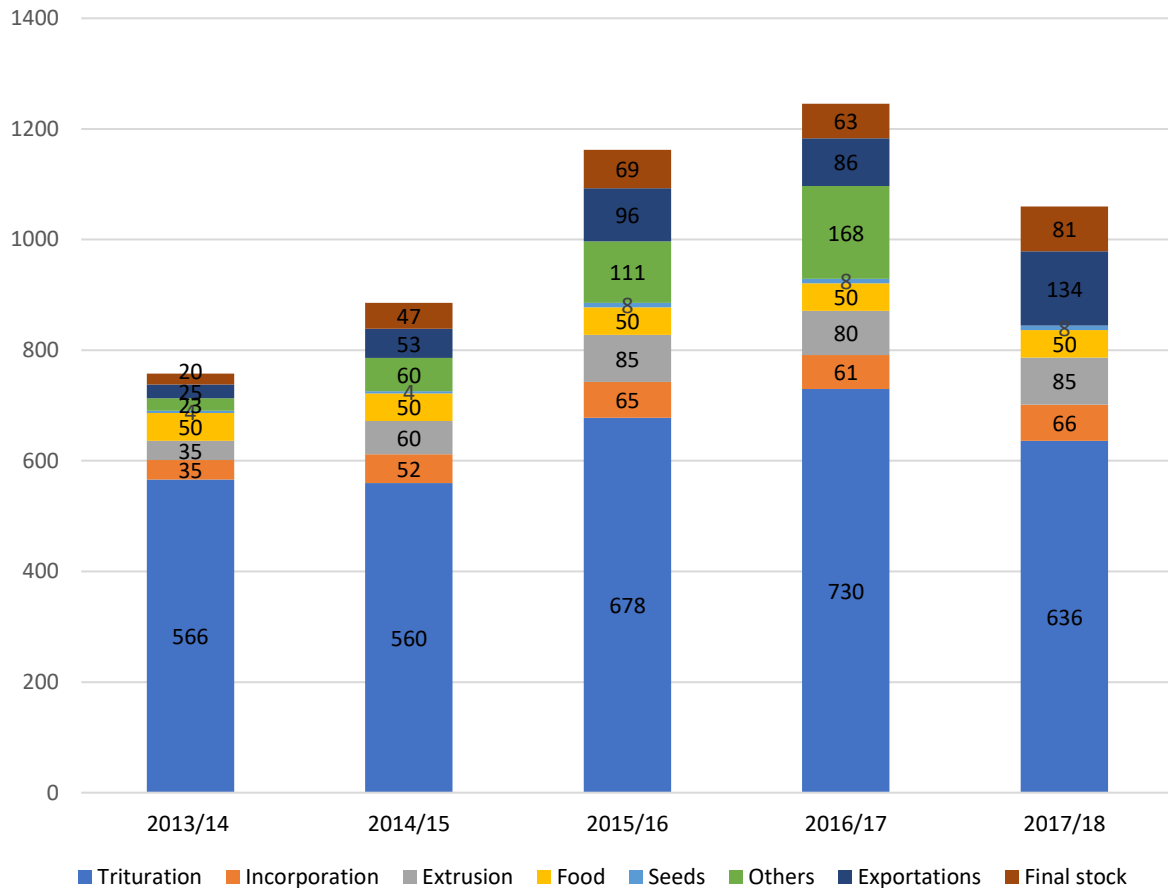


Figure 9: uses of soybean (1 000 tons) from 2013/2014 to 2017/2018. (FranceAgrimer).

- **Imports**

The national production does not cover the national feed consumption thus the imports of soybeans (738 105 tons²⁸) and soy meals (3 106 000 tons²⁹) are important. (Eurostat).

Grain imports increased from 648 136 tons in 2013 to 906 797 tons in 2016 before falling at 623 000 tons in 2017. Most of the imported soybeans came from Brazil (363 455 tons; 58 %) and the USA (112 264 tons; 18 %) in 2017. The imports from Netherlands dropped from 159 792 tons (18 %) in 2016 to an insignificant 1 461 tons in 2017. (Eurostat).

²⁸ Average calculated from 2013/2014 to 2017/2018.

²⁹ Average calculated from 2013/2014 to 2017/2018.

Table 6 : imports of soybeans (t) to France between 2013/2014 and 2017/2018. (Eurostat).

	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
Imports	648 136	666 273	846 317	906 797	623 300
UE countries	32 126	119 939	212 535	197 028	35 479
Belgium	23 801	25 771	27 391	26 819	24499
Spain	3 648	1 725	49 737	1 225	5 553
Netherlands	1 166	87 199	129 024	159 762	1 461
Non-EU countries	616 010	546 334	633 782	709 769	587 821
Brasil	103 601	232 919	120 375	406 161	363 455
Canada	52 481	131 723	121 503	123 664	69 470
Paraguay	186 953	49 341	145 764	0	22 044
USA	258 718	117 994	220 593	161 279	112 264

Meal imports increased from 3 051 000 tons in 2013 to 3 460 000 tons in 2015 before falling at 2 964 000 tons in 2016 and at 2 880 000 in 2017 (Eurostat) because of a decreased in the national production of compound feedstuff (stable or decreasing needs of French breeding farms) and the imports of other rich-protein products such as Ukrainian sunflower meals. (Expert). Most of the imported soymeals came from Brazil (1 835 322 tons; 63 %) and in smaller proportion from Belgium (310 071 tons; 11 %), India (235 450 tons; 8 %), Spain (139 924 tons; 5 %) and Argentina (101 881 tons; 3 %) in 2017. (Eurostat).

Table 7 : imports of soy meals (t) to France between 2013/2014 and 2017/2018. (Eurostat).

	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
Imports	3 233 606	3 248 911	3 431 135	2 789 880	2 927 198
UE countries	667 563	752 205	842 246	703 255	688 203
Belgium	291 844	329 964	387 363	340 566	310 071
Germany	70 185	67 987	67 729	79 216	83 908
Spain	146 933	151 476	165 618	155 108	139 924
Netherlands	86 847	112 370	130 050	71 540	74 739
Non-EU countries	2 566 043	2 496 706	2 588 889	2 086 625	2 238 995
Argentina	383 199	201 548	460 540	115 345	101 881
Brasil	1 678 288	2 067 339	2 080 427	1 747 230	1 835 322
India	262 989	165 547	7 366	176 008	235 450
USA	172 422	32 145	272	4	52

Grain and meal exports are limited and directed towards neighboring countries.

Grain exports increased from 21 543 tons in 2013 to 134 523 tons in 2017. Grains were exported to other European countries such as Belgium (48 883 tons; 36 %), Spain (28 717 tons; 21 %), Germany (24 849 tons; 18 %) and Italy (15 469 tons; 11 %) in 2017. (Eurostat).

Tableau 3: exports of French soybeans (t) between 2013/2014 and 2017/2018. (Eurostat).

	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
Exports	21 547	51 077	92 202	86 042	134 523
UE countries	16 929	44 473	83 746	77 038	122 877
Belgium	2 878	13 314	31 087	30 736	48 883
Germany	1 409	1 002	9 129	3 903	24 849
Italy	837	4 661	6 030	4 878	15 469
Portugal	495	1 162	1 805	1 386	871
Spain	10 516	23 754	34 935	34 108	28 717
Non-UE countries	4 618	6 604	8 456	9 004	11 646
Thailand	0	0	746	2 089	3 136
Switzerland	4 597	6 109	6 829	5 560	7 153

Meal exports experienced a wide fluctuation between 2013 and 2017. There were 92 887 tons of meals exported to Spain (28 398 tons; 31 %), the United Kingdom (26 784 tons; 29 %), the Netherlands (14 757 tons; 16 %) and Turkey (15 105 tons; 16 %) in 2017. (Eurostat).

Tableau 4: exports of French soy meals (t) between 2013/2014 and 2017/2018. (Eurostat).

	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
Exports	95 705	251 895	19 169	42 938	92 887
UE countries	81 768	241 857	17 594	39 148	77 480
Germany	7 306	11 518	1 703	3 098	1 807
Ireland	21 730	45 216	6 836	0	1 810
Portugal	24 432	94 914	2	3 036	3 049
Poland	4 401	0	0	0	0
Spain	1 450	82 330	7 120	10 236	28 398
Netherlands	9 679	2 533	709	743	14 757
UK	11 968	4 201	0	21 052	26 784
Non-UE countries	13 937	10 038	1 575	3790	15 407
Switzerland	3 135	6 228	1 020	3 788	99
Turkey	10 308	0	0	0	15 105

- **The feed market**

Grains are processed (trituration, extrusion or incorporation) in order to be used as feed in breeding farms.

The tonnage of grains used as feed increased from 636 000 tons in 2013 to 871 000 tons in 2016 before falling at 787 000 tons in 2017. In another hand, the percentage of grains used in the feed market decreased a bit from 89 % in 2013 to 80 % in 2017. (Terres Univia).

Most of the grains underwent a trituration process (636 000 tons) but the percentage of grains undergoing a trituration process decreased from 89 % in 2013 to 81 % in 2017 while the percentages of extruded and incorporated grains increased from 6 % and 5 % in 2013 to 11 % and 8 % in 2017. (Terres Univia).

