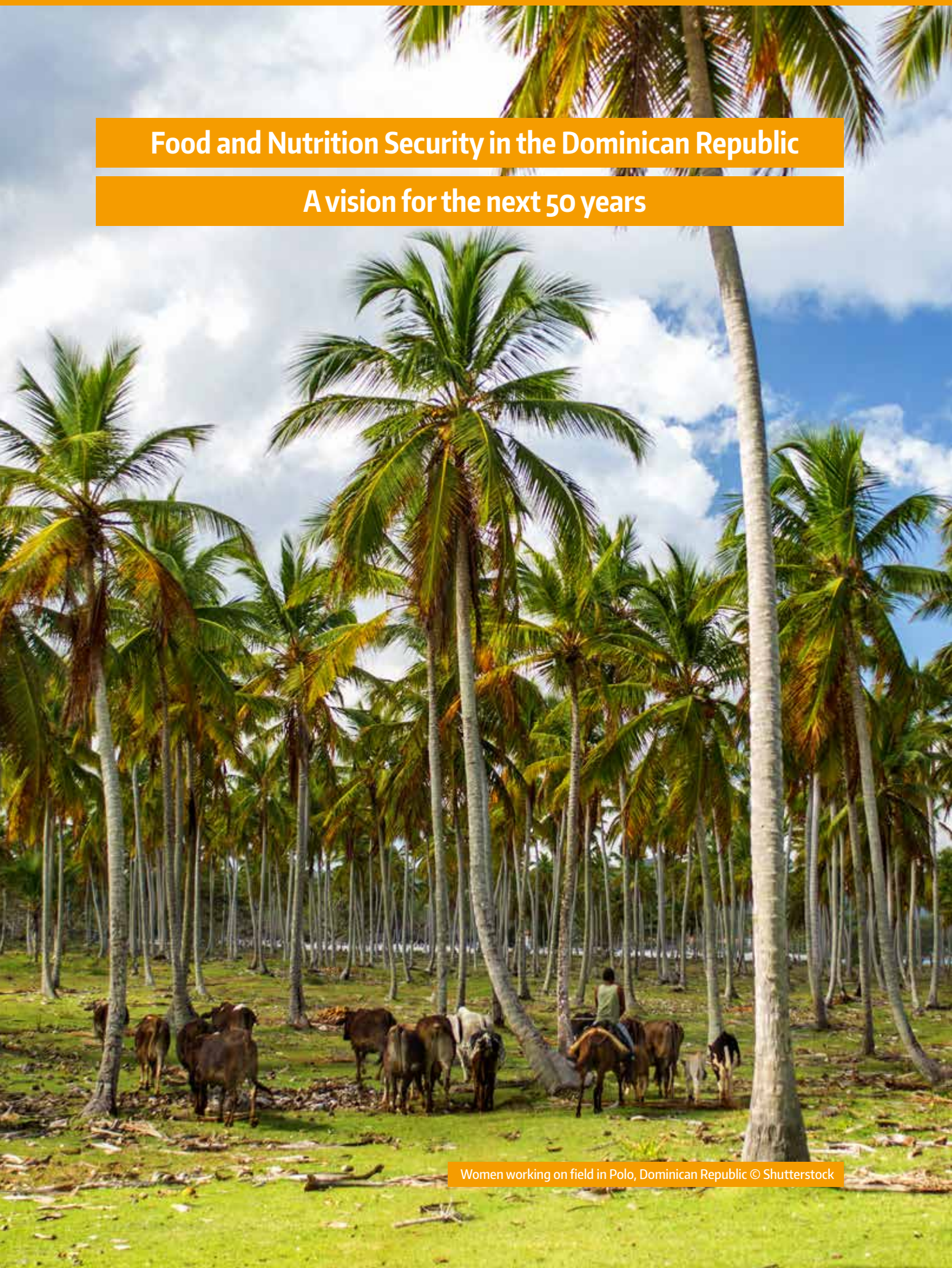
Food and Nutrition Security in the Dominican Republic

A vision for the next 50 years



Women working on field in Polo, Dominican Republic © Shutterstock

Dominican Republic

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Every Dominican has the right to proper food. **Although the country achieved one of the Millennium Development Goals by reducing hunger,** 1.3 million citizens still suffer from this while many others are affected by nutrition. A great deal remains to be done to eradicate these problems

Summary

The Dominican Republic is an island state with an area of 48,308 km², with 1.9 million hectares dedicated to agricultural production. The country's main agricultural products are rice, maize, sugar cane, coffee, cacao, tobacco, coconut, beans, pigeon peas, yucca, taro, sweet potato, yam, potato, plantain, banana, onion, eggplant, squash, tomato, avocado, papaya, pineapple, sweet orange, passion fruit, cucumber and chayote. Beef cattle, pig, poultry and egg production are also very important.

The country's research policies are formulated by the National Council for Agricultural and Forestry Research (CONIAF) and implemented by the Dominican Institute of Agricultural and Forest Research (IDIAF). Funding is received from national (MESCyT and CONIAF) and international organizations, and research is conducted by the state university (UASD) and several private universities. A current problem in the country is the high average age of agricultural researchers and the lack of a clear generational change policy. At the same time, Dominican public expenditure on agricultural research was 0.30% in relation to its GDP, much lower than the 1% recommended by the UN.

The Dominican Republic also faces a major freshwater crisis as a result of climate change, due to a 20% reduction in annual rainfall, increased evapotranspiration and population growth. Freshwater resources per capita are expected to decline from 2,200 m³ in 2008 to less than 400 m³ by 2100.

Twenty-three percent of Dominican soils are considered suitable for agricultural crops, with specific use and management practices, while another 16% can be used for grazing and rice with modern mechanization methods and intensive management methods. However, they are undergoing degradation, the main causes of which are: deforestation, construction of the road network, mining activity, climate phenomena, agrochemical use and unsustainable water management. Moreover, many soils with agricultural vocation are being urbanized.

Dominican biodiversity is threatened by the fact that a number of species of endemic and native flora and fauna are in danger of extinction. This is mainly caused by the destruction and fragmentation of habitats for changes in land use, expansion of the agricultural and livestock frontier, urban growth, infrastructure construction, mining, deforestation, the capture and extraction of wild species, forest fires, the introduction of invasive species, the emergence of new diseases and climate change (extreme hydrological events and drought).

It is estimated that forest cover has been reduced from 83% of the total area at the beginning of the 20th century to 28.5% in 2005, partly as a result of agricultural activity. Moreover, the use of forest materials in industry for energy generation and construction, the use

of slash-and-burn agriculture and the abuse of agrochemicals are practices that severely damage forests. It is essential to design and implement a Land-Use Plan to identify the potential uses of the soil in accordance with specific local conditions.

Regarding technological research, the country has been working on the use of enzymatic technologies to produce extracts, fermentations of industrial interest, bioprospecting, tissue culture and molecular characterization. Some universities, as well as a number of private companies, have developed proprietary protocols for plant production through *in vitro* tissue culture. Success stories resulting from this upsurge of interest include the massive introduction of crop varieties such as plantain, pineapple, potato and strawberry. Animal biotechnology, however, has not elicited the same interest. The incorporation of genetically modified organisms has been slow, since there was no legal framework in place until 2015.

The Dominican Republic has not escaped FoodBborne Diseases (FBD), several outbreaks of which have been reported, with seafood being the main culprit. A key problem in terms of food is the high overweight and obesity rate among the population, which may be due to unhealthy eating patterns, both traditional (Dominican cuisine is rich in carbohydrates and fried foods) and as a result of globalization (such as fast food and eating out). A small segment of society is concerned about healthy changes in food, although not necessarily on the basis of sound scientific foundations.

As for the legal framework, the passage of the Sovereignty and Food Security Law in 2016, which stipulates the right to adequate food for all people, and implies access to sufficient, healthy food, was a key event

A detailed reflection is required to meet the challenges and perspectives of the agricultural sector. The entire livestock sector will be within the Dominican Republic-Central America Free Trade Agreement (DR-CAFTA) in 2020, meaning that it will have to compete with quota- and tariff-free imports. Current competitiveness of Dominican agricultural exports is relatively low. DR-CAFTA provides possibilities, rules and predictability for the agricultural sector, yet also poses two known challenges. The first is to take advantage of expanded access to the US market and the second is to protect producers of sensitive goods.

