Spain
Country profile
Key messages

- Spain has an Agrobiodiversity Index status of 70.5, making it one of the most agrobiodiverse Mediterranean countries.

- In consumption, Spain has high food species diversity relative to other countries in the world, with consumption of fruits, vegetables, and nuts above the global average and diets that are not overly dependent on major staples. In contrast, the consumption of legumes is relatively low, and consumption of whole grains is below average, which can increase diet-related health risks.

- Spain’s levels of livestock breed diversity and crop species richness are among the highest in the world. Its production system is characterized by a highly diverse and relatively evenly distributed crop species diversity. However, its fish species richness is relatively low and livestock species diversity is moderate compared to other countries in the world. Its soil biodiversity, landscape complexity, and natural vegetation are low compared to other Mediterranean countries.

- A significant number of Spanish cultivated and wild species and crop varieties are conserved in genebanks compared to other Mediterranean countries. However, the in situ diversity of its underutilized species (understood as other wild socioeconomically and culturally valuable species) are not well represented in genebanks.
### Pillar 1: Consumption

- **Species diversity:** 76.5
- **Food diversity in supply (Shannon’s Index):** 76.5 (2.9)

### Pillar 2: Production

- **Functional diversity:** 89.7
- **(Avoided) Disability Adjusted Life Years attributable to dietary risks per 100,000 adults:** 89.7 (1,980)

- **Species diversity:** 67.5
- **Crop species richness in production (count):** 82.1 (101.0)
- **Crop species diversity in production (Shannon’s Index):** 72.7 (1.7)
- **Cropland with high crop species richness (%):** 96.5 (96.5)
- **Freshwater fish species richness (average count):** 31.1 (25.9)
- **Livestock breed diversity (Shannon’s Index):** 95.2 (2.9)
- **Livestock breed diversity (Shannon’s Index):** 95.2 (2.9)

- **Underutilized species:** 100.0
- **Energy from sources other than cereals, roots and tubers (%):** 100.0 (73.0)

### Pillar 3: Conservation

- **Species diversity:** 80.3
- **Varietal diversity in genebanks (Shannon’s Index):** 80.3 (4.6)
- **Species diversity in genebanks (Shannon’s Index):** 78.3 (4.9)
- **Crop wild relative occurrence diversity (Shannon’s Index):** 81.0 (5.2)

- **Underutilized species:** 42.0
- **In situ conservation of useful wild species (%):** 82.9 (82.9)
- **Ex situ conservation of useful wild species (%):** 1.1 (1.1)

### Indicators and Sub-Indicators

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Sub-Indicator (raw scores)</th>
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<tbody>
<tr>
<td><strong>Pillar 1: Consumption</strong></td>
<td></td>
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<tr>
<td>Management practices supporting agrobiodiversity: 100.0</td>
<td></td>
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<tr>
<td>Published diet guidelines (Yes/No): 100.0 (1.0)</td>
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<td>Published food composition tables (Yes/No): 100.0 (1.0)</td>
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<tr>
<td><strong>Pillar 2: Production</strong></td>
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<tr>
<td>Diversity-based practices: 95.2</td>
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<tr>
<td>Crop-livestock integration (% agricultural land with cropland and pasture): 90.3 (90.3)</td>
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<td>Integrated landscape initiatives (count): 100.0 (6.0)</td>
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<tr>
<td>Management practices supporting agrobiodiversity: 35.3</td>
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<tr>
<td>Nitrogen use efficiency (kg N output per kg N input): 39.8 (0.4)</td>
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<tr>
<td>Inverted Sustainable Nitrogen Management Index (Index 0 to infinity): 54.5 (36.2)</td>
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<tr>
<td>Organic agriculture (%): 8.6 (8.6)</td>
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<tr>
<td>Tree cover on agricultural land (%): 13.2 (4.0)</td>
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<tr>
<td>(Avoided) pesticide use (kg per ha): 89.3 (3.7)</td>
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<tr>
<td>Conservation agriculture (%): 6.4 (6.4)</td>
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<tr>
<td><strong>Pillar 3: Conservation</strong></td>
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<tr>
<td>Management practices supporting agrobiodiversity: 52.5</td>
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<tr>
<td>Indicators reported to the World Information and Early Warning System on Plant Genetic Resources for Food and Agriculture (%): 52.5 (52.5)</td>
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Context

Spain is a high-income country, with an annual GDP of US$1.393 billion and a GDP per capita of US$29,613 in 2019. Spain’s surface area covers 505,935 km². Around 47 million people inhabit the country, with 81% living mostly in urban areas, and an estimated population density of 94 inhabitants per km² in 2018. Estimates from 2017 indicated that 0.7% of Spain’s population lived below the poverty line, however its multidimensional poverty index has not been assessed.