Soy meal is the most used oilseed meal in France with a share of 44 % in 2017 followed by rapeseed (33 %) and sunflower (21 %) meals. This depicts the dependence of French feed compounder to the imports of soybeans and soy meals.

- **The food market**

Soybeans are processed into various food products.

The tonnage of grains used as food was around 50 000 tons in 2017. It was stable between 2013 (50 000 tons; 7 %) and 2017 (50 000; 5 %). (Terres Univia).

All the grains used as food are produced in France. (Expert).

Soybean flour and functional proteins accounted for 21 % of the overall vegetable proteins found in food products in 2017. Out of the 965 studied products containing soybean flour and functional proteins, 43 % were in the “salted food products” shelf, 20 % were in the meat and fish section and 17 % were in the “sweet food products” shelf in 2017. (GEPV, 2018).

Soya-based food products were first sold in organic shop and pharmacies but can now be found in large and medium sized supermarkets, schools and hospital cafeterias too. Soya-based food products sold in large and medium sized French supermarkets represented 51 250 tons of products and 141.15 million of euro in 2016. The “fresh dessert” market represented 52.5 % of the sale value before the soy drink market (29 %) and the “caterer” market (18.7 %). (Kantar, 2016).

- **The seed market**

There are two seed breeders named RAGT and Euralis semences.

The number of varieties increased from 55 in 2013 to 65 in 2019. (GEVES).

The number of hectares under contract for multiplication of soybean seeds was around 4 606 hectares from 2014 to 2017. It reached its lowest point at 3 892 hectares in 2014 and its highest point at 5 500 hectares in 2015. (Gnis, 2019b).

The ratio between farm seeds and certified seeds was evaluated at 50 % of farm seeds and 50 % of certified seeds in 2014. (Coselag).

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Imports were low (3 310 annual quintals from 2013 and 2017) in comparison to exports (15 056 quintals from 2013 to 2017) that doubled between 2013/2014 (7 115 quintals) and 2014/2015 (16 387 quintals). (Gnis, 2019b).

Table 8: surface area (ha), production (q), imports (q) and exports (q) of certified soya seeds from 2013 to 2017. (Gnis, 2019b).

	2014	2015	2016	2017
Surface area (ha)	3 892	5 500	4 139	4 891
Production (q)	95 706	93 320	90 776	103 719
Imports (q)	5 113	1 762	3 270	2 949
Exports (q)	16 387	14 682	18 678	18 416

- **The organic market**

The number of hectares of organic soybean increased from 10 209 hectares³⁰ in 2011 to 24 673 hectares³¹ in 2017 representing 17 % of the soybean surface area. Main producing regions included Occitanie and in much smaller proportion Nouvelle Aquitaine in 2017.³² (AgenceBio).

Table 9: soybean surface area (ha) in conversion to organic farming and certified in organic farming from 2013/2014 to 2017/2018. (AgenceBio).

	2013	2014	2015	2016	2017
Certified Surface Area	9 514	11 514	13 913	13 794	17 612
Surface Area in conversion and certified	10 209	12 777	20 031	24 394	24 673

FranceAgrimer (2018) conducted a mail survey among farmers³³ on the yield and the varietal distribution of soybean. The average yield was around 20.1 q/ha from 2012 to 2017 and reached 24 q/ha in 2017. There were 43 varieties of soybean used in organic production including 14 early and middle early varieties and 15 late and middle late varieties. The most common one was ISIDOR between 2013 (35 %) and 2017 (46 %).

Organic soy bean flour and functional proteins accounted for 25 % of the overall vegetable proteins found in organic food products in 2017 which is a bit higher than in the conventional market. (GEPV, 2018).

³⁰ It includes 695 hectares in conversion to organic farming.

³¹ It includes 7 061 hectares in conversion to organic farming.

³² These numbers coming from a compilation of departmental data can be underestimated because of the statistical secrecy operating at the departmental level.

³³ FranceAgrimer conducted a mail survey in 2018 among French farmers producing cereals, oilseeds and protein-rich plants which are certified in organic farming or which are in their second year of conversion to organic farming and got 1 269 questionnaires back corresponding to a response rate of 18 %.

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Prices presented in this chapter do not correspond to the prices of French produced soybeans and soy meals but imported ones. The severe drought in the USA and Russia led to an increase of prices of agricultural raw materials such as soybean in 2012. (Terres Univia).

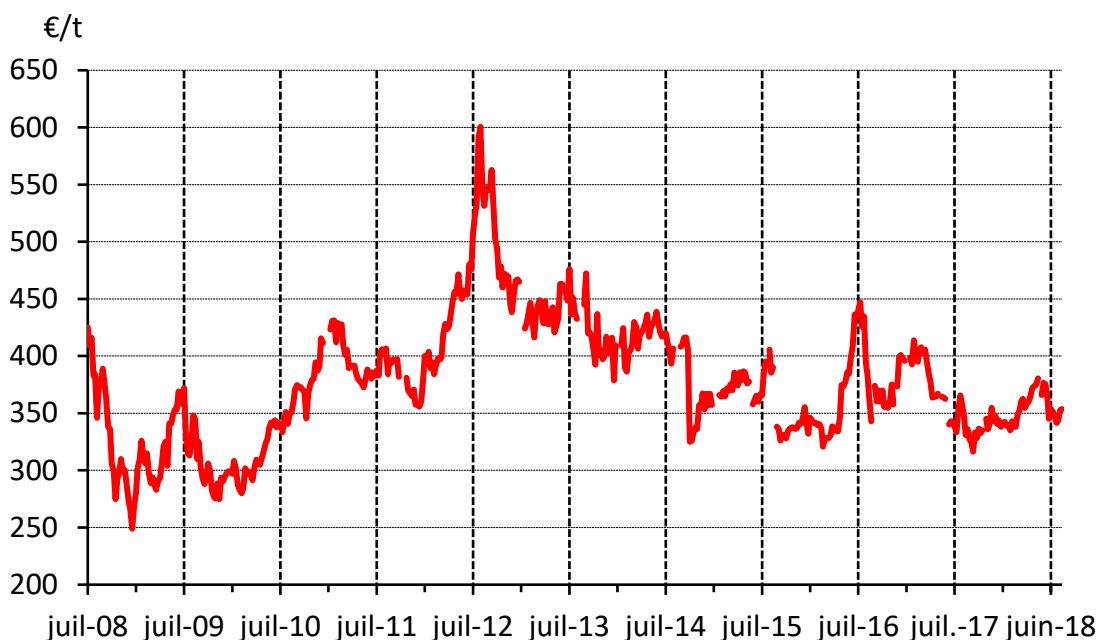


Figure 10: prices (€/t) of soybean (CAF Rotterdam) from July 2008 to June 2018. (Terres Univia).