I. National characteristics

The Dominican Republic is an island state occupying the eastern part of the island of Hispaniola, with an area of 48,308 km². A total of 1.9 million hectares (ha) are dedicated to

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Table 1. Dominican Republic: Percentage distribution of agricultural productive units, by main type of crop planted

Main type of crop planted	Number of units	
	Absolute	Relative
Total	**251,916**	**100.0**
Cereals	70,638	28.0
Vegetables and melon	8,256	3.3
Fruit and nuts	61,892	24.6
Oilseed crops	3,292	1.3
Root vegetable/tuber crops with high starch or inulin content	23,654	9.4
Crops for beverages and spices	43,750	17.4
Pulse crops	19,035	7.6
Sugar crops	1,418	0.6
Other crops	19,981	7.9

Source: National Agricultural Pre-Census, 2015, p. 35

agricultural production, distributed as follows: over 0.69 million ha for agricultural use, 0.56 million ha for animal husbandry, 0.46 million ha for the cultivation of agricultural products combined with animal husbandry, 0.07 million ha for planting of forest and timber trees, 19,000 ha for a combination of tree planting and animal husbandry and 17,000 ha for growing flowers and/or ornamental plants (National Agricultural Precensus, 2015)

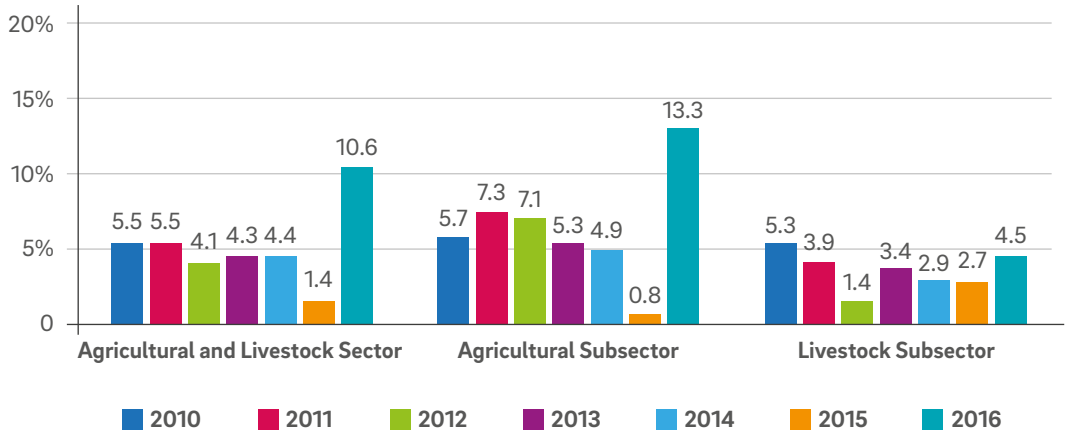
Land use at the national level shows a preponderance of agricultural activities. The majority of the country's productive units (251,916, or 62.6%) are dedicated to these activities. A fifth (20%) are devoted to animal husbandry, while 16.3% engage in both agricultural and livestock activities. Less than 1% are devoted to activities such as the planting of forest or timber trees, or cultivating flowers or ornamental plants (National Agricultural Precensus, 2015). The following table, taken from the National Agricultural Statistics Prediction Report, produced by the National Bureau of Statistics, shows the percentage distribution of agricultural production units by crop type.

The main agricultural products grown in the country are rice, corn, sugar cane, coffee, cacao, tobacco, coconut, red kidney bean, black beans, white beans, pigeon peas, cassava, taro, sweet potato, yam, potato, banana, plantain, onion, garlic, pepper, eggplant, squash, tomato, avocado, papaya, pineapple, sweet orange, passion fruit, cucumber and vegetable pear. There are currently about 300,000 ha under irrigation, equivalent to 55% of the country's potentially irrigable land, while 68.58% of cultivated land has irrigation infrastructure (National Bureau of Statistics, 2013).

The agricultural sector has enormous social importance for the country, since there are 319,676 agricultural production units (National Agricultural Precensus, 2015), and this sector accounts for 5.8% of the country's GDP. The following graph shows the variation of the GDP for the agricultural and livestock sector and the agricultural and livestock subsectors over the past seven years.

A third of the Dominican population is rural, earning its livelihood from agricultural and forestry activities. However, the rural population is increasingly linked to urban dynamics, in both economic and social issues. A large number of rural families have relatives abroad who send remittances that contribute to rural development and alleviate poverty. Nevertheless, analyses conducted on various crops show that limitations on access to financing for production and commercialization continue to constitute a major barrier to expansion (JAD, 2009).

Figure 1. Variation of GDP for the agricultural sector and the agricultural and livestock subsectors



According to statistics published by the Ministry of Agriculture (MA), products exported by the Dominican Republic are: rice, beans, pigeon peas, potato, yam, taro, yucca, garlic, red onion, eggplant, squash, pepper, cucumber, carrot, avocado, millet, pineapple, melon, banana, orange, plantain, banana, beef, chicken meat, pork and eggs. Of these, the main ones (≥ 100,000 quintals per year) are: plantain, avocado, rice, pepper, chicken meat, eggplant, beans, sweet potato, carrot, cucumber and pineapple (Dominican Ministry of Agriculture Statistical Base, 2017).

As for the livestock subsector, there are 115,578 productive units, which raise various types of livestock: cattle, pigs, goats, sheep, horses and farm and domestically reared poultry, the main ones being cattle (meat, milk and derivatives) and poultry (chickens and eggs). Other key livestock products include: rabbit, duck, guinea fowl, quail, turkey, fish and shrimp, honey and wax. Aquaculture and fishing activities have expanded in recent years, accounting for 11.3% of livestock production units (Precenso Nacional Agropecuario, 2015).

Research has shown that the growth of the agricultural sector is based on the development of the livestock subsector. According to data from the Central Bank, in the period between January and September 2016, annual growth in the added value of livestock, forestry and fisheries stood at 4.5%.

Exports of primary livestock products are limited, with only chicken meat, beef, pork and eggs and certain agroindustrial products being exported. In the case of imports, the situation is slightly different: nearly 5% of them correspond to this type of product. Conversely, a wide range of agricultural products are imported.

The main strengths of the agricultural sector include the attractive geographical position of the main markets, the fact that the country is an island, which creates a natural barrier against pests and diseases on the mainland and the efficient telecommunication system, which facilitates swift, easy access to international markets. There is also a basic road network in every region of the country, high consumption of traditional local gastronomical products by the diaspora, a technological innovation system(CONIAF, IDIAF and CEDAF) and programs to boost competitiveness (PATCA, PRODEVECO, CNC) (JAD, 2009).

According to a study undertaken by FAO to enable Caribbean countries to meet production needs, thereby guaranteeing their development and the food security of their inhabitants, it is essential to implement public policies and programs designed to promote family farming. These programs should include access to technologies to improve performance and productivity, information to support decision-making, outreach and training systems related to the sector, financing mechanisms, agricultural land, water resources and risk-management

mechanisms to cope with potential natural disasters. Strategic alliances should also be created to improve small producers' insertion into markets (ECLAC, FAO, IICA, 2014).

These production systems would be a very important component for the small-scale production of food and thus continue to increase the proportion of the population with an adequate nutritional balance. During the 1990-1992 period, 34.35% of the population was undernourished. However, by the period from 2014 to 2016, this proportion had decreased by 20 percentage points, meeting the 1C objective of the Millennium Development Goals (FAO, 2015).

To illustrate the evolution of undernourishment in the Dominican Republic over the past 25 years, the following figure is included in the FAO report, "Overview of Food Insecurity in Latin America and the Caribbean: The region meets the international hunger goals," published in 2015.

This report states that: "*The positive situation of food and nutrition security in the country reflects the fact that the food availability of the Dominican Republic has increased in recent decades, reaching 2,619 calories per day per person in the triennium 2014-16, despite the fact that the country is a net importer of both goods and agrifood products*".