Consumption for healthy diets

Food consumption in Spain covers a range of food groups. Cereals are mostly consumed as processed flour, except for rice. Butter and cheese are the main dairy products, while pulses and vegetables, such as broccoli, potatoes, eggplant, tomatoes and artichokes, and citrus fruits and apples are frequently consumed (Figure 1). Moderate consumption of meat, including pork, chicken, and lamb, and fish is common. In Spain, an average healthy person lives up to 83 years. In 2019, 3% of the Spanish population was reported to be undernourished and 1.8% and 8.6% were assessed as threatened by severe or moderate to severe food insecurity respectively between 2017 and 2019. The prevalence of stunting and wasting for Spanish children under 5 has not been reported. 13% of females aged between 15 and 49 were reported to be anemic and almost 7% of the population between 20 and 79 were diabetic in 2019. An estimated 22.8% of adult women (aged 18 years and over) and 24.6% of adult men are living with obesity.

Production for sustainable agriculture

About 52.4% of land area in Spain (261,833 km²) is devoted to agriculture, with 45% accounting for arable land (which is split into 65.4% temporary crops, 25.5% temporary fallow, and 9.2% under temporary pastures and meadows) (Figure 2). In 2019, agriculture, forestry, and fishing contributed to 2.7% of Spain’s GDP. Only 4% of the Spanish population is employed in the agricultural sector, and the percentage of female employment is only 2%. Olives (0.6%), grapes (0.4%) and barley (0.1%) are the three main contributors to GDP. The estimated average cereal yield in 2017 was 2,769 kg/ha. In 2016, fish capture production was estimated at about 900,000 tonnes and, in 2018, the estimated aquaculture production was nearly 350,000 tonnes. Eggs, milk, and meat (pig) are the three main animal-sourced foods produced in Spain, with an annual livestock production of above 34 million tonnes.
Conservation for future use options

In Spain, 28% (142,573 km²) of the total land area and 12.8% (128,316 km²) of marine areas are protected. Nearly 37% of Spain’s land area (184,520 km²) was forested in 2015. The net tree cover loss from 2001 to 2019 was 12,300 km², showing a decrease of 11% tree cover since 2000. A total of 1,262 plant and 3,376 animal species have been assessed in Spain for risk of extinction. Of these, 281 plants, 18 mammals and 19 birds are threatened. Spain harbors one of the richest flora of the Mediterranean region. It is a centre of edible and wild plant diversity (Figure 3) and particularly rich in leguminous plants including Trifolium, Medicago, Lupinus and Vicia species.
Agrobiodiversity Index score

Spain has an Agrobiodiversity Index status score of 70.8.

Status: What’s driving the Agrobiodiversity Index score?

For Spain, we see that scores are highest in consumption (88.7), followed by conservation (67.3), and production (55.4). This indicates that agrobiodiversity is relatively effectively used in consumption for healthy diets and conserved for current and future use options, while there is potential for much better use of agrobiodiversity in production for sustainable agriculture. We can take a closer look at the indicator scores to understand what underlies the differences in status of agrobiodiversity across the pillars of Spain’s food system.

Consumption

**Species diversity in diets:** Food species diversity is high in Spain relative to other countries in the world and also compared to other Mediterranean countries. Consumption of fruits, vegetables, and nuts are above global average values. Consumption of legumes species is relatively low and can be increased.

**Functional diversity:** The functional diversity score of 89.7 reflects a moderate number of avoided Disability Adjusted Life Years attributable to dietary risk factors. Consumption of fruits, vegetables, whole grains, legumes, and nuts can be further increased to reduce dietary health risks. Consumption of red meat is high and can be lowered to reduce dietary health risks.