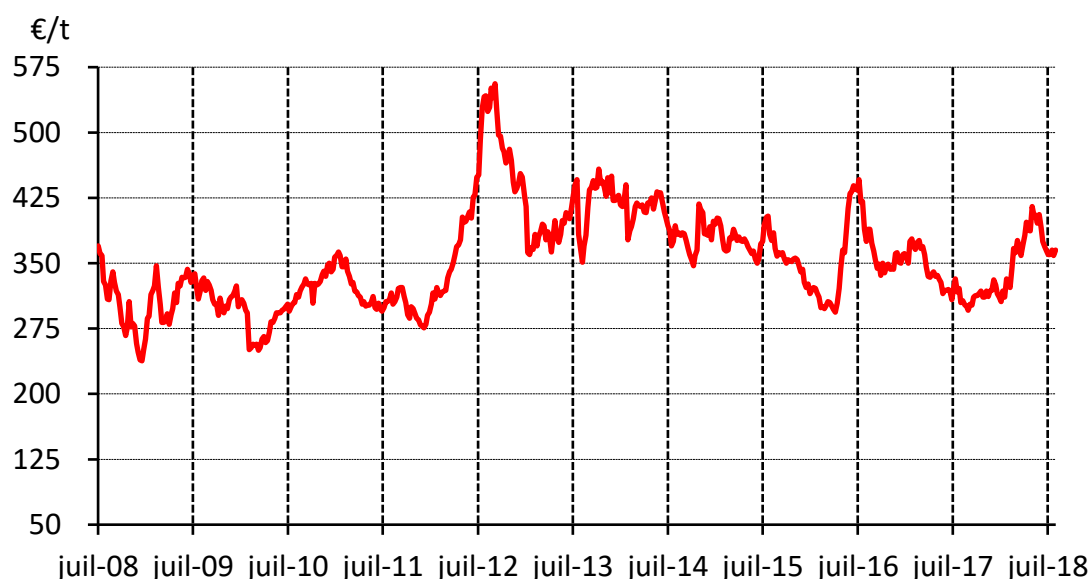
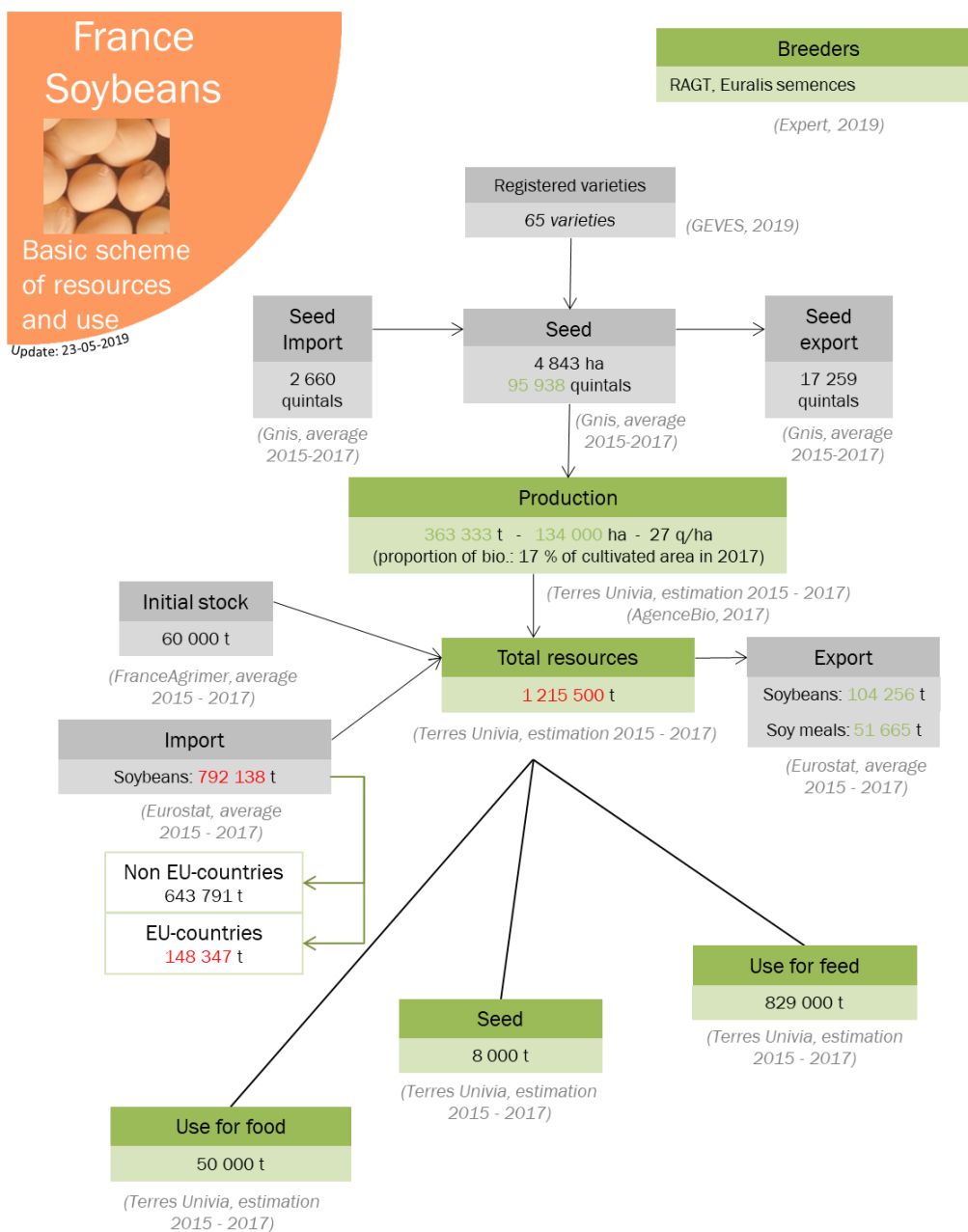


Figure 11: prices (€/t) of soy meal (Lorient) from July 2008 to July 2018. (Terres Univia).



Scheme modified to COSELAG (2016-2017)

Figure 12: scheme of resources and uses of soybeans. (Terres Univia, GEVES, Gnis, AgenceBio, FranceAgrimer, Eurostat, expert).

Green number = upward trend

Red number = downward trend

Black number = constant trend

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Production

France was the fifth world field bean producer behind China (1 609 000 tons), Ethiopia (878 000 tons), the United Kingdom (651 000 tons) and Australia (484 000 tons) with 250 000 tons produced in 2016. It was the second European field bean producer but its contribution to the European production decreased as other European countries such as Lithuania and Germany developed their national production. (Terres Univia).

Field bean is the third most produced legume in France. (Terres Univia).

FIELD BEAN SURFACE AREA 2017 82 400 ha

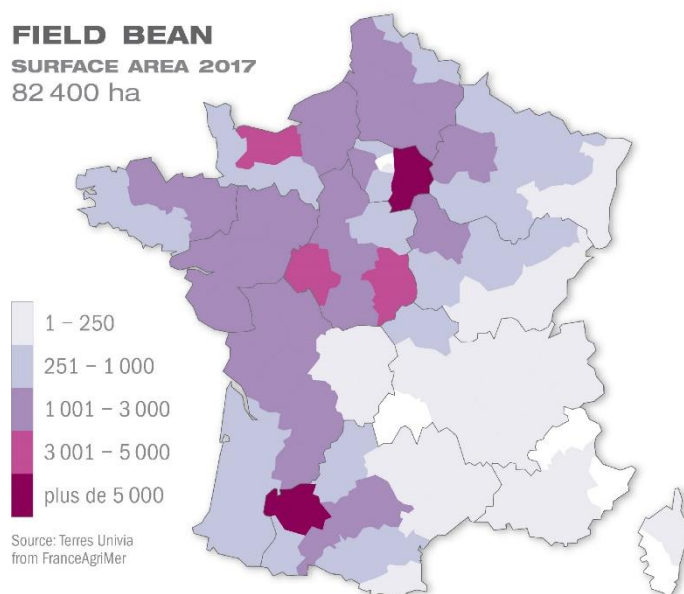


Figure 13: map of field bean surface in 2017. (Terres Univia from FranceAgrimer).

Field bean surface increased from 68 000 hectares in 2013 to 91 300 hectares in 2015 because of the attractive prices of the Egyptian food market, the promotion of the agronomic and environmental benefits of field beans, the implementation of CAP measures such as the EFA and the diversification measures of the greening part of the direct payments and the VCP. It then stabilized around 82 000 hectares in 2016 and in 2017. (FranceAgrimer). The crop protection product ban on EFA implemented in 2018 should have a negative impact on field bean surface area in 2018 and later.

Field bean was grown in Centre (16 %), Occitanie (14 %) and Nouvelle-Aquitaine (13 %) regions in 2017. (FranceAgrimer). Historic producing regions such as Hauts-de-France, Normandie and Ile-de-France decreased their field bean surface area between 2015 and 2017³⁴ because bruchid damaged the visual appearance of the grains preventing grain sales on the Egyptian food market. (Expert).

³⁴ Hauts-de-France represented 26 % of the French field bean surface area in 2015 and 10 % in 2017. Normandie accounted for 17 % in 2015 and 11 % in 2017. Ile-de-France accounted for 16 % in 2015 and 10 % in 2017. (FranceAgrimer).

Spring field bean represented 67 % of French field bean surface area while winter field bean represented the other 33 % in 2017. Spring field bean contribution to the national field bean surface area decreased from 90 % in 2013 to 67 % in 2017 because spring field beans were targeted to the Egyptian food market³⁵ but as it has been said earlier bruchid damaged the visual appearance of the grains preventing grain sales on the Egyptian food market. (FranceAgrimer).

Winter field bean is recommended in southern regions because their flowering period come earlier than the flowering period of spring field bean varieties reducing water stress.

The yield was estimated at 33.5 q/ha from 2013 to 2017. It was lower in 2017 (25.7 q/ha) than in 2016 (30.5 q/ha) because of a dried weather and high temperatures over the flowering period. (Arvalis/Terres Inovia/SSP).

Table 10: field bean surface area (ha), yield (q/ha) and production (t). (Terres Univia, FranceAgrimer and Arvalis/Terres Inovia/SSP).

	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
Surface area (ha)	68 000	76 400	91 300	82 000	82 400
Yield (q/ha)	38.9	41.2	31.2	30.5	25.7
Production (t)	265 000	315 000	285 000	250 000	212 000

Markets

Grain resource increased from 295 000 tons in 2013 to 347 000 in 2014 before falling at 279 000 tons in 2016 following the production trend over this same time period. (Terres Univia).

Grain resource is used on various markets nationwide and worldwide. The national feed market represented the main part of the uses (145 000 tons) followed with the export market (110 000 tons).³⁶ (Terres Univia, Eurostat).

³⁵ Spring field bean crop produces big beige grains that are appreciated on the Egyptian market while winter field beans are smaller and darker.

³⁶ Averages calculated from 2013/2014 to 2017/2018.

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Table 11: resource and uses of field bean (1 000 tons) from 2013/2014 to 2017/2018. (Terres Univia, FranceAgrimer and Eurostat).