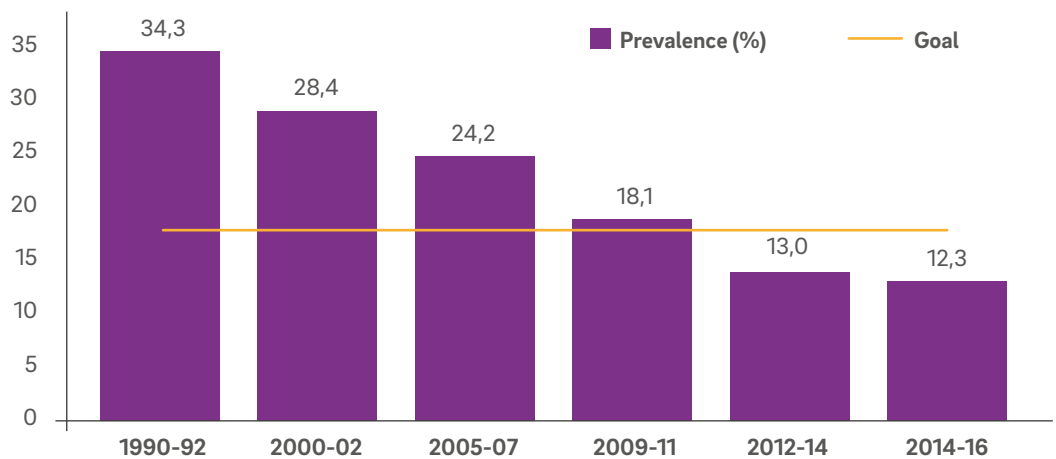
Other important aspects cited by this study as strengths are:

- Between 2004 and 2013, the country has managed to reduce poverty from 54.4% to 40.7% while extreme poverty fell by 8.8 percentage points during the same period, totaling 20.2% of the population (ECLAC, online).
- The country has been one of the regional pioneers in the institutionalization of food aid programs. Since the 1940s, State Economic Canteens have delivered food rations to the vulnerable population.
- The creation in 2008 of the Council for Food Security, responsible for implementing food and nutrition security actions, as well as consolidating and reinforcing the Dominican social protection system. (World Bank, online)" (FAO, 2015).

An important milestone for guaranteeing the fundamental right to adequate food and nutrition was the passage of Law No. 589-16, which created the National System for Sovereignty and Food and Nutrition Security of the Dominican Republic (SNSSAN), to establish the institutional framework for the creation of the SNSSAN.

However, all these actions and progress alone will not guarantee food security, since the Dominican Republic is a small island state located on one of the most active hurricane routes on the planet, extremely vulnerable to the impacts of climate change, with a high illiteracy rate, a

Figure 2. Evolution of undernourishment (%) in the Dominican Republic



Source: FAO, PMA, and FIDA. 2015.

deficient education system, where there is no political continuity when there is a change of government, or a public health system designed to meet the population's needs.

Another key aspect to be addressed is the growing migratory phenomenon of the rural population toward cities. In many parts of the Dominican countryside, there has been no generational replacement. Faced with the lack of incentives for agricultural production, young Dominicans set out for urban centers in search of opportunities, often living in overcrowded spaces with a lack of resources and services to guarantee their subsistence and quality of life.

II. Institutional climate

a. National Agricultural Research System

The Dominican Republic has a National System of Agricultural and Forest Research (SINIAF). Created in 2012, through Law 251-12, it comprises several institutions including the National Council for Agricultural and Forest Research (CONIAF), the organization responsible for formulating the country's agricultural research policy. Of particular importance is the Dominican Institute of Agricultural and Forest Research (IDIAF), the official body responsible for implementing research policy, as well as undertaking the various research projects approved by national (MESCyT and CONIAF) or international organizations (JICA-Japan, GIZ-Germany, KOPIA-Korea, USAID-USA, among others). It also includes public and private institutions and organizations that conduct research or technology-transfer actions in the agricultural and forestry sector, universities with faculties related to the sector, technological networks and any other agency directly or indirectly linked to agricultural or forestry research activities or (UASD, UCATECI, UNPHU, UISA, UNEV, UTECO) and the Institute of Innovations in Biotechnology and Industry.

b. Current status of SINIAF

The average age of the SINIAF researchers is currently estimated at 55 years. This is due to the difficulty of achieving effective generational replacement, which suggests that working

conditions and salaries must be improved to make research more attractive as a profession (SODIAF, 2016). It is also necessary to further strengthen the training program through the granting of master and doctoral fellowships to current and potential researchers to increase the country's research capacity.

Research institutions in the Dominican Republic tend not to receive budget increases, and in some cases, these have been reduced by up to 30%. With adequate investment, necessary actions can be taken, such as improving the infrastructure for research on soil, phytopathology, entomology, virology and biotechnology laboratories. This includes purchasing up-to-date equipment and training laboratory technicians (SODIAF, 2016).

c. Universities and Research Institutes

The Dominican Republic boasts 50 higher education centers, according to the National Statistics Office (ONE), citing the administrative records of the Ministry of Higher Education, Science and Technology (MESCyT). In 2014, 443,555 were enrolled in higher education, 181,340 (41% of the total) at UASD, the public university. The remainder are distributed among private higher education institutions and seven specialized public institutes, with an enrolment of 262,215 (59% of the total).

These institutions are grouped under the Dominican Association of Universities, within whose framework the board of Agriculture and Livestock faculties operates. The association met in April 2016 to gather information on the research capacities of universities in the areas of agricultural and livestock sciences, in which UASD participated, together with ten other higher education institutions. Although research is undertaken at most of these centers, in many cases, its impact is actually marginal, even

Monocultures can have a long-term negative ecological impact.

though it is given considerable importance in the statutes of these organizations. Many of these universities have laboratories and experimental fields together with a limited number of researchers.

The creation of the Science and Technology Research Fund (FONDOCYT), which administers the MESCyT, has enabled research to be promoted at most universities and colleges. In recent years, through FONDOCYT, projects have been approved that have permitted the acquisition of equipment and the improvement of laboratories for university research. Although FONDOCYT is open to many areas of science that do not impact food and nutrition security, it is the largest local competitive fund currently in existence, and is expected to remain an opportunity for agricultural research capacity development at universities.

d. Strengths of SINIAF

- There are research capacities with experience, which could benefit young researchers in a process of generational replacement.
- SODIAF's *Revista Agropecuaria y Forestal* (APF) is published in both printed and digital versions as an important instrument for the dissemination of research results.
- SODIAF holds a Biannual Congress to facilitate the exchange of researchers from agricultural, livestock and forestry areas.
- Several proposals from SINIAF researchers have received funding from MESCyT through FONDOCyT.

e. Challenges and prospects for agricultural research

- Reorient research policy: emphasize the use of alternative local materials to reduce costs and improve crop quality.

Techniques that prevent soil erosion guarantee long-term production.

- Convince government authorities, as well as private-sector institutions, to invest more in research and development.
- Strengthen the Dominican Republic's outreach system.
- Encourage small producers to group together in cooperatives and clusters in order to leverage economies-of-scale.
- Add value to Dominican agricultural products through agroindustrial innovation.
- Create synergies between the public and private sector, and among state institutions to boost the country's research.
- Encourage young people to study agronomy and related degree courses, and to undertake specialization studies that will enable them to engage in research.

A key indicator, used internationally to determine the priority governments give to agricultural research, is intensity-of-investment. This is calculated as a percentage of Agricultural GDP (GDPAg). In 2012, Dominican public spending on agricultural research was 0.30% of its GDPAg. The UN recommends that this percentage be not less than 1% (Stads et al., 2016). According to a recent study by the International Food Policy Research Institute (IFPRI), in order for the Dominican Republic to narrow the investment gap, investment intensity in the agricultural sector will have to be raised to 2% of GNP (Nin, 2016).

III. Characteristics of Resources and Ecosystems

a. Water resources and challenges for the next fifty years

The Dominican Republic has an average annual rainfall of 1,410 mm, with a total volume of 68,620 million m³. Domestic renewable water resources have been estimated at 23.498 million m³/year, distributed among six hydrographic basins. Underground water resources have been evaluated at 4,161 million m³/year; although only 59.34% of this amount is recoverable for use (FAO-Aquastat, 2017).

National water extraction exceeds 7,000 million m³, 80% of which is used for agricultural and livestock production, 12% for municipalities and the remaining 8% for industrial activities. Only 80% of the population has access to improved sources of drinking water (FAO-Aquastat, 2017), which has serious quality and quantity limitations.

This resource faces several problems for its sustainability, including environmental degradation, together with production and distribution problems and climate variances due to the impact of climate change combined with inadequate planning, pollution of sources, lack of sanitation and inadequate infrastructure. This has resulted in the current shortage and the threat of a major crisis in the future (Dominican Political Observatory, 2014).

A study published by the University of Columbia, New York, in 2008, based on IPCC projections, shows that the Dominican Republic faces a major freshwater crisis as a result of climate change, due to a 20% reduction in annual rainfall, an increase in evapotranspiration of 2 km³ by the end of the century and a nearly 50% increase in the Dominican population by the middle of the century. The availability of freshwater per capita is expected to decline from 2,200 m³ in 2008 to less than 400 m³ by 2100.

