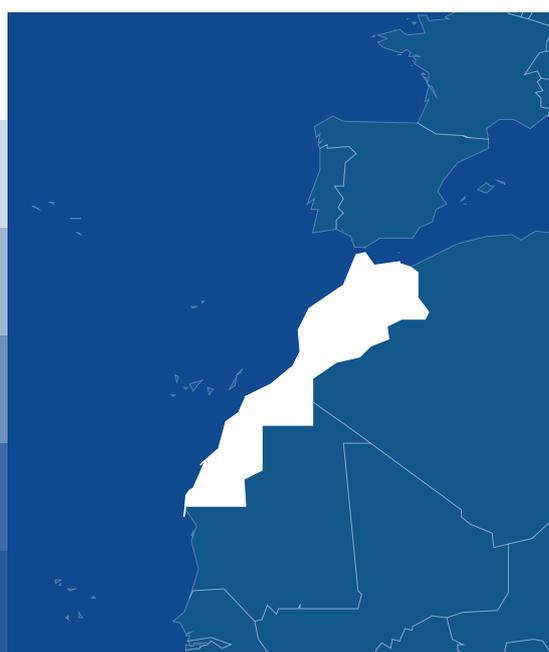


Morocco

Country profile



Key messages

- Morocco has an Agrobiodiversity Index status of 54.1, reflecting a moderate integration of agrobiodiversity into the food system.
- In consumption, while food species diversity is relatively high, diets are heavily dependent on major staple crops and red meat. Consumption of underutilized and local species, nut species and whole grains is relatively low. These dietary patterns contribute to dietary risks.
- The production system is characterized by high livestock breed diversity while crop species and livestock species diversity are moderate, and fish species richness is low compared to other Mediterranean countries. Soil biodiversity is very low. Morocco has low levels of landscape complexity and natural vegetation could be better integrated in and around croplands.
- Although a considerable number of Morocco's species and varietal diversity are conserved in genebanks compared to other Mediterranean countries, the *in situ* diversity of its underutilized species and other useful wild socioeconomically and culturally valuable species are poorly represented in genebanks.

Pillar 1: Agrobiodiversity in consumption for healthy diets
Pillar 2: Agrobiodiversity in production for sustainable agriculture
Pillar 3: Agrobiodiversity in conservation for future use options