	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
Production	265	315	285	250	212
Initial stock	15	19	43	60	36
Imports	15	13	15	15	31
Resource	295	347	343	325	279
National consumption	119	181	190	196	175
Feed ³⁷	929	151	162	168	152
Food ³⁸	10	10	10	10	10
Seeds ³⁹	17	20	18	18	13
Exports	157	123	93	93	82
UE countries	14	11	16	31	24
Non-EU countries	143	112	77	62	58
Feed to non-EU countries	25	25	46	56	50
Food to non-EU countries	118	87	31	6	8
Final stock	19	43	60	36	22
Uses	295	347	343	325	279

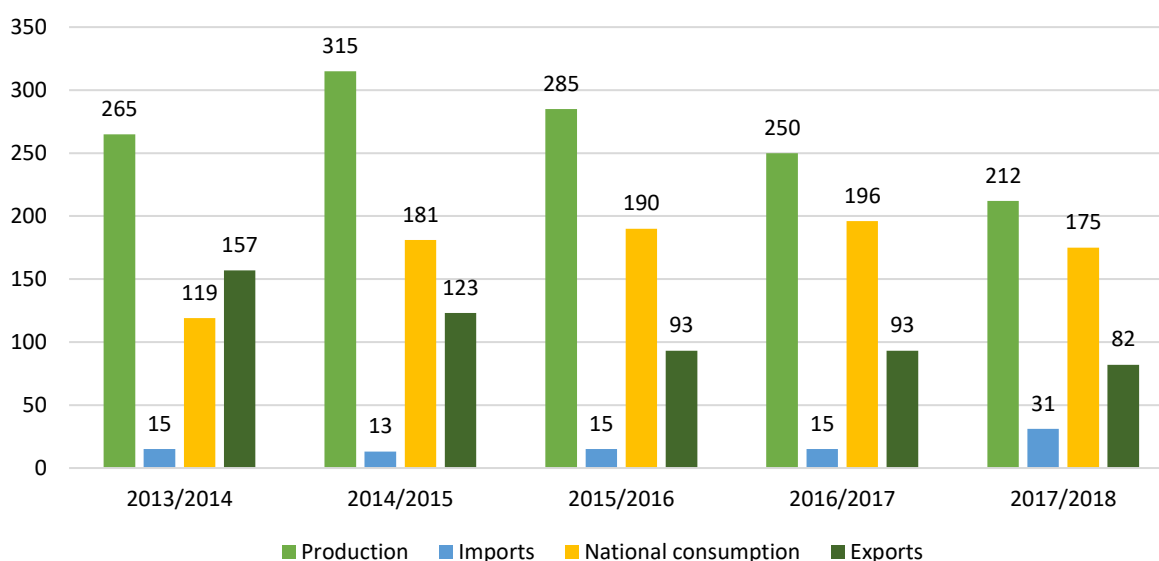


Figure 14: Supply balance of field bean (1 000 tons) from 2013/2014 to 2017/2018.⁴⁰ (Terres Univia and Eurostat).

³⁷ The national feed consumption is an estimation based on the difference between grain resources and grain stocks, exports, the estimated food use and the estimated seed use. It tends to be overestimated.

³⁸ The national food consumption is an estimation based on expert statement.

³⁹ The national seed consumption of a year is an estimation based on the multiplication a sowing rate of 0.22 t/ha with the surface area of the next year.

⁴⁰ This figures does not represent the initial and final stocks.

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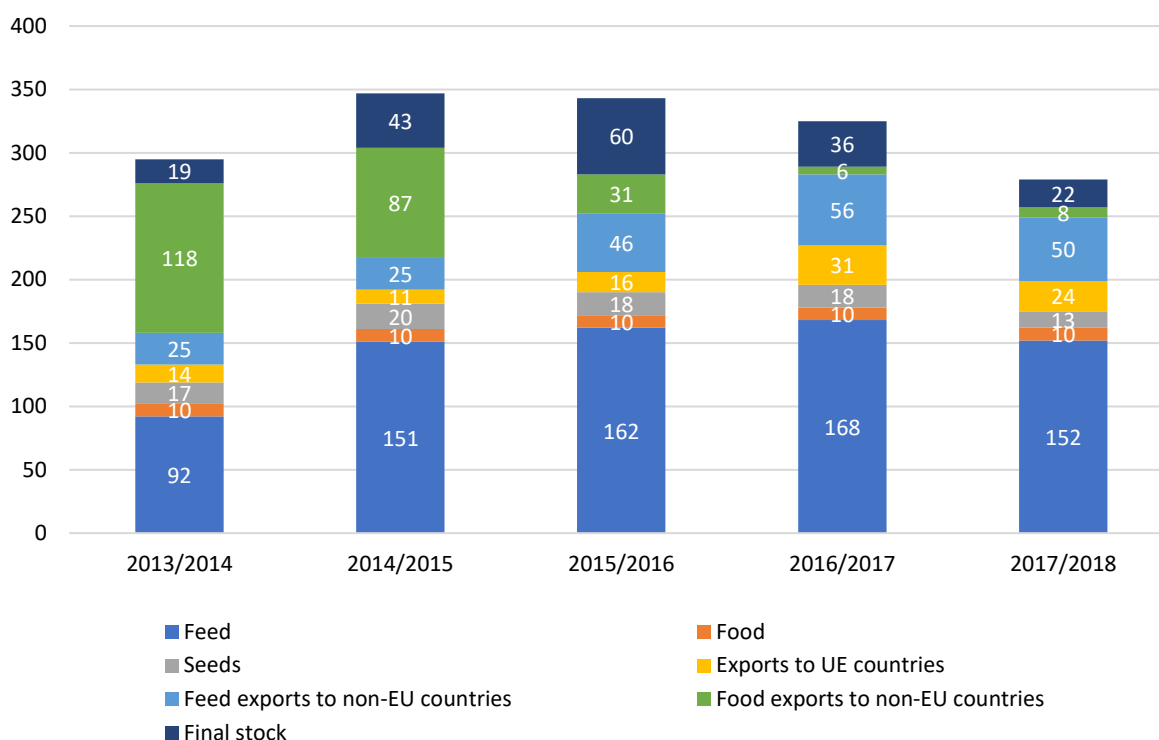


Figure 15: Uses of field bean (1 000 tons) from 2013/2014 to 2017/2018. (Terres Univia, FranceAgrimer and Eurostat).

• The imports

Annual imports were limited from 13 000 tons to 15 000 tons between 2013 and 2016 before jumping at 31 296 tons (11 % of the grain resource) in 2017. Imports came from UE-countries but the contribution of each of them fluctuated. Hereby, UK was the first supplier of field beans in France. (Eurostat).

Tableau 5: imports of field bean (t) to France between 2013/2014 and 2017/2018. (Eurostat).

	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
Imports	14 890	13 204	15 235	15 082	31 296
UE countries	14 357	12 600	14 857	14 615	30 727
Denmark	0	6 600	2 953	3 000	0
Estonia	0	0	2 970	0	3 101
Italy	938	883	1 276	1 551	763
Leetonia	4 511	0	0	0	0
Lithuania	38	3 697	3 554	999	10
Spain	1 448	901	891	1 527	848
Sweden	4 310	0	0	0	0
UK	2 954	183	3 033	7 248	25 713
Non-UE countries	533	604	378	467	569

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement N°727672

- **The export markets**

On the feed export market, grains are exported dehulled to rise their protein content to Norwegian fishing farms. This market increased from 25 000 tons (8 % of the grain uses) in 2014 to 50 000 tons (18 %) in 2017. (Terres Univia). It is now expected to be stable as the amount of exported dehulled grains corresponds to the processing capacity of the Soufflet factory, the French producer of dehulled field beans based at Rouen harbor. (Expert).

Food exports decreased from a record 245 000 tons in 2010 to 8 000 tons in 2017 because bruchid damaged the visual appearance of the grains. Bruchid grains could not be sold on the Egyptian food market and were downgraded and sold on the Norwegian feed market.

There are several criteria to meet for grains exported as food to Egypt (expressed in maximum percentage per grain lot) in addition to the level of grains damaged by insects such as bruchid (5 %) such as the grain moisture content (15 %), the grain dockage (1 %) and the level of broken grains (5 %)⁴¹. Moreover, grains must have a uniform size and a beige color. (Terres Univia).

Terres Inovia (2018a) conducted an annual survey on the quality of the grains and evaluated that 80% of grain lots had more than 1 % of bruchid grains in 2016. This situation improved in 2017 with 40 % of grain lots under 1 % of bruchid grains (similar situations in 2013 and 2015) but was still serious for all producing regions. There is for now no effective solution to control bruchid population on the field (withdrawal of molecules and limitation of the number of treatments). Moreover, Terres Inovia (2018a) evaluated the moisture content around 14 % and calculated that 62 % of the grain lots had less than 1 % of dockage before grain sorting, 60 % of them had less than 1 % of broken grains and 90 % of them had grains with a uniform size and beige color in 2017.

Tableau 6: exports of French field bean (t) between 2013/2014 and 2017/2018. (Eurostat).