The country has 13 state agencies devoted to water governance. In addition, there is a General Law on Environment and Natural Resources, with specific regulations for the management of both safe drinking water and water for other purposes, groundwater and discharges into the subsoil and wastewater. There is also a Law on the Domain of Terrestrial Waters and the Distribution of Public Waters; however, there is not yet a General Water Law or a Land Use Law that would permit integral, sustainable water management under a watershed approach.

b. Water resources and challenges for the next fifty years

The Dominican Republic shares the island of Hispaniola with the Republic of Haiti, occupying approximately three quarters of the territory (48,308 km²). Its physiography is determined by four mountain ranges running almost parallel

from the NW to the SE. These elevations are interspersed with five depositional basins and plains containing the country's most fertile soils.

There are a number of state agencies responsible for soil use, the main ones being: The Ministry of Agriculture; the Ministry of Soils and Waters as part of the Ministry of Environment and Natural Resources (MIMARENA); the Dominican Agrarian Institute and the Agricultural Bank.

Modern methods with mechanization mean that Class V (15.75%) can also be used for grazing and rice cultivation, with extremely intensive management measures (Atlas Biodiversidad RD, 2012).

The Dominican Encyclopedic Dictionary of the Environment, based on data provided by MIMARENA, reports that 15% of the country's soils are overused while 40% are underused. This same source indicates that only 30% of Dominican soils, most of which are found in National Parks, have adequate use.

The main causes of soil degradation in the country are deforestation, construction of the road network, mining activity, the impact of climate phenomena, agrochemical use and unsustainable water management. The complexity of all these variables poses an enormous challenge for the population. Reversing the process of soil degradation will require a National Strategic Plan under the perspective of watershed management. A Land Use Law should also be enacted, strictly regulating the use of agrochemicals and integrating continuous conservation practices into agricultural culture, taking into account topography, soil type and potential use. Particular attention must be paid to the reforestation of critical areas and the incorporation of organic agriculture in order to advance sustainability in the medium term.

c. Energy Challenges

For over 30 years, the Dominican Republic has faced a severe energy crisis, reflected in constant brownouts lasting from 4 to 10 hours a day, which affects over 50% of the population (CDEEE, 2015), and the use of electricity through illegal connections - 25% of the population lacks a formal contract (CDEEE, 2015), which causes a minority to have to pay excessive tariffs to cover these inefficiencies and imposes a significant tax burden on the government for direct and indirect subsidies (*Diario Libre*, April 24, 2014). Over 85% of energy is obtained from fossil fuels, significant amounts of which are lost, mainly due to distribution failures (UNDP, 2017).

Electricity demand is rapidly increasing as a result of population growth. According to the National Energy Commission (CNE), energy demand will double by 2030.

In the search for solutions, in 2001, the National Energy Commission was created as a result of the passage of the General Electricity Law (Law 125-01). Another measure taken was the creation, through Law No. 100-13, of the Ministry of Energy and Mines. There is also a National Energy Plan that will not be in place until 2025.

The main challenge of the country's energy sector is the regularization of the service to make it accessible to the entire population on a regular basis at a fair price. This goal should become viable with the incorporation of energy production from alternative sources, taking advantage of the existence of the Law on Incentives for Renewable Energies and Special Incentives enacted in 2007.

d. Conflicts and challenges for biodiversity. Problems associated with overexploitation. Reduction of genetic diversity

According to historical records and lists compiled in recent decades, the island of Hispaniola is home to six thousand species of vascular plants, 5,500 of which grow in the Dominican Republic. In 2011, MIMARENA produced the first Red List of Threatened Plants based on criteria established by IUCN, comprising 547 species.

In 2016, as a result of meticulous research, the National Botanic Garden published the Red List of Vascular Flora in the Dominican Republic, listing 1,388 species, 831 of which are endemic and 557 native. According to this document, there are 813 species in Critical Danger, 249 in Danger, 249 that are vulnerable and 45 for which there is Minor Concern.

In terms of fauna, invertebrates constitute the largest group with approximately 7,030 species. Researchers agree that the local fauna has barely been studied and that there are also 74 species of amphibians, 71 of which are endemic

Cultures in a controlled environment have an enormous growth potential.

to the island; 166 reptile species, 87% of which are endemic; 306 bird species, 32 endemic, and 53 mammal species. The 2011 Red List of Endangered, Threatened or Protected Species in the Dominican Republic contains 223 animal species, many of which are Critically Endangered.

All the species included in the Red List of the Dominican Republic are protected by national laws and international conventions.

The main threats to the preservation and conservation of Dominican biodiversity are the destruction and fragmentation of habitats due to changes in land use, the expansion of the agricultural and livestock frontier, urban growth, infrastructure construction, mining, deforestation, the capture and extraction of wild species, forest fires, the introduction of invasive species, the emergence of new diseases and climate change (extreme hydrological events and drought).

An important element that negatively impacts native biodiversity is the introduction of invasive species, which is closely linked to productive activities in the Caribbean region.

In response to this situation, as part of the national biodiversity conservation policies, the Dominican Republic has joined the list of countries acting at a global, regional and private level to promote the conservation and sustainable use of natural resources, particular of biological diversity. It has ratified several conventions such as The Convention on Biological Diversity, the Convention on Climate Change, the Convention on Combating Desertification and Drought, the Convention on Wetlands (RAMSAR) and the Kyoto Protocol (MIMARENA, 2017).

e. Implications of forest trends

Agricultural activity has been practiced intensely since the 19th Century, which has led the decline of many plant species through the elimination of their habitats. Moreover, the use of forest materials in industry for energy generation and construction, the development of slash-and-burn agriculture and the over-use of agrochemicals are practices that severely affect forests. It is estimated that in the early

Detection of pesticide residue.

20th Century, forest cover in the Dominican Republic occupied 83% of its total area. By 2005, that percentage had fallen to 28.5%, according to a FAO assessment of global forest resources.

In order to offset this situation, a number of private- and public-sector initiatives have emerged with the aim of preserving and/or conserving species, ecosystems and environments of major importance for Dominican nature both in situ and ex situ.

The work of conserving species outside their natural area is mainly undertaken by the National Botanic Garden. This institution has undertaken essential work for several years now. Last year, the Red List of Vascular Flora was circulated in the Dominican Republic as a result of a meticulous research process and a few weeks ago, a Seed Bank was inaugurated on the garden's premises.

Since 1997, MIMARENA, through the Quisqueya Verde Project, has also undertaken reforestation work and recovered flower species. Over a period of nearly 20 years, millions of plants have been planted in degraded or vulnerable areas, encouraging the use of native and endemic species. This is the first government plan for massive reforestation on a nationwide scale.

This same agency contains a Vice-Ministry of Protected Areas and Biodiversity. There is also a National Law for the Management of Protected Areas, as a result of which Protected Areas now constitute 25% of national territory. There is also a Vice Ministry of Forest Resources.

Other institutions include the Dominican Forestry Chamber and a large number of non-profits working to recover, protect and/or preserve forest or species strongholds in areas

with high endemism, water catchment areas, protected areas and degraded areas with Class VI, VII and VIII soil.

f. Potential impacts of climate change

The Dominican Republic is one of the ten most vulnerable states to the effects of climate change. Extreme climate-related phenomena - such as floods and droughts - are on the rise. Their frequency and magnitude are expected to increase, and are likely to affect agricultural and livestock production throughout the country (National Adaptation to Climate Change Strategy, 2014-2020).