**Underutilized species:** Over 60% of energy in Spanish diets is obtained from sources other than major cereals, roots, and tubers, explaining the maximum score for underutilized species in this category (60% is what we use as a threshold) and indicating that diets are not overly dependent on major staples. This does not mean that the of underutilized and local species is at its maximum but that the diet is not overly dependent on the major staples. Consumption of whole grains is slightly under the average global value, indicating that processing of cereals for human consumption can be further reduced.

There were no data available on varietal diversity in consumption.

Production

**Varietal diversity:** The diversity of livestock breeds maintained in production in Spain is one of the highest in the world. Spain has 52 breeds of sheep in production, 49 of cattle, 23 of pig, 20 of goat, 19 of horse, 15 of chicken, although fewer than eight breeds of other species including only one domesticated duck breed and one camel breed. Keeping multiple breeds in production should help farmers maintain livelihoods in times of pest and disease outbreaks or other production challenges, because different breeds have different resistance to pests and diseases.

**Species diversity:** With 101 distinct commodities in production, crop species richness is high relative to the global maximum of 123 species (in China) and well above average compared to the nine other Mediterranean countries. The area coverage of different crops in production per 10x10 km is evenly distributed, meaning cropped landscapes have a high diversity relative to other countries in the world and compared to other Mediterranean countries. A very high percentage (97%) of agricultural land contains a high diversity of crop species at 10x10 km scales. This does not mean that crop diversity is at its maximum potential level, so seeking ways to enhance crop diversity at field, farm, and landscape levels is recommended to enhance natural pest and disease controls, yield stability, biodiversity, and other ecosystem services. With 26 recorded freshwater fish species, fish richness is low relative to other countries in the world and compared to the nine other Mediterranean countries. Livestock species diversity in production is moderate compared to other countries in the world and average compared to the nine other Mediterranean countries. Actions to boost livestock richness in areas of the country where these are low would help ensure farmers in all regions rely on a wide species base, helping shield them against pests and diseases and other production challenges.
Soil biodiversity: Soil biodiversity is low for most of the country, averaging 0.5 on a scale of 0.11 to 1.35 (representing the minimum and maximum global extremes). Integrated plant nutrient management can help maintain and restore soil health, such as through increased use of cover crops, application of mulch and animal manure, and intercropping with legumes.

Landscape complexity: 29% of Spain’s cropped landscapes have at least 10ha of natural vegetation at 1x1 km scales, which is well below the 100% recommended here, and average compared to the nine other Mediterranean countries. Maintaining natural vegetation in and around cropland helps maintain habitat connectivity and ecosystem functioning to sustain nature’s contributions to agriculture, including reducing the risk of pest and disease outbreaks, maintaining pollinators, and safeguarding crop wild relatives. Establishing at least 10% natural habitat at local (1x1km) and landscape (10x10 km) scales could be achieved on farm through practices such as live fences (trees, hedgerows), woodlots, flower strips and set aside, and off farm by safeguarding portions of natural or semi-natural forests, wetlands, and grasslands around cultivated areas.

There were no data on functional diversity, underutilized species, or pollinator and natural enemies in production.

Conservation

Varietal diversity: Spain has a high score for varietal diversity (80.3), relative to the globally best performing country (France) indicating that a significant number of samples of crop varieties are conserved in genebanks.

Species diversity: The species diversity score is high (79.7), reflecting that a high proportion of Spain’s cultivated and wild species are conserved in genebanks, and a very high diversity of crop wild relative species have been identified growing in-country, relative to other countries in the world.

Underutilized species: Spain has a moderate score (42) for conservation of underutilized species (useful wild species. While 82.9% of useful wild species are conserved in situ, their representativeness in ex situ repositories is very low (1.1%).

There were no data available for functional diversity of genetic resources in conservation.
**Actions: What actions are being taken to maintain and increase agrobiodiversity?**

**Consumption:** Spain has local food-based dietary guidelines and food composition tables in place, supporting the promotion and awareness of the dietary benefits of dietary diversity at functional and species level.

**Production:** Action scores are high (65.3) for agrobiodiversity in production. This score reflects widespread adoption of diversity-based practices together with low adoption of agrobiodiversity-supportive management practices.