	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
Exports	156 517	123 340	92 837	92 513	82 309
UE countries	13 871	10 910	15 641	31 068	24 183
Belgium	4 324	2 678	4 130	9 438	5 229
Italy	5 401	6 097	4 955	9 195	7 834
Spain	3 058	1 545	2 590	2 778	3 585
Netherlands	966	516	2 698	8 702	6 896
Non-UE countries	142 646	112 430	77 196	61 445	58 126
Egypt	117 603	87 034	30 796	5 791	8 214
Morocco	0	0	0	0	2 300
Norway	25 035	25 352	46 364	55 598	47 570

⁴¹ These numbers may be slightly different depending on the contract.

- **The national feed markets**

The national feed market increased from 92 000 tons (31 % of the grain uses) in 2013 to 151 000 tons (44 %) in 2014 before stabilizing at 162 000 tons (47 %) in 2015 and 168 000 tons (52 %) in 2016. It reached 152 000 tons of grains (54 %) in 2017⁴². (Terres Univia).

Some of the grains are produced and consumed on the farm while another part of the grains is processed into compound feedstuff. Terres Univia gives an estimation of the part of the production used on the farm as feed and seeds subtracting the produced and the collected tonnage. The part of the production used on the farm represented 28 % of the overall annual production at its lowest in 2013 and 39 % of the overall annual production at its highest in 2017. (Terres Univia). On another hand, Agrosynergie (2018) estimated based on a case study that there were 25 % of the production used on the farm in 2015.

Agreste (2017) conducted a survey among feed producers on the amount of each raw material processed into compound feedstuff⁴³ and there were 35 900 tons of field bean grains processed into compound feedstuff in 2015 which is small compared to the overall tonnage used in the feed sector. The share of field bean in compound feedstuff was limited to 0.2% far behind cereals (48.2 %) and oilseed meals (29.6 %).

There are several criteria to meet for the grains to be sold in the national feed sector (expressed in maximum percentage per grain lot) including the grain moisture content (16 %), the grain dockage (4 %), the level of broken and bruchid grains (10 %)⁴⁴. (Terres Univia). Moreover, the nutritional profile of the grains including their protein content is more important in the feed sector than in the food sector and is expected to be high. (Expert).

Terres Inovia (2018a) conducted a study on the quality of the grains⁴⁵ and evaluated that the protein content was around 29.9 % of dry matter in 2017 compared to an average of 28.7 % of dry matter between 2013 and 2017.

There is no information about the part of the grains used in the pet food segment but it would be interesting to know more about the use of field bean in this market segment. However, the part of the grains used in the pet food segment is expected to be lower for field bean than for field pea. (Expert).

⁴² The estimation of the amount of grains used in the feed sector is based on the difference between grain resources and grain stocks, exports, the estimated seed use and the estimated food use. It tends to be overestimated.

⁴³ Agreste conducted a survey in 2015 among all the French feed producers that had an annual compound feedstuff production superior to 5 000 tons (representing 99 % of the French compound feedstuff production) and got a response rate of 98.9 %.

⁴⁴ These numbers may be slightly different depending on the contract.

⁴⁵ This study is based on 68 samples collected through all the country.

- **The national food markets**

Field beans can be used as grains or processed into food products and functional ingredients.

On the national food market, field bean is used in the milling and in the baking sectors in the form of flour and functional proteins. Field bean flour can thus be added to wheat flour to whiten and strengthen the bread.

It is a stable market that represented 10 000 tons (4 % of the grain uses) in 2017. (Terres Univia).

There are several criteria to meet for the grains to be sold in the national food sector (expressed in maximum percentage per grain lot) including the grain moisture content (16 %), the grain dockage (4 %), the level of broken and bruchid damaged grains (10 % including 1 % of bruchid grains)⁴⁶. (Terres Univia).

Field bean proteins accounted for 4 % of the overall plant proteins used in processed food products in 2017. They were mainly found in the bakery section (53 %) and the “salted food products” shelf (34 %). (GEPV, 2018).

- **The seed market**

There are 3 seed breeders named Agri Obtentions, RAGT and Limagrain.

There are 29 varieties including 14 winter field bean varieties in 2019. (GEVES). Varietal selection is limited.

The number of hectares under contract for multiplication of field bean seeds was stable from 2014 to 2017 but it raised in 2015 (3 212 ha) such as the total surface of field bean. (Gnis, 2019a).

The ratio between farm seeds and certified seeds is stable with 80 % of farm seeds and 20 % of certified seeds. (Expert).

Production and exports decreased between the 2014/2015 and the 2017/2018 campaigns. On another hand, imports increased over the same time period. (Gnis, 2019a).

Table 12: surface area (ha), production (q), imports (q) and exports (q) of field bean certified seeds from 2013 to 2017. (Gnis, 2019a).

	2014	2015	2016	2017
Surface area (ha)	2 482	3 212	2 920	2 946
Production (q)	81 944	59 531	49 516	42 219
Imports (q)	1 669	2 496	2 726	3 908
Exports (q)	3 062	1 629	817	722

⁴⁶ These numbers may be slightly different depending on the contract.

- **The organic market**

The number of hectares of organic field bean increased from 7 342 hectares⁴⁷ in 2013 to 17 005 hectares⁴⁸ in 2017. This represented 11 % in 2013 and 21 % in 2017 of the total cultivated area.⁴⁹ (AgenceBio). Strong demand and deficit in production thus encourage producers to grow organic field bean. Main producing regions included Occitanie, Nouvelle Aquitaine and Centre Val de Loire in 2017. (AgenceBio).

Table 13: field bean surface area (ha) in conversion to organic farming and certified in organic farming from 2013 to 2017. (AgenceBio).

	2013	2014	2015	2016	2017
Certified Surface Area	6 316	9 024	9 154	9 656	10 033
Surface Area in conversion and certified	7 342	10 769	12 467	16 056	17 005

FranceAgrimer conducted a mail survey among farmers⁵⁰ on the yield and the varietal distribution of field bean. The yield was estimated at 20 q/ha in 2017. There were 25 varieties of field bean used in organic production. The most common varieties were all winter field bean varieties named IRENA (29 %), DIVA (21 %), AXEL (12 %), OLAN (8 %) and CASTEL (6 %) in 2017. AXEL is the most recent one (2014) while OLAN and CASTEL have been registered in the Official Catalogue of plant varieties in 1991 and 1987. IRENA surface area decreased from 40 % in 2016 to 29 % in 2017 but it was still the most common one. DIVA and CASTEL surface areas increased from 7 and 3 % IN 2015 to 21 and 12 % in 2017. (FranceAgrimer, 2018).

There were 16 810 tons of organic field bean on the national market over the 2016/2017 campaign including the collected tonnage (11 963 tons), the stocks (1 969 tons) and the imports (2 878 tons). Moreover, 13 560 tons were used in feedstuff compounds and 593 tons were used as seeds. The exports represented 450 tons.⁵¹ (FranceAgrimer, 2018).

⁴⁷ It includes 1 026 hectares in conversion to organic farming.

⁴⁸ It includes 6 972 hectares in conversion to organic farming.

⁴⁹ These numbers coming from a compilation of departmental data can be underestimated because of the statistical secrecy operating at the departmental level.

⁵⁰ FranceAgrimer conducted a mail survey in 2018 among French farmers producing cereals, oilseeds and protein-rich plants which are certified in organic farming or which are in their second year of conversion to organic farming and got 1 269 questionnaires back corresponding to a response rate of 18 %.

⁵¹ Provisional figures.

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The prices of field bean exported as food to Egypt is compared to the price of wheat. Field bean prices decreased between 2012 and 2017. When French field bean stopped being exported to Egypt because of their poor visual appearance, the price of food field bean dropped to meet the prices of feed field bean. The peak during the year 2012 correspond to the prices of exported food field bean as the Soufflet factory was not operating yet. (Terres Univia).