Score	41-60
0-20	61-80
21-40	81-100

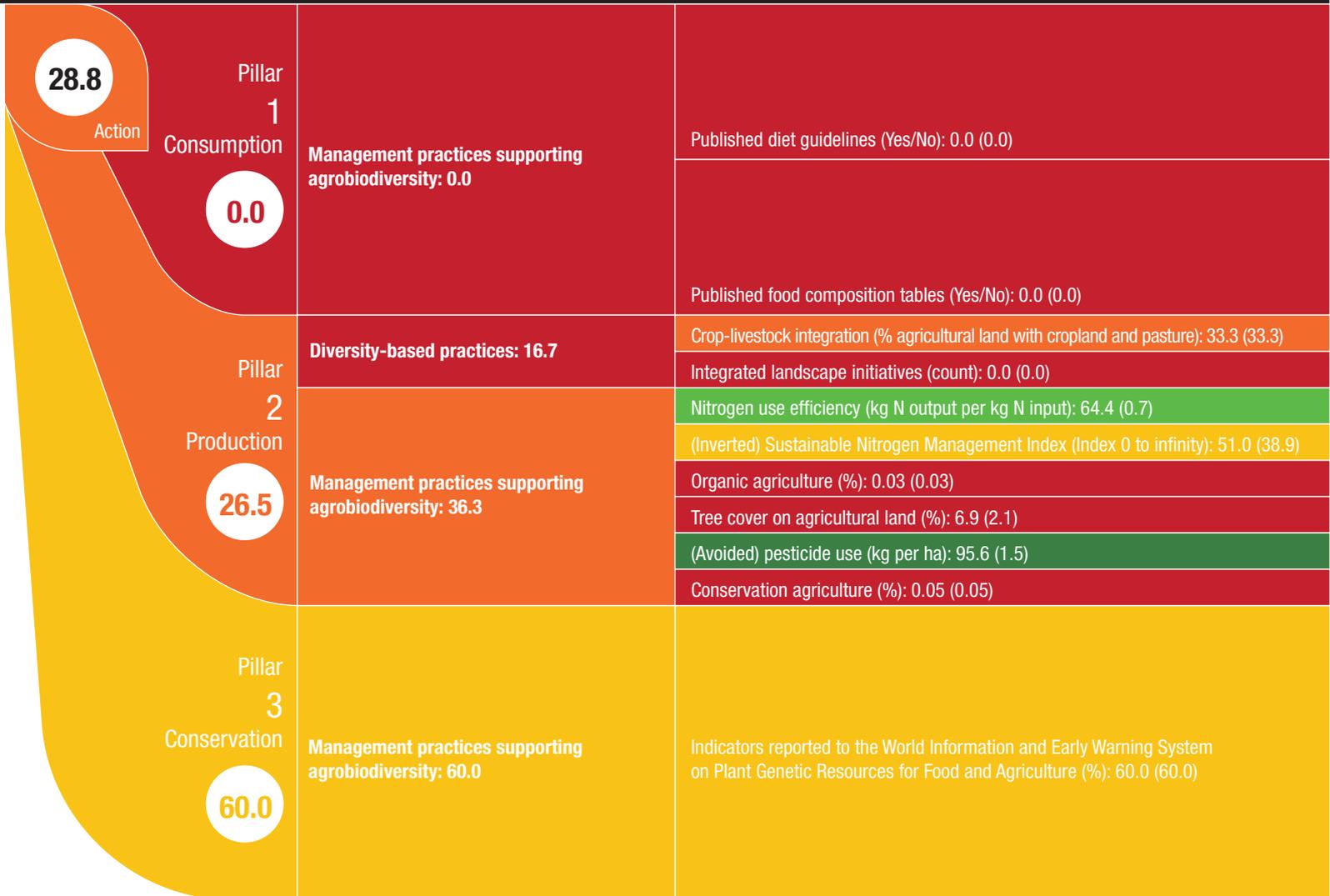
All raw scores are scaled from 0 to 100. See Annex 2 for details.

SUB-INDICATOR (raw scores)	INDICATOR	PILLAR
Overall agrobiodiversity: 0 (0)	Commitments supporting agrobiodiversity: 6.7	Pillar 1 Consumption 6.7
Varietal/breed diversity: 0 (0)		
Species diversity: 33.3 (1)		
Functional diversity: 0 (0)		
Underutilized species: 0 (0)		
Overall agrobiodiversity: 100.0 (3)	Commitments supporting agrobiodiversity: 54.2	Pillar 2 Production 54.2
Varietal/breed diversity: 66.7 (2)		
Species diversity: 0 (0)		
Functional diversity: 66.7 (2)		
Underutilized species: 66.7 (2)		
Pollinator diversity: 0 (0)	Commitments supporting agrobiodiversity: 66.7	Pillar 3 Conservation 66.7
Soil biodiversity: 66.7 (2)		
Landscape complexity: 66.7 (2)		
Overall agrobiodiversity: 66.7 (2)		
Varietal/breed diversity: 66.7 (2)		
Species diversity: 66.7 (2)		
Functional diversity: 33.3 (1)		
Underutilized species: 100.0 (3)		

42.5
Commitment



PILLAR	INDICATOR	SUB-INDICATOR (raw scores)
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Context