- **Diversity-based practices:** Available data indicate that there is high potential for integrated farming in Spain, with 90% of agricultural landscapes (10x10 km areas) containing both cropland and pasture, facilitating crop–livestock integration. This is above average compared to other Mediterranean countries.

- **Production management practices supporting agrobiodiversity:** The environmental efficiency of production is moderate relative to other countries in the world, based on the Sustainable Nitrogen Management Index (SNMI) score. Given that nitrogen use efficiency is relatively low, the moderate SNMI score suggests that improving nitrogen use efficiency is more important than improving land use efficiency (yields) to reduce the environmental impacts of production. Spain has very low levels of pesticide use relative to other countries in the world, estimated at 3.7 kg per hectare, far below the highest global user (28.0 kg per ha in Mauritius). The avoided use of pesticides will be having a positive impact on soil biodiversity, pollinators, and natural enemies of pests, with benefits for agriculture and biodiversity. Trees are integrated into 4% of agricultural land in Spain, which is extremely low relative to other countries in the world and likely reflects the difficulty in sustaining plants that need a lot of water, such as trees, in the arid climates that prevail over much of Spain. Setting aside small areas of farmland for planting functionally and nutritionally diverse trees can provide multiple benefits for farmers in arid climates. Drought-resistant and native tree varieties could be prioritized to minimize water consumption while providing other benefits to farmers. Organic agriculture is practiced on 8.6% of agricultural land and conservation agriculture on 6.4% of arable land, which is very low relative to other countries globally and in the Mediterranean.

**Conservation:** Spain has reported on 52% of the indicators for monitoring progress on the implementation of the second Global Plan of Action on Plant Genetic Resources for Food and Agriculture of the UN Food and Agriculture Organization. An analysis of the data in the plant genetic diversity monitoring system WIEWS maintained by FAO for Spain shows some active conservation actions for its plant genetic resources. It has taken measures to survey and conserve both crop wild relative species and farmer varieties in situ. Spain has also collected a considerable number of samples for long-term conservation in genebanks. Spain’s reporting also shows that
actions have been taken to regenerate their genebank samples, as well as to characterize and evaluate them so they can be used. Efforts have been made to distribute genetic materials from the genebank to various stakeholders, including national research institutes, the private sector, farmers, and foreign stakeholders. Farmer varieties and underutilized species have been identified for potential commercialization. Spain has a good documentation system in place for both in situ conservation of crop wild relatives and for its ex situ collections, with over 150,000 crop samples documented and published on the web.

Commitments: How supportive of agrobiodiversity are national policies?

The commitments analysis was based on Spain’s National Biodiversity Strategy and Action Plan (2011).  

Consumption: Spain’s National Biodiversity Strategy and Action Plan (NBSAP) mentions a few times the important role of agrobiodiversity for nutritious and secure diets. In addition, Spain has a ‘Seed, Nursery Plants and Plant Genetic Resources Law’ which enables the development of a plan to safeguard species and varieties of food plants and animals. The country also has a strategy to document and share the status of genetic resources for agriculture and food, and action plans for using and consuming them. Nonetheless, specific targets or strategies to increase species or varietal diversity in diets are lacking.

Production: Overall, the plan discusses the need for more sustainable management of wild and domesticated aquatic and terrestrial species. The country mentions the importance of putting in place strategies that increase diversity on the farms and in the landscapes where agriculture, aquaculture, and silviculture exist to integrate the linkages between production and conservation further. Strategies targeted at restoring fragmentation and degradation in agricultural landscapes primarily include creating, improving, and maintaining ecological connectivity. The multifunctionality of farms (e.g. food and ecosystem services) is mentioned. Nonetheless, the only specific strategy for on-farm diversification is linked to fostering agroforestry (one mention of hedges). Strategies for improving and protecting soil biodiversity also exist through soil protection and management, and biocontrol (using methods such as naturally occurring predators to manage pests, see agrobiodiversity highlight below) is seen as an environmentally friendly practice that should be further promoted. Organic farming is also mentioned and linked to better livelihoods for farmers, but specific strategies or targets to increase this production system are lacking. Finally, strategies to better monitor local fish and their extraction are also put forward.