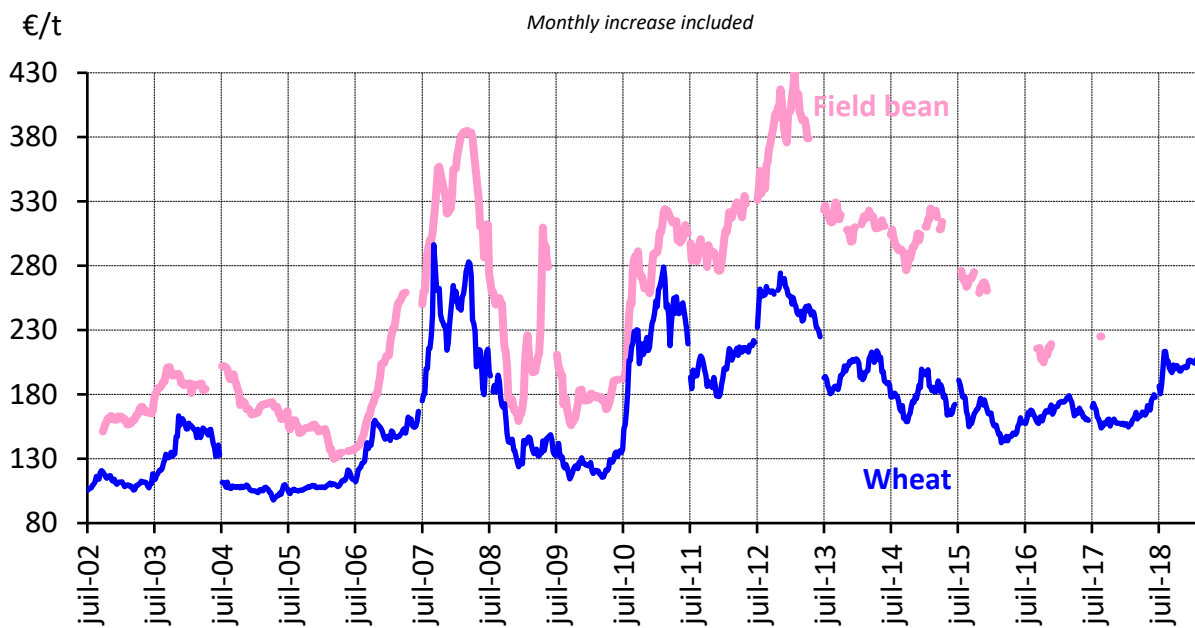
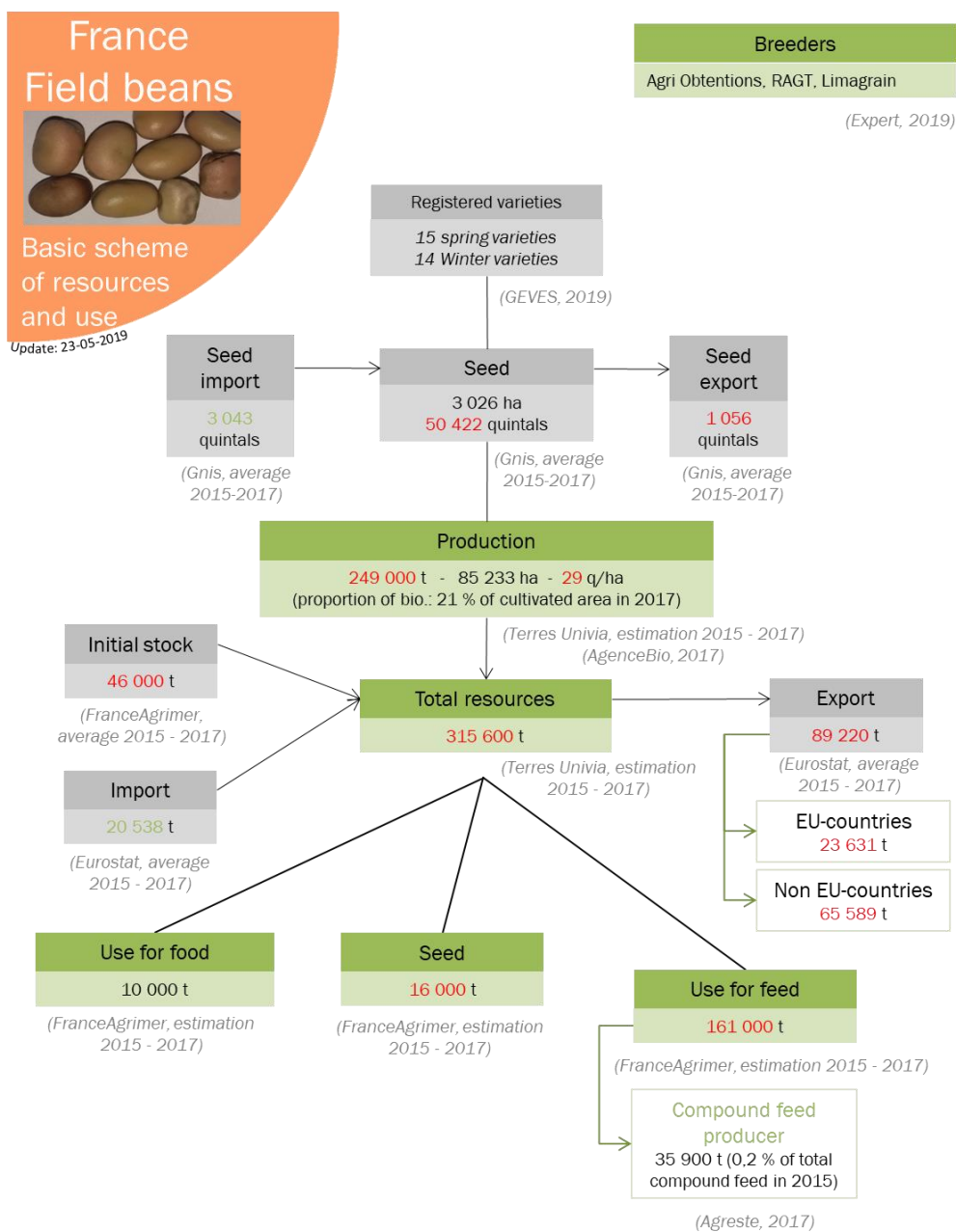


Figure 16: prices (€/t) of (food) field bean (rendu Rouen) between July 2002 and July 2018. (Terres Univia).

Scheme of resources and uses



Scheme modified to COSELG (2016-2017)

Figure 17: scheme of resources and uses of field beans. (Terres Univia, GEVES, Gnis, AgenceBio, FranceAgrimer, Eurostat, Agreste, expert).

Green number = upward trend

Red number = downward trend

Black number = constant trend

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French lentil production is marginal on the world market. (FAO).

LENTIL

SURFACE AREA 2017

33 881 ha

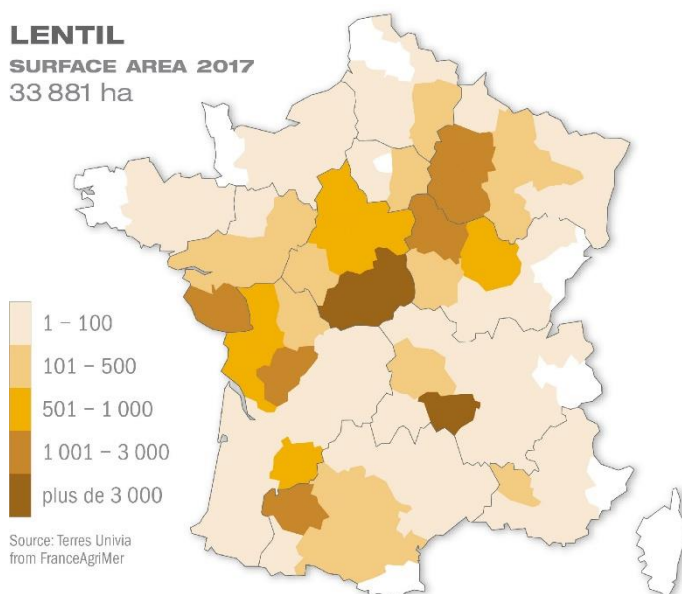


Figure 18: map of lentil surface area in 2017. (Terres Univia from FranceAgrimer).

Lentils are mainly cultivated in Auvergne, Centre and Champagne regions. The lentil surface area increased from 14 000 hectares in 2013 to 34 000 hectares in 2017 with an increase of 62 % between 2016 and 2017. (FranceAgrimer).

On another side, there were 8 204 hectares engaged in organic production (including 893 hectares in conversion) in 2017 corresponding to 24 % of the lentil surface area.⁵² (AgenceBio).

Most of the lentils produced in France are green lentils while there is a small production of coral lentils located in the Champagne region. (Expert).

Table 14: lentil surface area (ha) from 2013/2017 to 2017/2018. (FranceAgrimer).

	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
Surface area	14 282	16 568	17 186	20 924	33 803

Table 15: lentil surface area (ha) in conversion to organic farming and certified in organic farming from 2013/2014 to 2017/2018. (AgenceBio).

	2013	2014	2015	2016	2017
Certified Surface Area	3 842	4 753	4 883	5 398	7 311
Surface Area in conversion and certified	3 906	4 806	4 988	5 720	8 204

There is no lentil breeders and breeding programs. There is only one green lentil variety called *Anicia* that is sold by Agri Obtentions, a branch of the “Institut National de la Recherche Agronomique” (INRA). (Expert).

⁵² These numbers coming from a compilation of departmental data can be underestimated because of the statistical secrecy operating at the departmental level.

France is a net importer of lentil. The volumes and the origin of imported lentils are stable. There were around 30 000 tons of lentils imported from Canada (41 %), the first world producer and exporter of lentils, and from China (37 %) between 2013 and 2017. Imports from other EU countries were limited. (Eurostat).

Table 16: imports of lentil (t) to France between 2013/2014 and 2017/2018. (Eurostat).

	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
Imports	30 322	29 845	31 761	27 888	29 073
EU countries	1 673	2 066	1 219	1 872	2 678
Spain	1 079	620	475	620	740
Non-EU countries	28 649	27 779	30 542	26 016	26 395
Canada	11 908	13 819	12 438	10 227	13 110
China	12 907	10 925	14 176	10 175	7 049
USA	1 424	1 125	1 612	2 203	1 747
Turkey	1820	1 649	2 121	2 552	3 546

Exports were limited compared to the imports slowly going from 2 003 tons in 2013 to 5 005 tons in 2016. Lentils were mainly exported to other EU-countries between 2013 and 2016. (Eurostat).