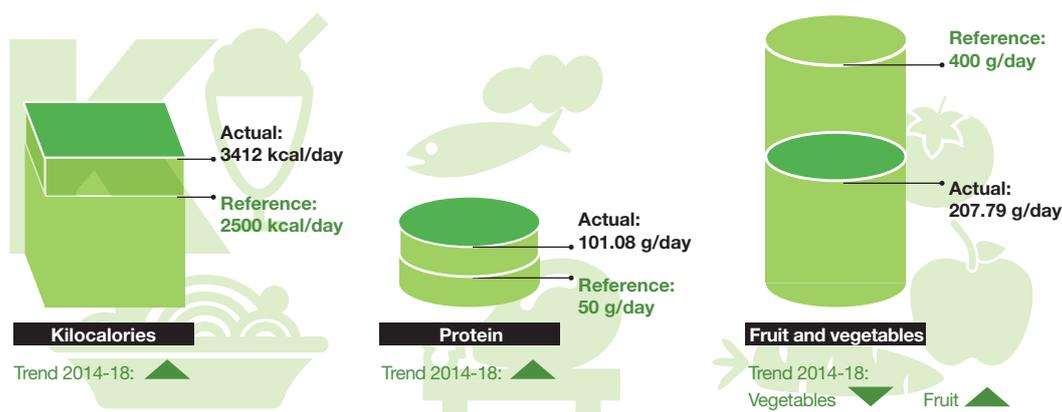
Morocco is a lower middle-income country. In 2019, its annual and per capita GDP were US\$119 billion and US\$3,204 respectively.¹ Morocco's land area covers 446,550 km².² The country's population is over 36 million people,³ with an estimated population density of 81 inhabitants per km² in 2018.⁴ About 63% of Morocco's population reside in urban areas.⁵ Latest estimates, from 2019, indicated that 4.8% of the population lived below the national poverty line,⁶ while data from 2011 estimated 13.1% of the population was vulnerable to multidimensional poverty.⁷

Consumption for healthy diets

The Moroccan diet typically exhibits high to moderate consumption of wholewheat and barley flour, couscous, dairy products, such as cheese and buttermilk, lamb meat, and low intake of rice (Figure 1). Vegetables such as tomatoes, pumpkin, potatoes, and chickpeas, and fruit, especially dates, are commonly consumed, however use of olive oil and tea is low.⁸

In Morocco, the overall life expectancy of an average person is 76 years.⁹ In 2019, 4% of the Moroccan population was reported to be undernourished¹⁰ and 25.9% was estimated to be suffering from moderate to severe food insecurity between 2017 and 2019.¹¹ The prevalence of stunting and wasting for Moroccan children under five was reported as 15.1% and 2.6% respectively in 2017.^{12,13} Around 37% of women aged between 15 and 49 are anemic¹⁴ and 7% of the population between 20 and 79 is diabetic.¹⁵ An estimated 32.2% of adult women (aged 18 years and over) and 19.4% of adult men are living with obesity.¹⁶

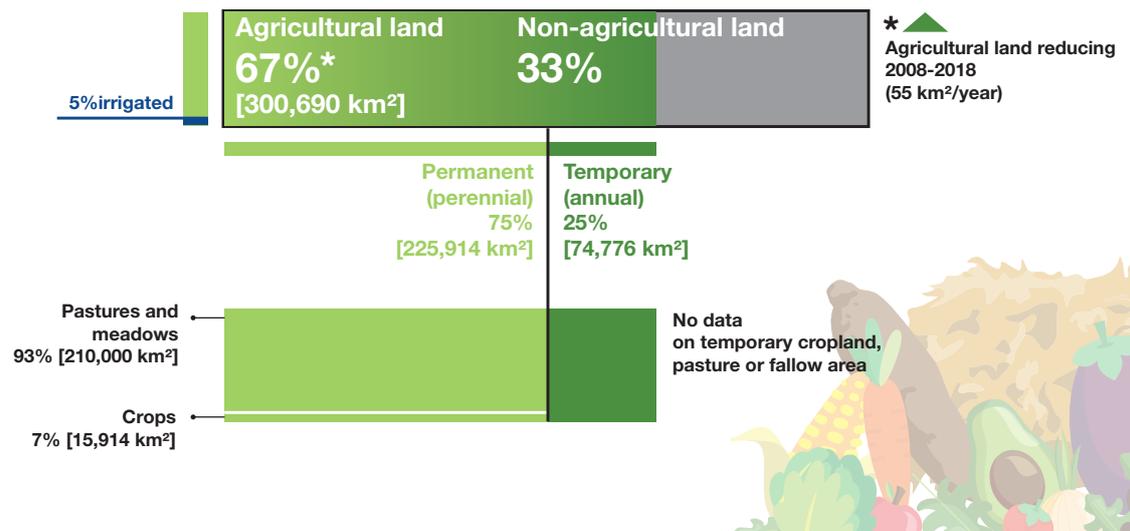
Figure 1: Kilocalorie, protein, fruit and vegetable supply