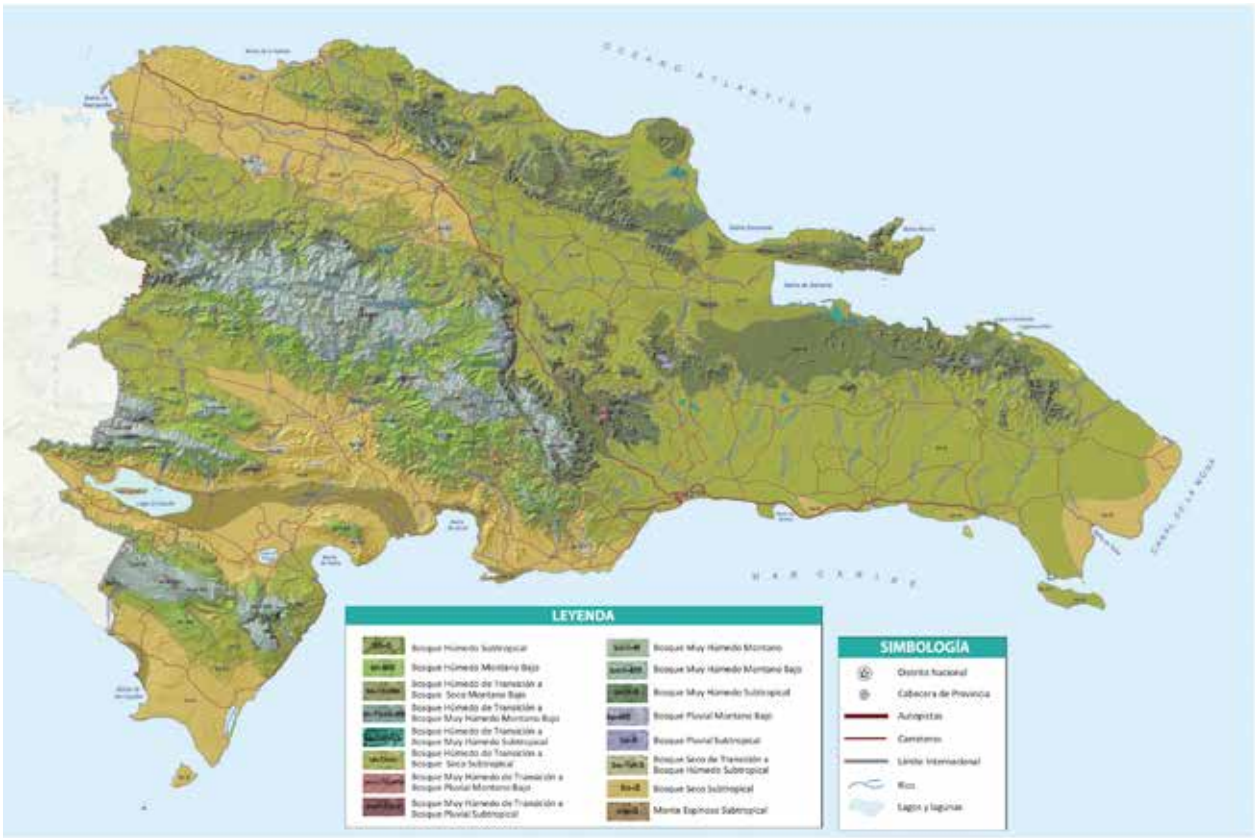
Sea level rise may result in salt water intrusion, through river mouths at high tide, or directly affect underground basins, which may impact water quality in aquifers that have hydrological continuity with the sea, making it unsuitable for human use or agriculture. Marine intrusion of groundwater is one of the most serious problems resulting from climate change.

The country's groundwater reserves would be seriously affected by their physical-chemical deterioration and the reduction of water potential due to the rainfall deficit. The most likely hydrological scenarios would be characterized by a significant reduction of the country's water potential, both surface and underground, which would lead to the deterioration of the chemical and biological quality of water (National Adaptation Strategy to Climate Change, 2014-2020), therefore impacting biodiversity.

g. Building resilience to extreme events a eventos extremos

Significant progress has been made in the Dominican Republic to adapt to climate change with the aim of creating resilient citizens and communities. To this end, clearly defined public policies, laws and regulations have been implemented and national climate-change

Use of molecular techniques to certify agricultural production.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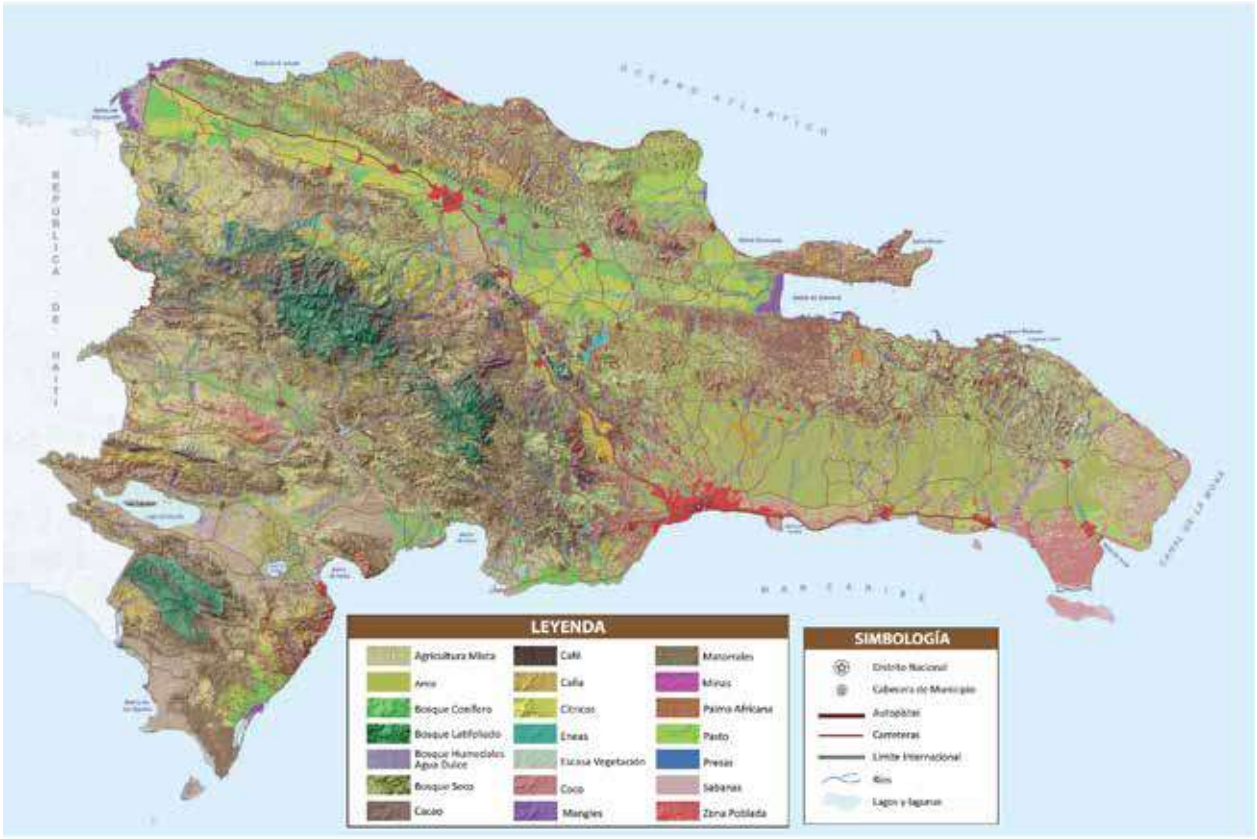
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Bosque Conífero
Bosque Latifoliado
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Bosque Seco
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Caña
Cítricos
Eneas
Escasa Vegetación
Coco
Mangles
Matorrales
Minas
Palma Africana
Pasto
Presas
Sabanas
Zona Poblada
SIMBOLOGÍA
Distrito Nacional
Cabecera de Municipio
Autopistas
Carreteras
Límite Internacional
Ríos
Lagos y lagunas

education programs developed for teachers and students, impacting thousands of people.

Article 194 of the Dominican Constitution establishes as a State priority, the formulation and implementation of a land-use plan to ensure the efficient, sustainable use of the country's natural resources, in accordance with the need for adaptation to climate change. In the same vein, Axis 4 of the National Development Strategy 2030, "Seeks to achieve a society with a culture of sustainable production and consumption, which manages environmental risks and protection and natural resources with equity and efficacy and promotes adequate adaptation to climate change".

There is also a National Commission for Adaptation to Climate Change and a Clean Development Mechanism led by the President, through which important initiatives at the local and international level have been achieved. Strategic partners have been obtained for the implementation of projects and actions in order to build national capacities to address the impacts derived from this alteration of the climate. It is important to highlight the importance of the National Comprehensive Disaster Risk Management Plan in the Dominican Republic, based on Law 147-02.

h. Prospects and future outlook

The future of natural resources in the Dominican Republic is rather uncertain, mainly because their sustainability depends on a multiplicity of factors and variables. An effective solution will depend on the clear, precise understanding of the status of this environmental asset and the importance of achieving its sustainability, the availability of immeasurable resources, a strong State will, knowledge of the problem on the part of social sectors and above all, an integral approach to the problem to understand and address the various internal and external factors of a social, economic and environmental order.