Table 17: exports of lentil (t) from France to other countries between 2013/2014 and 2016/2017. (Eurostat).

	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
Exports	2 003	2 482	3 907	5 005	5 803
EU countries	1 290	1 829	3 387	4 248	4 629
Belgium	257	291	554	968	818
Germany	213	279	477	608	479
Italy	11	65	237	396	785
Spain	284	220	1 149	869	839
UK	314	261	478	682	1 187
Netherlands	24	508	153	406	158
Non-EU countries	713	653	520	757	1 174
USA	376	303	215	314	567

The production is used as food (dried, canned and incorporated into food products). The part of the production downgraded and sold as feed is negligible.

Imported lentils are more adapted to canning than French lentils and are thus canned or processed into food products (Expert) while the French production under designation of origin is sold dried on higher value (national and international) markets. Amongst them Lentille de France, Lentille verte du Berry which is under a Protected Geographical Indication (PGI) and Lentille verte du Puy which is under a Protected Designation of Origin (PDO) can be cited. (Agrosynergie, 2018).

Retailers are more and more looking for French produced lentils because of the growing consumer trend towards eating locally grown food. (Expert).

The Association Des Entreprises de Produits Alimentaires Elaborés or ADEPALE⁵³ (2018) conducted a survey among the member companies of the Fédération Nationale des Légumes Secs (FNLS)⁵⁴ to describe lentils sold in France in 2017⁵⁵. Lentil was the best sold pulse in 2017 representing 50 % of the sales before beans (27 %) and peas (22 %). There were 59 % of green lentils, 34 % of blond lentils and 7 % of red and coral lentils. Green lentil sales increased by 12 % between 2016 and 2017 but blond, red and coral lentil sales slowed down. Most of them were sold to supermarkets (50 .4 %) and to process industries (31.2 %) or on the out-of-home catering market (18.4 %). Supermarkets are the first outlet because consumers can cook non-processed lentils fast (no soaking needed and a short cooking time).

Based on an interview with a representative from the Association Nationale Interprofessionnelle des Légumes Secs (ANILS)⁵⁶, Agrosynergie (2018) evaluated the producer price of various lentil designations : conventional Lentille de France (500 €/t), organic Lentille de France (600-700 €/t), Lentille verte du Berry (600 €/t), Lentille verte du Puy (2 000 €/t) and organic Lentille verte du Puy (2500 €/t).

⁵³ ADEPALE is an association of food processing companies.

⁵⁴ FNLS is the French association of dried pulses.

⁵⁵ The results are based on 32 470 tons of lentils.

⁵⁶ ANILS is the French interbranch organization of dry legumes.

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French chickpea production is marginal on the world market. (FOP, 2019).

CHICKPEA
SURFACE AREA 2017
19 553 ha

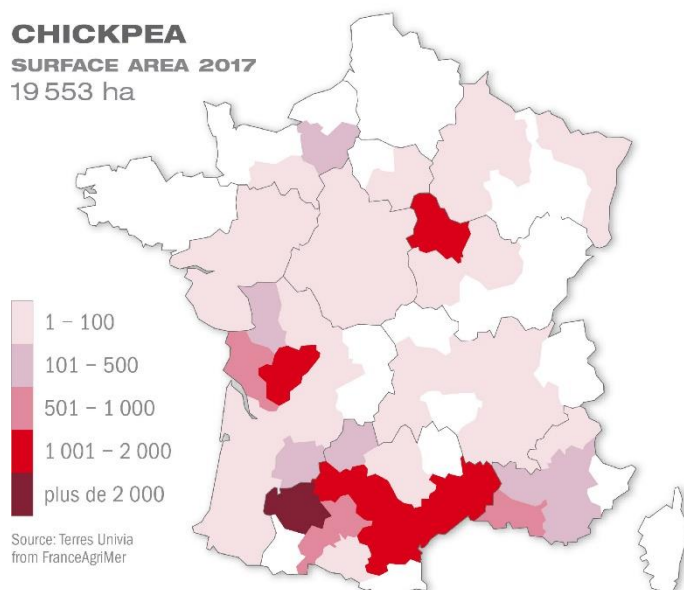


Figure 19: map of chickpea surface area in 2017. (Terres Univia from FranceAgriMer).

Chickpeas are mainly cultivated in the South of France because of their adaptation to the Mediterranean climate. The chickpea area has been increasing from 237 hectares in 1993 to 19 548 hectares in 2017. (FranceAgrimer). It jumped by 105 % between 2016 and 2017 because of attractive prices and the development of a regional chickpea sector in southwestern regions. (Expert).

On another side, there were 4 569 hectares engaged in organic production (including 520 hectares in conversion) in 2017 which represented 23 % of the chickpea surface area.⁵⁷ (AgenceBio).

Most of the chickpeas produced in France are Kabuli chickpeas (big yellow grains) and are sold dried or incorporated into food products. There is a small production Dasy chickpeas (small colored grains) that are better for caning. (Expert).

Table 18: chickpea surface area (ha) from 2013/2014 to 2017/2018. (FranceAgrimer).

	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
Surface area (ha)	8 506	8 627	8 893	9 538	19 548

Table 19: chickpea surface area (ha) in conversion to organic farming and certified in organic farming from 2013/2014 to 2017/2018. (AgenceBio).

	2013	2014	2015	2016	2017
Certified Surface Area	720	984	1 220	1 943	4 049
Surface Area in conversion and certified	887	1 092	1 449	2 240	4 569

There is no chickpea breeders and breeding programs. Chickpea varieties come from cultivars created by INIAV (Portugal) through lines coming from the International Center for Agricultural Research in the Dry Areas (IRCADA). (Expert).

⁵⁷ These numbers coming from a compilation of departmental data can be underestimated because of the statistical secrecy operating at the departmental level.

Imports increased from 4 311 tons in 2015 to 11 509 tons in 2017. Chickpeas were mostly imported from non-EU countries such as India and Mexico. (Eurostat).

Table 20: imports of chickpea (t) to France between 2013/2014 and 2017/2018. (Eurostat).

	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
Imports	6 061	5 776	4 311	7 929	11 509
EU countries	1 630	1 159	1 224	2 845	2 634
Belgium	294	213	231	253	332
Italy	253	60	444	386	525
Spain	137	186	262	1 211	995
Netherlands	632	343	15	544	48
Non-EU countries	4 431	4 617	3 087	5 084	8 875
India	3 262	2 622	2 001	1 878	863
Mexico	599	1 342	630	1 339	1 484
Argentina	80	310	0	509	1 183
USA	121	1	38	178	4 945
Canada	0	0	9	692	83

Exports increased from 1 578 tons in 2013 to 14 070 tons in 2017. Chickpeas were mostly exported to EU countries such as the United Kingdom and Belgium. (Eurostat).

Table 21: exports of chickpea (t) from France to other countries between 2013/2014 and 2017/2018. (Eurostat).

	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
Exports	1 578	2 723	6 200	7 737	14 070
EU countries	1 558	2 679	5 707	7 573	12 585
Belgium	220	679	906	2 319	2 670
Germany	264	436	601	433	929
Hungary	126	201	305	374	594
Italy	2	134	870	733	427
Spain	165	348	846	774	1 560
Netherlands	78	136	641	720	2 436
UK	674	615	1 351	2 036	3 491
Non-EU countries	20	44	493	164	1 485
Algeria	6	1	8	10	147
India	0	0	460	0	528
United Arab Emirates	0	0	0	0	375

The production is used as food (dried, canned or incorporated into food products). The part of the production downgraded and sold as feed is negligible.

ADEPALE (2018) conducted a survey among the member companies of FNLS to describe the amount of chickpeas sold in France in 2017⁵⁸. Chickpea represented 13 % of pulse sales and chickpea sales had been increasing since 2014. Most of it was sold to process industries (57.5 %) then to supermarkets (25 %) and on the out-of-home catering market (17.5 %). Process industries are the first outlet because chickpeas have a large soaking and cooking time and are thus processed to reduce their preparation time.

Retailers are more and more looking for French produced lentils because of the growing consumer trend towards eating locally grown food. (Expert).

Agrosynergie (2018) estimated the price ratio between organic and conventional production at 2.1 based on collector prices of 2015.

⁵⁸ The results are based on 8 435 tons of chickpeas.

France was the third European producer of lupin (15 000 tons) far behind Poland (205 000 tons) and Germany (53 000 tons) in 2017. (Terres Univia). Poland and Germany are favoring narrow leaved lupin (*Lupinus angustifolius*) and yellow lupin (*Lupinus luteus*) while France is producing white lupin (*Lupinus albus*).