Production for sustainable agriculture

In Morocco, 67% (300,690 km²) of its total land area is dedicated to agriculture, of which only 74,776 km² is used as arable land, of which 16% is under temporary fallow (Figure 2).^{17,18} The agriculture, forestry and fishing sectors contribute 11.4% of Morocco's GDP.¹⁹ The level of employment in the agricultural sector reaches up to 34% of the overall working population, and of these more than half (53%) are women.^{20,21} The main crops in terms of economic value contributing to annual GDP (in % of total contribution from agriculture) are wheat (1.9%), olives (0.7%), and barley (0.5%).²² The average cereal yield in Morocco is 1,758kg /ha.²³ In 2018, capture fisheries and aquaculture production were estimated at about 1.4 million metric tons and 1,267 tons respectively.^{24,25} In the same year, annual livestock production - with eggs, milk, and meat the three main animal-sourced food produced - was estimated at over 8.4 million tons.²³

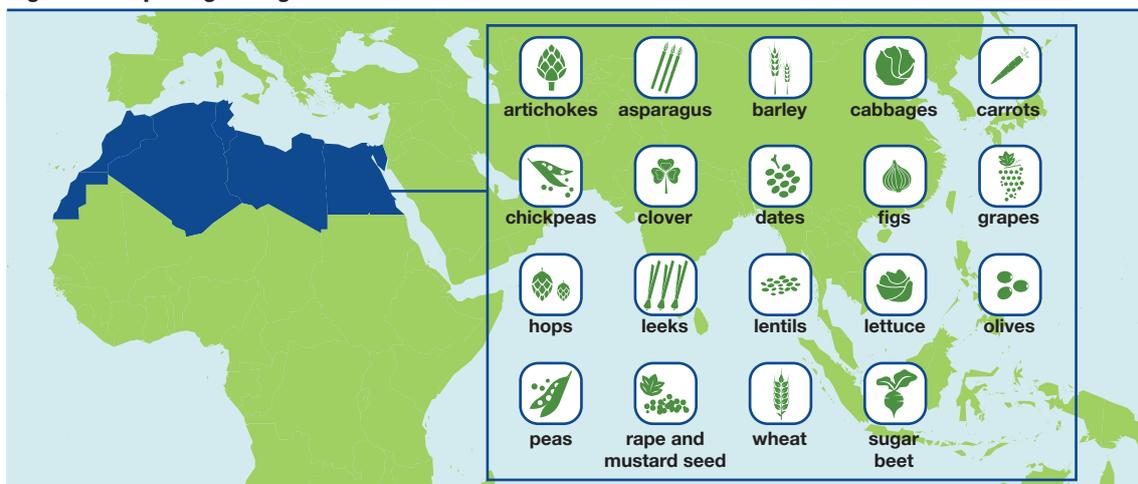
Figure 2: Land used for agriculture



Conservation for future use options

Morocco has a geographically varied climate and topography, which includes part of the Sahara desert, several high (>2000 m altitude) mountain chains and nearly 3500 km of coastline, providing habitat for over 7,000 plant species and over 24,000 animal species and spanning a range of agroclimatic zones (Figure 3).²⁶ Currently, only 4.27% of Morocco's total land area (~17,382 km²) and 0.69% (276,136 km²) of its marine area is protected.²⁷ An estimated 56,240 km² (13%) of its land area was forested in 2015,²⁸ with the country having lost 6.3% of its tree cover since 2000.²⁹ For plants, 57 of the 588 species assessed in Morocco for overall extinction risk are threatened, while for animals, of the 1,891 species assessed, 19 mammals and 18 birds are considered threatened.³⁰ While information is not readily available on the threat status of cultivated crops or their wild relatives, a national association is in the process of surveying and characterizing local crop varieties in Morocco to improve the knowledge base.²⁶ Climate change and loss of both prime agricultural land and natural habitat due to unchecked urban expansion are among the primary causes of biodiversity loss, including agrobiodiversity.²⁶ Fish populations and other marine life along the Moroccan coastline are degraded to varying degrees, due to overexploitation and pollution.²⁶

Figure 3: Crops originating from South and East Mediterranean



Agrobiodiversity Index score

Morocco has an Agrobiodiversity Index status score of 54.1.

Status: What's driving the Agrobiodiversity Index score?

For Morocco, we see that scores are highest in consumption (60.5), followed by conservation (60.1), and production (41.6). 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 Morocco's food system.

Consumption

Species diversity in diets: Food species diversity is moderately high in Morocco relative to other countries in the world and average compared to other Mediterranean countries. Consumption of fruits, vegetables, and legumes are above the global average¹⁶ and almost meet dietary recommendations. Consumption of nut species is relatively low.