As for agriculture in the Dominican Republic, projections indicate that there will be a temperature increase, and a decrease in total rainfall together with a decrease in the duration of the rainy season. Several models predict that there will be extreme events with more intense rains during the rainy season, in addition to intense droughts (National Strategy for Adaptation to Climate Change, 2014-2020).

In the valleys and plains where much of the agricultural sector is concentrated, resilience will be tested by several climate-change events, particularly increasing river flows, floods, high temperature, high relative humidity, increased incidence of pests and diseases, saline intrusion, high evaporation rates and greater stress on plants (crops) (National Strategy for Adaptation to Climate Change, 2014-2020).

It is essential to design and implement a Land Use Plan to determine the potential uses of the land in accordance with local conditions. It will also be necessary to identify the most vulnerable areas, establish flood control systems, ensure the integrated management of watersheds and crop diversification, promote access to credit and implement an Early Flood Warning System.

IV. Technology and Innovation

The use of biotechnologies to produce goods and services including more abundant foods or with interesting characteristics could make an enormous contribution to food and nutrition security. The Institute of Innovation in Biotechnology and Industry (IIBI) is an official institution that spearheads biotechnology efforts, with an emphasis on supporting agriculture and agribusiness. Its achievements to support agroindustry include the use of enzymatic technologies to produce extracts, fermentations of industrial interest, bioprospecting, tissue culture and molecular characterization.

A number of universities, as well as several private companies, have developed proprietary protocols for plant production through in vitro tissue culture. Success stories resulting from this upsurge of interest include the massive introduction of banana, pineapple, potato and strawberry varieties. In the case of plantains, sigatoka-resistant varieties have been developed, which increased production and therefore reduced consumer prices.

IIBI has documented the molecular characteristics of fruits-of-interest for exportation, to

guarantee quality and denomination of origin. These include the banilejo mango and the Creole avocado, locally sourced products with overseas market niches.

IDIAF and UASD have undertaken projects with soil micro-organisms beneficial to plants. They expect to be able to obtain inocula that will increase growth and shorten the waiting time for the first harvest of open-field legumes and species grown in a controlled environment. This line of research on soil microbiology promises to be extremely useful for improving efficiency and increasing the productivity of certain crops consumed by the Dominican population. An additional benefit is that it can be used to achieve biological control of soil pathogens, thereby reducing the use of fungicides and other agrochemicals.

Biotechnology applied to animal production has not been widely explored in the Dominican Republic. Some research has been carried out, such as the genetic characterization of dairy cattle, and at UNEV, one project with steers and another with sheep are being implemented to select outstanding animals through molecular tests that identify key genes. The use of semen selection from bulls or males of another species based on genomic test results is not yet widespread.

Efforts to develop aquaculture in the Dominican Republic have been led by IDIAF and the Dominican Aquaculture Association (ADOA). But this sector has not had enough state support, and currently has only a few members who run profitable farms, together with some recent cooperative efforts. The Strategy for the Development of Aquaculture (IDIAF, 2007) proposed the following topics-of-importance for research purposes:

- Genetic improvement of Nile tilapia for research purposes
- YY juvenile fish production
- Diversification of cultivated species (such as sea bass, snapper, crustaceans, trout, ornamental fish)
- Diversification of cultivation methods and use of water bodies (cages, corrals, raceway, intensive and polyculture).

Fresh fruits and vegetables in the market.

Table 2. Most important crops by local consumption in the Dominican Republic

Rice (*Oriza sativa*)	Cacao (*Theobroma cacao*)	Cucumber (*Cucumis sativus*)
French Bean (*Phaseolas vulgaris*)	Sweet potato (*Ipomoea batatas*)	Potato (*Solanum tuberosum*)
Banana (*Musa paradisiaca*)	Eggplant (*Solanum melogena*)	Onion (*Allium cepa*)
Plantain (*Musa paradisiaca*)	Green pepper (*Capsicum annuum*)	Garlic (*Allium sativum*)
Cassava (*Manihot esculenta*)	Tomato (*Solanum lycopersicum*)	

a. Use of genetically modified organisms

Although the use of transgenic crops has led to significant gains in countries in the region, the incorporation of living modified organisms has been extremely slow in the Dominican Republic. This is largely due to the fact that there was no law providing a legal framework or defining biosecurity measures for this purpose. At the same time, certain sectors thought they might be affected if the use of transgenics in the country were approved.

After over ten years of revision, Law No. 219-15 on Biosafety was passed in 2015. This law is concerned with the safe use of genetically modified living organisms. This legal framework may permit the start of risk-analysis processes for the introduction of transgenic seeds and crops. It is the responsibility of the Ministry of the Environment and Natural Resources (MIMARENA) to grant approval. However, by 2012, the press had begun to report the signing of agreements between Dominican and foreign companies for the introduction of transgenic seeds into the country (Listín Diario, 2012).

Since 2010, the country has had a laboratory for the identification of genetically modified crops. It is an IIBI agency created to provide certification for exporters required to prove that their products are GMO-free. This laboratory is also able to detect the undeclared importation of transgenics.

The delay in passing the Biosafety Act limited the development of genetic engineering. This law is essential to the implementation of DNA manipulation techniques such as CRISPR and the importation of transgenic seeds, which may be useful for food security in the country, especially for plants with genes for water-stress resistance and salinity tolerance. The Dominican Republic still lacks the training and infrastructure required for the development of genetically modified animals to be more productive, resistant or have greater nutritional value.

One of the ways to ensure that people ingest the nutrients required for their particular needs is through the obtainment and production of agricultural items with certain nutritional characteristics. This will be achieved through research into genetic improvement, and the obtainment and/or identification of biofortified products. These products possess higher concentrations of certain key nutrients than their unimproved counterparts. Examples include the worldwide effort to produce high-beta-carotene sweet potatoes, and the production of rice and beans with high iron and zinc content already available in the country. This will reduce problems such as anemia in children and the elderly. It should also contribute to promoting the consumption of functional foods.

Biotechnological research and other technological innovations would have a greater impact on the country's food security if they concentrated on these agricultural items.

V. Increasing the efficiency of food systems

a. Technology in agricultural production

A diagnosis of the Dominican agri-food sector showed that the main obstacles that have prevented the achievement of public-policy objectives are:

1. Low productivity, profitability and competitiveness. Although there are very dynamic groups of producers, in general, lags persist in the agricultural sector.

2. Rural financial system. This is one of the most obvious problems, since for many producers, formal credit is scarce or extremely expensive.
3. Limited economies-of-scale in production functions. This is related to the small size of the domestic market as well as to the high fragmentation of agricultural holdings.
4. Low incorporation of national added value into primary production. This is mainly due to the lack of processing and marketing structures and a dearth of information on market opportunities.
5. Incidence of natural phenomena such as hurricanes, storms, floods and tornados. These have historically affected agri-food production and resulted in a decline in production.

The following priorities have been established to reverse this situation:

A. Improve the sustainability of production systems, based on sustainable agriculture practices and the protection of fragile forest ecosystems.
B. Increase the productivity and profitability of farmers to eliminate the delays that prevent competitive insertion into markets.
C. Improve rural social equity and reduce the poverty in which a significant part of the rural population lives, for which a model has been developed, combining the achievement of economic, social and environmental results and targeting specific population groups.

b. Increasing the efficiency of food systems

In order to increase the efficiency of food systems, the following actions have been proposed for the agricultural and rural sector in the Dominican Republic: a) strengthening of nutritional food security and combat poverty; b) strengthening of the Social Protection Network for the most vulnerable sectors; c) use and management of water resources; d) protection of natural resources and the environment; e) support for human capital development and business management, and f) community rural development.

In order to achieve food and nutrition security in the country, it is essential to increase investment in farmers' assets as a successful strategy for combating poverty. The efficiency of these investments depends on a set of conditions including coordination among macroeconomic, sectoral and rural development policies; the establishment of a decentralized, participatory regional approach to rural development; and strengthening institutions to support income-generating activities in rural areas.

The basic, interrelated components, divided into short-, medium- and long-term actions, are as follows:

1. Productive reconversion and diversification. The Dominican Republic must leverage the comparative advantages it has on traditional export crops (coffee, cacao, sugar and bananas), as well as non-traditional crops such as mango, avocado, oriental vegetables, pineapple, bananas and tomatoes.
2. Support for the development of rural micro-financing services. Access to financial services in rural areas is still limited. This component seeks to increase the supply of rural financing for producers, contribute to reducing transaction costs and strengthen community and other producers' organizations to promote "financial intermediation" in rural areas.
3. Strengthening the technical capacities of small- and medium-sized producers and the development of value chains. The purpose is to contribute to the creation of technical capacities and an organizational structure, through education, access to technologies and the formation of value chains, so that producers can intensify and diversify production, meeting quality, safety and market price standards, which will ensure the population's food and nutrition security. The efficient integration of value chains is of great importance for successfully competing in both national and international markets.
4. Promotion of rural, peri-urban and agricultural markets. The aim would be to establish a market-intelligence mechanism (such as market niches, access requirements and packaging), to provide useful business

information to reorient production and marketing patterns, and to assist producers in setting up innovative direct marketing, processing and packaging systems.