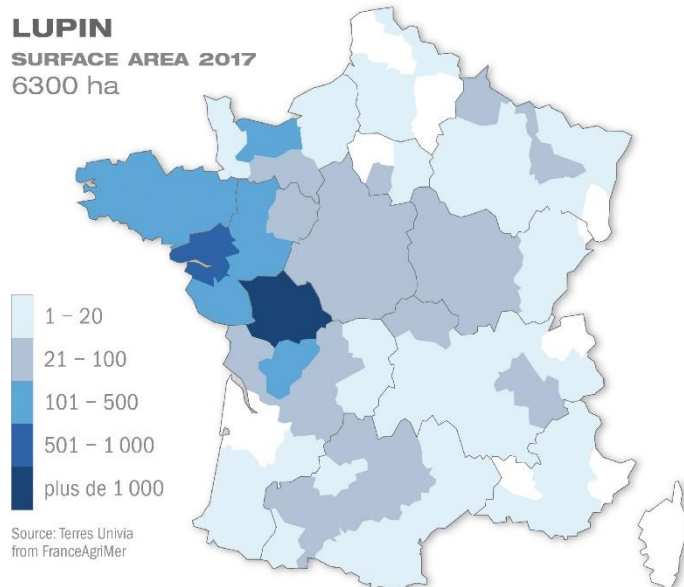


Figure 20: map of lupin surface area in 2017. (Terres Univia from FranceAgrimer).

organic farming and in conversion to organic farming increased from 191 hectares⁵⁹ in 2012 to 893 hectares⁶⁰ in 2017.⁶¹ (AgenceBio).

Lupin is mainly grown on the western part of France including Pays-de-la-Loire and Poitou-Charentes regions. Lupin area increased between 2013 (2 900 hectares) and 2016 (8 400 hectares) but fell at 6 300 hectares in 2017 because of a lack of interest for this crop and the crop protection product ban on EFA. (FranceAgrimer). The average yield was around 24.6 q/ha between 2013 and 2017 reaching a maximum of 28.5 q/ha in 2014 and a minimum of 22 q/ha in 2016. (SSP). The annual production increased between 2013 (7 000 tons) and 2016 (18 500 tons) but dropped at 14 800 tons in 2017 following the same trend as the surface area. (Terres Univia).

The number of hectares certified in

Table 22: lupin surface area (ha), yield (q/ha) and production (t) from 2013/2014 to 2017/2018. (Terres Univia with FranceAgrimer and SSP).

	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
Surface area (ha)	2 900	4 300	7 100	8 400	6 300
Yield (q/ha)	24	28.5	25	22	23.5
Production (t)	7 000	12 300	17 800	18 500	14 800

⁵⁹ It includes 14 hectares in conversion to organic farming.

⁶⁰ It includes 164 hectares in conversion to organic farming.

⁶¹ These numbers coming from a compilation of departmental data can be underestimated because of the statistical secrecy operating at the departmental level.

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Table 23: lupin surface area (ha) in conversion to organic farming and certified in organic farming from 2013 to 2017. (AgenceBio).

	2013	2014	2015	2016	2017
Certified Surface Area	177	312	209	283	729
Surface Area in conversion and certified	191	357	331	453	893

Lupin can be used as feed and as food in the form of functional ingredients. For example, lupin is used in baking and meat processing activities in the form of flour and functional proteins. Lupin proteins accounted for 1 % of the overall vegetable proteins used in food products in 2017. (GEPV, 2018). Inveja – Lup'ingredients is a main actor in the lupin sector. It processes about 10 000 tons of lupin (Expert) into functional ingredients and has obtained a patent for lupin proteins production process Protilup 450. (Schneider A., 2015). Expanscience on another side produces lupin peptides and lupin oil for cosmetic industries. (Schneider A., 2015).

Imports coming from the Netherlands became important compared to the national production in 2015 while exports were marginal between 2013 and 2017. The Netherlands were in fact the first EU importer of lupin between 2015 and 2017. Most of these imports came from Australia. (Eurostat).

Table 24: imports and exports of lupin (t) between 2013/2014 and 2017/2018. (Eurostat).

	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
Imports	773	7 117	11 591	10 962	11 527
Exports	76	87	181	101	112

On the seed market, the number of hectares under a contract for the multiplication of lupin seeds was on average around 382 hectares between 2014 and 2017. Seed imports were marginal while seed exports increased between 2013/2014 (754 quintals) and 2015/2016 (1 202 quintals) before falling at 745 quintals in 2016/2017.

Table 25: Surface area (ha), production (q), imports (q) and exports (q) of white lupin certified seeds from 2013 to 2017. (Gnis, 2019a).

	2014	2015	2016	2017
Surface area (ha)	361	352	474	342
Production (q)	9 073	10 010	7 561	8 489
Imports (q)	7	5	0	0
Exports (q)	913	1 202	745	931

Data presented in this chapter correspond for the surface area to the surface area of dehydrated fodder and for the production to the production of dried fodder but one can consider these data to be true for dehydrated alfalfa because alfalfa is the main dried fodder.

The surface area intended to produce dehydrated alfalfa was stable between 2014 and 2018 (67 969 ha). (Terres Univia). In an interview, the representatives of Coop de France déshydratation⁶² and Desialis⁶³, mentioned their willingness to increase this surface area by 40 000 hectares in the next years which would represent 4 000 more producers and 6 to 10 more dehydration factories. (A. Carpon, 2018).

DEHYDRATED FODDER SURFACE AREA 2017 67 072 ha

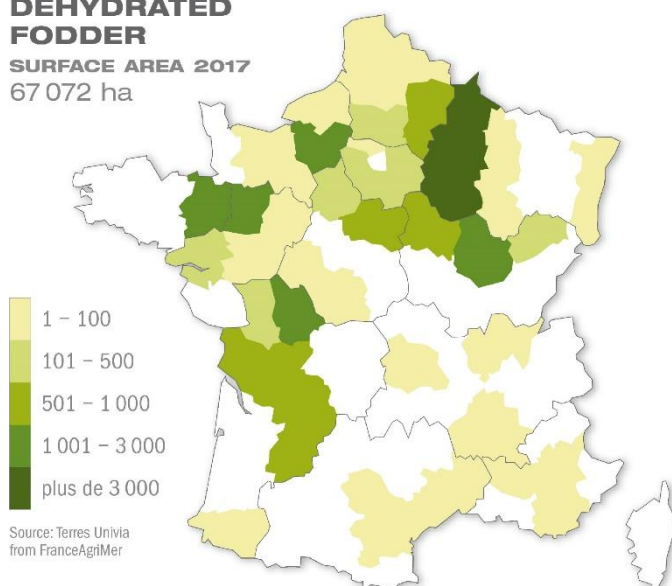


Figure 21: map of dehydrated fodder surface area in 2017. (Terres Univia from FranceAgrimer).

Alfalfa is then dehydrated in one of the 27 French dehydration factories. (Coop de France déshydratation, 2018).

The yield was higher in north eastern regions (13 t of Dried Matter/ha) while the south western regions had a lower yield (7t of DM/ha) but were more engaged into organic production. (Coop de France déshydratation, 2018).

Dehydrated alfalfa is used as feed in the form of pellets or hay.

Both representatives mentioned a strategy of diversification of the outlets for dehydrated alfalfa including exports to the Arabic peninsula including Saudi Arabia. Saudi Arabia did in fact forbid fodder irrigation in 2019 preventing alfalfa production. (A. Carpon, 2018).

Furthermore, they estimated that France has a deficit of 8 000 to 10 000 tons of organic alfalfa. (A. Carpon, 2018).

Table 26: surface area (ha) and production (Kt) of dehydrated alfalfa in France from 2014 to 2018. (Terres Univia).

	2014	2015	2016	2017	2018
Surface area (ha)	66 500	67 358	68 519	68 935	68 532
Production (Kt)	810	726	745	850	850

⁶² Coop de France déshydratation is a national association of the cooperatives engaged in the production of dehydrated fodders.

⁶³ Desialis is the main European producer of dehydrated products.

This study provided information about French production, imports and feed and food export and national markets.

The surface area of field pea, field bean and alfalfa were stable between 2016 and 2017 while the surface area of soybean and in particular the surface areas of lentil and chickpea experienced a strong increase over this time period. Some species endured on another side a decrease of the yield.

Field pea, soybean, field bean and lupin have both a feed and a food outlet while alfalfa is used as feed and lentil and chickpea are used as food. There were huge imports of soybean and soy meals and a low level of incorporation of field pea and field bean in feed compound feedstuffs compared to cereals and oilseed meals on the national feed market. On the national food market, the production of lentil, chickpea and other dry legumes benefited from the growing demand for French products while the process of functional ingredients represented an interesting outlet for field pea and in smaller proportion for soybean, field bean and lupin. The food export markets are important for some of the species but depend on the visual appearance of the grains, export opportunities and worldwide competition.

Some information is missing such as the uses of the grains exported to EU countries whether it is on the feed or on the food sector and the segmentation of the national feed market with the pet food market segment.

It appears that there is a need to find technical solutions to maintain or increase the production and to improve the visual appearance of the grains on one side and to develop the consumption of vegetable proteins through communication efforts on another side.

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Terres Univia.



List of the interviewed experts

Anne Schneider: coordinator of the mixt technological unit Alter’N, manager of mega-projects on legumes and their ecosystem services at Terres Inovia.

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