Functional diversity: The functional diversity score of 53 reflects a moderate number of avoided Disability Adjusted Life Years¹ attributable to dietary risk factors relative to other countries in the world and above average across the ten Mediterranean countries. Consumption of fruits, vegetables, whole grains, legumes, and nuts can still be further increased to reduce dietary health risks¹⁶. Consumption of red meat is high and can be lowered to reduce dietary health risks¹⁶.

Underutilized species: Only 38% of energy in Moroccan diets is obtained from sources other than major cereals, roots, and tubers, explaining the moderately low score for underutilized species and indicating that diets are quite heavily dependent on major staples. Consumption of whole grains is particularly low in Morocco,¹⁶ indicating that cereals are mainly consumed as highly processed foods.

There were no data available on varietal diversity in consumption.

Production

Varietal diversity: The diversity of livestock breeds maintained in production in Morocco is high relative to other countries in the world and above average for the ten Mediterranean countries. Morocco has 11 breeds of cattle and six of goat in production but only one or two breeds of other species including dromedary, horse, sheep, and guinea fowl. In addition to averting the loss of animal genetic resources, 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 88 distinct commodities in production, crop species richness is high relative to the global maximum of 123 species (in China) and above average across the ten Mediterranean countries. The top ten crops by harvested area are wheat, barley, olives, almonds, maize, broad beans, lupins, chickpeas, and tangerines. The area coverage of different crops in production per 10x10km is unevenly distributed, meaning cropped landscapes have low diversity relative to other countries in the world and compared to other Mediterranean countries. A moderately high percentage (61%) of agricultural land contains a high diversity of crop species at 10x10km scales. However, crop diversity is not at its maximum, and enhancing crop diversity at field, farm, and landscape levels is recommended to enhance natural pest and disease controls, yield stability, biodiversity, and other ecosystem services.³¹ With only seven recorded freshwater fish species, fish richness is very low both relative to other countries in the world and compared to the nine other Mediterranean countries. Livestock species diversity in production is high compared to other countries in the world and 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 very low for most of the country, averaging 0.3 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: 40% of Morocco's cropped landscapes have at least 100ha of natural vegetation at 1x1 km scales, which is well below the 100% recommended, but above 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 (1x1 km) 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 diversity in production.

Conservation

Varietal diversity: Morocco has a high score for varietal diversity (70.2), relative to the globally best performing country (France) indicating that a significant number of samples of Moroccan crop varieties are conserved in genebanks.

Species diversity: The species diversity score is high (71), reflecting that Morocco has a high proportion of its cultivated and wild species conserved in genebanks and that a high number of known crop wild relatives have been identified in-country, relative to other countries in the world.