Conservation: Targets to safeguard and preserve agrobiodiversity are mainly linked with crop wild relatives and ex situ conservation efforts. Similarly, the country targets better protection of wildlife and local aquatic and terrestrial species in relation to hunting and fishing activities. The NBSAP plan recognizes a lack of actions around in situ conservation.

Credit: Pixabay/Nikolaiy
# Recommendations

This section suggests concrete actions that can be taken to improve the use and conservation of agrobiodiversity for more sustainable food systems (Table 1). The list of actions is by no means exhaustive or prescriptive. It is intended for review, discussion, and improvement by in-country policy specialists.

## Table 1: Recommended actions to enhance agrobiodiversity in the national food system

<table>
<thead>
<tr>
<th>Food system pillar in the Agrobiodiversity Index</th>
<th>Recommendations</th>
<th>Risk and resilience</th>
<th>Global policy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumption for healthy diets</td>
<td>Actively support and maintain the rich species and functional diversity in consumption, e.g. through specific policies and programs linking biodiversity and nutrition. Promote consumption of legumes and whole grains.</td>
<td><a href="#">Diagram</a></td>
<td>SDG2 Zero Hunger SDG12 Sustainable Consumption and Production United Nations (UN) Decade of Action on Nutrition - reducing overweight, obesity and anemia</td>
</tr>
<tr>
<td>Production for sustainable agriculture</td>
<td>Maintain and further increase Spain’s crop richness and livestock breed diversity to ensure resilient productive systems. Promote tree planting on and around farmland, favoring native and drought-resistant varieties, and practices that increase the proportion of natural habitat proximate to farmland, e.g. flower strips, hedgerows, set aside.</td>
<td><a href="#">Diagram</a></td>
<td>Post-2020 CBD Goal 1 No Net Loss SDG 2 Zero Hunger</td>
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<tr>
<td>Conservation for future use options</td>
<td>Greater effort is required to fully report on the progress of conservation and use of plant genetic resources for food and agriculture (PGRFA) in the reporting format of the second Global Plan of Action on PGRFA. Spain possesses a high diversity of minor crops and crop wild relatives so a National Conservation Strategy and Action Plan, involving key stakeholders (from different sectors e.g. environment, forestry, agriculture etc.) should be developed to enhance their conservation and use across the country to fulfill commitments to global conservation treaties, strategies and plans.</td>
<td><a href="#">Diagram</a></td>
<td>Post-2020 CBD Goal 3 Genetic Diversity Post-2020 CBD Goal 4 Nature’s Benefits SDG 15 Life on Land FAO second Global Plan of Action on PGRFA</td>
</tr>
</tbody>
</table>
Agrobiodiversity highlight

**Integrated pest management in horticultural production in Almería**

Almería in Spain hosts one of the world’s largest horticultural areas (approximately 36,000ha). Globally, it is also the location where integrated pest management (IPM) is most widely applied. Farmers release biological control agents, such as aphid-eating wasps or predatory bugs, to reduce the pest pressure on chestnuts, citrus trees, and squashes, among other crops. The release of the biological control agents is strictly monitored and regulated by national and European laws.

In 2013, pests were regulated using biological control on 27,000ha of land (75% of the total area). In 2016, 10,000ha of peppers (nearly 100% of the total), 9,500ha of tomatoes (more than 80%), 3,500ha of cucumbers and substantial areas of zucchini (courgettes), eggplant (aubergine), melon and green beans, among other crops, were managed under biological control practices.

**Sources:** [36]
References

End notes

I. The Convention on Biological Diversity is an international treaty for the sustainable use and conservation of biological diversity. In 2010 it launched a strategic plan, running from 2011 to 2020, with 20 ambitious targets known as the Aichi Targets from the city in which they were signed. The international community has developed new targets, but their signature has been delayed due to the COVID-19 crisis.
The Alliance of Bioversity International and the International Center for Tropical Agriculture (CIAT) delivers research-based solutions that harness agricultural biodiversity and sustainably transform food systems to improve people’s lives.

Bioversity International and CIAT are CGIAR Research Centres.

https://alliancebioversityciat.org/tools-innovations/agrobiodiversity-index