5. Strengthening social organization. Activities to strengthen the capacities of communities in their organization and participation, including the undertaking of participatory diagnoses and plans. To this end, emphasis is placed on training and assistance in preparing management and investment plans on the farm and in communities.
6. Strengthening of rural municipalities through investment in productive and social infrastructure. Strengthen rural municipalities through the training and financing of community projects and municipal outreach, as a means to enhance community development. The latter will include basic infrastructure (such as neighborhood roads, irrigation canals and collection centers) and other services.
7. Community rural development. This initiative complies with the commitments undertaken by the government of the Dominican Republic to meet the Sustainable Development Goals (SDG) and is part of the National Development Strategy. Support would focus primarily on areas with the highest levels of poverty and food insecurity. This situation affects the SW region and certain border communities in the NW region.
8. Technological innovation. The aggregate technological level of Dominican agricultural production is low except for subsectors of poultry production, certain fruits and vegetables, specialty coffee, organic bananas and the measures adopted by certain individual producers.

Two different subsectors currently coexist: one that is modern or undergoing modernization, with relatively advanced technology and a market orientation, and a small-scale one, with limited business-management capability that tends to be concentrated in fragile environments with low fertility soils. The aims is to strengthen national institutions (public and private) for the generation and transfer of agricultural technologies, in order to promote productive efficiency, competitiveness and environmental sustainability, as requirements for guaranteeing food and nutrition security in the Dominican Republic.

Some markets offer meat that failes to meet safety standards.

Availability of a variety of grains contributes to good nutrition.

VI. Health Considerations

a. FoodBorne Diseases (FBD)

The World Health Organization (WHO) defines FoodBorne Diseases (FBD) as those resulting from the ingestion of food with etiological agents in sufficient amounts to affect the consumer's

health. The most common symptom is diarrhea or other gastrointestinal symptoms.

According to the Ministry of Public Health and Social Welfare of the Dominican Republic (MISPAS), during the 1995-2002 period, 267 outbreaks of FBD were reported, of which only 55% were investigated. The most commonly involved food was fish, accounting for 61% of the total (MISPAS, 2003).

The 2014 General Health Report of the General Directorate of Epidemiology (MISPAS, 2014) indicates that in 2013, there were 471,383 outpatient consultations (8.03% of the total) due to diarrhea and gastroenteritis of presumably infectious origin. According to international estimates, the main cause of diarrheal or gastroenterological problems is the consumption of unsafe food or contaminated water (Peralta, 2011). In the Dominican Republic, only 84.4% of the population has access to improved sources of drinking water, according to the General Health Report 2014. The same report documents the deaths of 57 children ages 1 to 4 from acute diarrheal disease, a rate of 3.1%.

According to Peralta Girón (2011), during the 2004-2010 period in the Dominican Republic, 103,102 cases of FBD and 164 outbreaks (a proportion of 153/100,000 inhabitants) were reported. Of these outbreaks, 21% required hospitalization. A total of 3,010,915 cases of Acute Diarrheal Disease (ADD) were also reported. The WHO estimates that 100% of the Dominican population has suffered at least one case of FBD during their lifetime. The main foods involved were fish and shellfish (34%), water (18%), dairy products (15%) and meat and poultry (9%). Likewise, the infectious agents isolated were, in order of importance, *E. coli, Staphylococcus aureus, Entamoeba histolytica, Salmonella* spp. *Shigella*, hepatitis A virus and Norovirus.

Due to the island's geographic location, it is important to mention ciguatoxin, transmitted by the consumption of fish during certain months of the year, when they feed on the microalgae that produce it. Fish and shellfish were responsible for 34% of cases of FBD in the 2004-2010 period (Peralta, 2011).

In recent years, cholera has become a threat to the health of the island's population, mainly in Haiti, to which it was brought by Nepalese UN troops. From Haiti it spread to the Dominican Republic, presumably due to the constant migration of Haitian nationals to this country. In 2013, 1,954 cases of cholera occurred in the country, at a rate of 20 cases/100,000 inhabitants, with La Altagracia, one of the country's main tourist areas, being the most severely affected province, with a rate of 317 cases/100,000 inhabitants (MISPAS, 2014).

FBD not only constitute a public health problem, but also affect tourism, the main source of foreign exchange in the Dominican Republic. Domenech-Sánchez et al., (2009) report the results of a study on a Norovirus outbreak at two hotels in the Dominican Republic. Jiménez et al., (2011) report on an international outbreak of cholera contracted at a wedding in the Dominican Republic, which infected people from four different countries. Blume et al., report cases of ciguatera in German tourists in 1983 (Blume et al., 1983).

b. Overconsumption of food

Postmodern society has been characterized by an increase in overweight and obesity rates, as a result of the imbalance between caloric intake and energy expenditure, mainly due to more sedentary lifestyles and changes in dietary patterns. The Dominican Republic is no exception. Obesity is a risk factor related to chronic noncommunicable diseases, and in many cases is the trigger for many secondary comorbidities affecting all Latin-American countries. The Body Mass Index (BMI) will be used as an indicator for the excessive consumption of food in the Dominican Republic.

Data on overweight and obesity rates in the Dominican Republic vary according to the sources consulted. According to a report by Deloitte published in the national press, obesity increased from 6% in 1980 to 22% in 2014 (Diario Libre, 2016), meaning that the country ranks 11th of 21 American countries. The Second Latin-American Obesity Consensus (Gómez et al., 2014) reports that in the Dominican Republic, 27.1% of the people are obese and 37.5% are

IDIAF-3 rice variety selected by local researchers.

overweight, making a total of 64.6% of the population with high weight. The FAO National Food and Nutrition Security Profile (2015), citing WHO, places obesity in the population over 18 years of age at 23.9%, segmenting that data into 18.2% of men and 29.5% of women. According to the same source, 7.6% of children under 5 are overweight.

This situation is the result of the significant increase in caloric intake that the Dominican population has experienced from 2,118 kcal/day/person in 1900 to 2,620 kcal/day/person at present. Another possible cause of the growth of overweight and obesity rates could be the increase in the number of people who consume food outside the home, especially in large cities, for work or recreational reasons. This is exacerbated by the proliferation of high-calorie fast-food restaurants in the past 20 years and their greater affordability. Moreover, Dominican food is low in fruits and vegetables (12% of calories consumed), and extremely rich in sugars (13% of calories consumed) (FAO, 2015).

According to the Second Latin-American Obesity Consensus, the Dominican Republic is expected to be one of the countries with the highest obesity rate in the world by 2020 (Gómez et al., 2014). There is also a high prevalence of diabetes and hypertension, two diseases that have been linked to eating habits, and that constitute a risk factor for obesity. According to the 2014 Report by the General Directorate of Epidemiology (MISPAS, 2014), diabetes affects 10.4% of men and 9.9% of women in the country. Hypertension affects 34.4% of the adult population in the Dominican Republic.

High levels of inequality persist in the country. This is why, despite the problems caused by overconsumption of food, malnutrition continues. According to WHO data cited by FAO (2015), malnutrition in children under 5 years of age was 4%, subdivided into 7.1% of children under 5 with chronic malnutrition and 2.4% with acute malnutrition. However, the General Directorate of Epidemiology reported that, for the same year, 9.8% of children under 5 suffered from chronic malnutrition. Likewise, 8.1% of children are born with low body weight (MISPAS, 2014). According to FAO (2015), the incidence of micronutrient deficiencies is as follows: 34.6% display anemia; 86% iodine deficiency and 13.7% Vitamin A deficiency.

Accordingly, the Dominican Republic needs to address the issue of food security while developing nutrition-education policies to help prevent problems of obesity and other diseases such as diabetes and high blood pressure.

c. Expected changes in food consumption patterns and their implications

In traditional Dominican food, lunch is the main meal and comprises rice, beans, meat (if possible) and a salad that consists, in most cases, of lettuce or cabbage with tomato and cucumber. Breakfast and dinner were generally made up of "provisions" (bananas, cassava and other root vegetables and/or tubers) with egg, salami or cheese. In many cases, bread has replaced these provisions. Many of these foods are eaten fried.