Underutilized species: Morocco has a low score (39.1) for conservation of underutilized species (useful wild species). While 76.2% of useful wild species are conserved *in situ*, their representativeness in *ex situ* repositories is very low (2%).

There were no data available for functional diversity of genetic resources in conservation.



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Actions: What actions are being taken to maintain and increase agrobiodiversity?

Consumption: For consumption, Morocco does not have food-based dietary guidelines or food composition tables to support biodiversity for healthy diets.

Production: Action scores are low (26.5) for agrobiodiversity use in production. This score reflects very low adoption of diversity-based practices together with low adoption of agrobiodiversity-supportive management practices.

- **Diversity-based practices:** Available data indicate that there is moderate potential for integrated farming in Morocco, with 33% of agricultural landscapes (10x10 km areas) containing both cropland and pasture, facilitating crop–livestock integration. This is 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 high, the moderate SNMI score suggests that there is potential to improve land use efficiency (yields) to reduce the environmental impacts of production, with measures such as intercropping, agroforestry, or double cropping. Morocco has very low levels of pesticide use relative to other countries in the world, estimated at 1.5 kg per hectare, which is far below the highest global user (28.0kg 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 2.1% of agricultural land in Morocco, 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 extreme arid climates. Setting aside small areas of farmland for planting functionally and nutritionally diverse trees can provide multiple benefits for farmers in arid climates.³² Drought-resistant and native tree varieties could be prioritized to minimize water consumption while providing other benefits to farmers. Organic agriculture is practiced on 0.03% of agricultural land and conservation agriculture on 0.05% of agricultural land, which is very low relative to other countries globally and in the Mediterranean. However,



Credit: ©IFAD/Giulio Napolitano

the very low use of pesticides indicates organic agriculture may be more widespread than suggested by official records.

Conservation: Morocco has reported on 60% of the indicators used in the World Information and Early Warning System (WIEWS) to monitor the status of plant genetic resources for food and agriculture, which is better than most Mediterranean countries. An analysis of conservation actions reveals that Morocco has effectively established conservation sites with management plans for *in situ* conservation of crop wild relatives and wild plants. It has also carried out significant collecting missions for long-term conservation of plant genetic resources for food and agriculture in genebanks. Morocco has distributed to other users a significant number of crop samples from the national genebank. The country has been active in breeding activities and releasing varieties.

There are, however, few pre-breeding activities using genebank material. The national documentation system for plant genetic resources for food and agriculture in the country for both *ex situ* and *in situ* conservation is poorly developed and it lacks the capacity to systematically monitor and safeguard genetic diversity. This undermines efforts to effectively conserve and use Moroccan genetic resources and to reduce genetic erosion in the country.

Commitments: How supportive of agrobiodiversity are national policies?

The text mining for Morocco was based on their *National Biodiversity Strategy and Action Plan for 2016-2020* (NBSAP).³³

Consumption: Morocco has a very low score (6.7) for commitments to enhancing the use of agrobiodiversity in consumption, similar to other Mediterranean countries. While the NBSAP discusses the risks to dietary diversity associated with losing agrobiodiversity, there are no explicit strategies or targets to enhance agrobiodiversity in consumption. This is based only on a review of Morocco's NBSAP and other national documents may include commitments to promoting the use of food diversity for healthy diets. Nonetheless, it highlights a potential gap in agrobiodiversity policy.

Production: Morocco has a moderate score (54.2) for commitments to enhancing agrobiodiversity in production relative to countries around the world, which is above average compared to the nine other Mediterranean countries. The NBSAP includes commitments to breeding and increasing adoption of local varieties adapted to their environment and anticipated changes in climate, together with raising awareness and improving farmer access to these varieties. It also includes commitments to reinforcing soil microorganisms to reverse soil degradation and programs to increase the use of local, underutilized and native crop, tree, and livestock species. Planned actions include distributing tree species to farmers willing to implement agroforestry systems, developing and adding value to local varieties and products, and making available seed stocks of local varieties. More generally, Morocco aims to develop and value organic production and encourage sustainable agriculture, making it mandatory to conduct an impact assessment of mariculture, inland aquaculture, and agriculture activities to guarantee their sustainability and biodiversity conservation.

Conservation: Morocco has a high score (66.7) for commitments to enhancing agrobiodiversity in conservation relative to countries around the world, and also above average compared to the other nine Mediterranean countries. Morocco's conservation strategies include programs for *ex situ* and *in situ* conservation of agrobiodiversity with a socioeconomic value, to safeguard crop wild relatives and local breeds and varieties, and native fish populations. This includes commitments to developing programs to protect habitats for wild plant and animal relatives, add value to local cattle breeds, and to protect and conserve autochthonous fish populations in continental waters.

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

Food system pillar in the Agrobiodiversity Index	Recommendations	Contributing to:	
		Risk and resilience	Global policy
Consumption for healthy diets	<p>Promote dietary diversity and reduce overreliance on major staples for dietary energy.</p> <p>Develop food-based dietary guidelines and food composition tables to help increase awareness and build programs that support dietary diversity.</p>		<p>SDG2 Zero Hunger</p> <p>SDG12 Sustainable Production and Consumption</p> <p>WHO Decade of nutrition – reducing overweight, obesity and anemia</p>
Production for sustainable agriculture	<p>Promote a wider diversity of crop species in production, favoring locally adapted varieties. Use agroecological practices to improve soil health and boost biological pest controls to improve yields for higher land use efficiency.</p>		<p>Post-2020 CBD Goal 1ⁱⁱ No Net Loss</p> <p>SDG 2 Zero Hunger</p>
Conservation for future use options	<p>Ensure that underutilized and crop wild relative species in the country are adequately sampled and conserved in the national genebank.</p> <p>The national information system on plant genetic resources for food and agriculture should be improved. In this respect a national information-sharing mechanism should be set up to monitor the status of conservation and use of agrobiodiversity in the country.</p> <p>More efforts should be made to promote the use of diversity conserved in genebanks by breeders in the country by promoting pre-breeding activities.</p>		<p>Post-2020 CBD Goal 3 Genetic Diversity & 4 Nature's benefits</p> <p>SDG 15 Life on Land</p> <p>Second Global Plan of Action on Plant Genetic Resources for Food and Agriculture³⁵</p>

Agrobiodiversity highlight

Agrobiodiversity at the heart of agroecology in Morocco

Morocco has been enacting an agroecological vision by improving the conservation and sustainable management of five oasis systems with a focus on strengthening the role of these systems in household food security, through the preservation and use of agrobiodiversity.

The project, 'Biodiversity conservation and mitigation of land degradation through adaptive management of agricultural heritage systems', was funded by the Global Environment Facility (GEF). Its work so far has achieved remarkable results in the context of agroecology, including in terms of:

- Preservation and enhancement of agrobiodiversity**
 Surveys were conducted at each of the sites to inventory 144 local varieties, 57 of which were well characterized. A regulatory framework for seed development of local varieties was developed and submitted to the country's competent authorities and a local seed production, storage and distribution network established at each of the five sites. This represents a considerable strengthening of local seed systems as a basis for agroecology and organic farming.
- Development of sustainable water and land management practices**
 About 700 farmers (30% women), from more than 56 villages and representing more than 28 associations and 40 cooperatives, participated in training to improve skills in agroecological approaches, such as organic farming techniques and site certification or techniques of seed production and conservation and participatory breeding to improve local varieties and preserve a broad genetic base for *in situ* conservation.

Sources: ³⁴



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End notes

- I. The overall burden of disease is assessed using the disability-adjusted life year (DALY), a time-based measure that combines years of life lost due to premature mortality (YLLs) and years of life lost due to time lived in states of less than full health, or years of healthy life lost due to disability (YLDs). One DALY represents the loss of the equivalent of one year of full health. DALYs for a disease or health condition are the sum of the years of life lost due to premature mortality (YLLs) and the years lived with a disability (YLDs) due to prevalent cases of the disease or health condition in a population.
- II. 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.



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