However, in recent years, changes in eating habits have been observed in Dominicans, especially in the middle and upper socioeconomic strata. These changes in eating habits are caused by many people's interest in leading healthier lives and controlling their body weight. These changes, however, are not necessarily guided by specialized nutritional advice, but by various sources of doubtful scientific validity.

Globalization has led to the internationalization of cultural and economic patterns, which in turn influence people's eating patterns. The change in working hours mean that many people, especially in Santo Domingo, are forced to eat lunch outside the home, either in the cafeterias of the companies where they work, or at nearby restaurants.

One type of restaurant that has expanded greatly in the past 25 years are fast-food chains. The first fast-food franchise in the Dominican Republic was established in 1992. By 2015, there were already 41 hamburger restaurants in the country's largest cities and tourist resorts (Listín Diario, 2015). There has also been a noticeable expansion of pizza shops, and stalls selling hot dogs, fried empanadas and meat and fried derivatives. Fast food constitutes an important part of the eating pattern of Dominican children and young people (Listín Diario, 2015).

In 2007, the Central Bank of the Dominican Republic conducted the National Survey of Household Expenditure and Income. The absolute total and the percentage distribution of household expenditure on food and non-alcoholic beverages were obtained. Menchú et al., (2013) determined the composition of the Dominican diet by analyzing data from this survey by examining the food purchased by Dominicans during a specific week.

According to this survey, the most commonly consumed foods were: poultry, eggs, wheat bread, plantains and bananas, prepared foods and processed natural juices. In some regions, people also ate onion, condiments, dehydrated soups and sauces and dressings. These were followed by: milk, sausage, rice, sugars, vegetable oil, potatoes and root vegetables, onion, chili, savory snacks, carbonated drinks, dehydrated soups and sauces or dressings. In some regions, coffee, tea and chocolate were consumed.

As one can see, food patterns are changing, expressed in the addition or elimination of certain foods from the food basket and the availability of fast-food outlets. It is important to emphasize that purchasing power and time constraints are the main reasons why families to choose to buy ready-to-eat products.

d. Understanding and encouraging behavioral changes and the emergence of personalized nutrition

Although a Food and Nutrition Security and Sovereignty Law has existed since 2016, many tasks remain pending, one of them being to study the nutritional quality of Dominican food in depth. On the basis of this research, it will be

Support for small-scale farmers can have a favorable impact on food security.

possible to understand and encourage changes in the patterns of food consumption on the basis of scientific criteria.

The Dominican Republic must take the necessary precautions to combat the growing problem of overweight and obesity, in addition to diabetes and high blood pressure. At the other end of the scale, the persistence of high rates of child malnutrition, anemia, iodine deficiencies and Vitamin A must be addressed.

VII. Policies to contribute to food and nutrition security

The Dominican Government defined the following as the most relevant specific objectives of its Food and Nutrition Security policy: increase food availability; facilitate physical and economic access to food; achieve the recommended consumption of food, in quantity and quality, and strengthen preventive and curative actions that will contribute to the biological use of food.

Nutritional food-security policies also prioritize the development of human resources and highlight the need to strengthen education in nutrition and food security in basic education and build teachers' capacities, which will contribute to the comprehensive education of children, and adolescents. The target population of Food and Nutrition Security activities includes the following groups: children under five and of school age; women heads of household; expectant mothers; nursing mothers; youth; older adults, and other segments representing families living in extreme poverty in economically, socially and environmentally deprived areas.

Organic cacao is one of the high quality exportable products.

Local consumption and exports of mango are extremely important.

In vitro culture of fungus-free banana.

Local eating habits do not include the consumption of fish.

a. Legal framework

The country has a legal framework that addresses the issue of food and nutritional security at various levels. This includes the following:

a. The Constitution: Modified in 2010, the Constitution recognizes the right of all citizens to have access to quality goods and services (Article 53). Article 54 refers directly to food security. Likewise, Article 61 on the right to health stipulates that the State must ensure access to drinking water and improved food, among other aspects.

b. Law on Food Sovereignty and Security (No. 589-16): The purpose of this document is to establish the institutional framework for the design and development of food and nutrition sovereignty and security policies as a guarantee for preserving the right to food (Art. 1).

Article 6 defines the right to proper food for everyone, which means that they can feed themselves, have financial capacity, protection from the risk of losing access to food, the opportunity to consume healthy, nutritious food, and access to accurate information. At present, the formulation of the Law of Sovereignty and Food Security is still pending.

c. National Development Strategy: Through Law No. 1-12, passed on January 25, 2012, the National Development Strategy (NDS) was approved, which will be in force until 2030. Providing a country vision, it is linked to the formulation of multi-annual plans for each government, institutional, sectoral and territorial plan, and national and municipal budgets.

The NDS has four strategic axes. Among the objectives of the third axis are two that are directly related to food sovereignty and food security. These are Objective 3.4, which proposes sufficient, decent jobs, and Objective 3.5, which seeks to achieve a sectoral, territorially coordinated productive structure that is competitively integrated into the global economy and leverages local market opportunities.

d. Sectoral Strategic Plan for Agricultural Development 2010-2020 of the Ministry of Agriculture: This Strategic Plan establishes political lines, through strategic axes with its respective objectives and goals, prior to which it undertakes an analysis of the sector. In general, the plan is dominated by a neoliberal approach and the promotion of business production mainly oriented toward the export of goods. However, it contains very little about a vision on food and nutrition security.

b. Macroeconomic policies concerning food

Macroeconomic policies permit large-scale imports and maintain a steady and increasing deficit in the relationship between imports and exports. In 2015, the deficit was €6.985 million Euros, representing 11.38% of GDP. This undermines food and nutrition security.

Obtaining the currencies to support the import model has required increasing external debt. In 2015, external debt stood at €21,159 million Euros, equivalent to 34.94% of the GDP and €2,118 Euros per capita. This trend will jeopardize the stability and availability of food for the population.

c. Financing policy

Financing for the agricultural sector relies mainly on public financing through the Agricultural Bank and the Economic Fund for Agricultural Development (FEDA). The Strategic Plan is designed to strengthen these organizations and reinforce agricultural insurance, all from a state perspective. It is necessary to develop policies which, at the same time as they increase the public financing of agricultural production, oblige commercial banks to transform their loan portfolio, by facilitating loans to finance production rather than just consumption.

One element regarded as positive yet which distorts public policy are the "surprise visits," whereby the president visits communities and allocates resources directly in accordance with the demands submitted to him. This practice is detrimental to the corresponding institutions, since resources are allocated directly to groups of agricultural producers, without proper planning, analysis of the situation or technical and business monitoring, and are therefore destined not to produce any long-term productive effect.

Citrus production has been destabilized nationwide due to disease.

d. Land reform policy

The Strategic Plan drawn up by the Ministry of Agriculture in 2010 proposes an agrarian reform policy that includes strengthening the mechanisms for implementing agrarian reform, a vision of rural territorial development for the development of the reformed sector, obtaining land through the recovery of State land, the enforcement of the fair share law, land purchase and the renovation of current settlements, as well as the strengthening of associated groups and cooperativism.

According to the National Register of Agricultural Producers (updated in 2003), the country's agricultural area was 1.9 million ha. A high percentage of the land is owned, with 34.6% of owners possessing farms with more than 100 ha, approximately 49% owning units with between 5 and 100 ha and only 17.4% possessing farms with fewer than 5 ha. Part of the productive land is being given over to other non-agricultural uses such as urban growth, tourist infrastructure, mining, airports and other types of infrastructure. Unless more aggressive policies are implemented to conserve and reclaim productive land, food and nutrition sovereignty and security will be a chimera.

e. Research policy and technology transfer

The Strategic Plan for the Sector (2010-2020) proposes to promote research, technological development and innovation to improve the production, processing and marketing of agricultural products through new practices that will enable producers to increase production and productivity, and enter national and international markets. It also proposes to introduce new agricultural and animal varieties and novel techniques for the extension and dissemination of research.

f. Food and Nutrition Security Policies

The legal instruments that express Food and Nutrition Security policies have previously been mentioned in the Legal Framework section. These policies depend on political will focusing on three aspects: 1) Allocating resources through the budget and increased private financing; 2) Strengthening institutions in the sector and transforming some of them, and 3) Efforts to develop Associative Rural Firms.

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