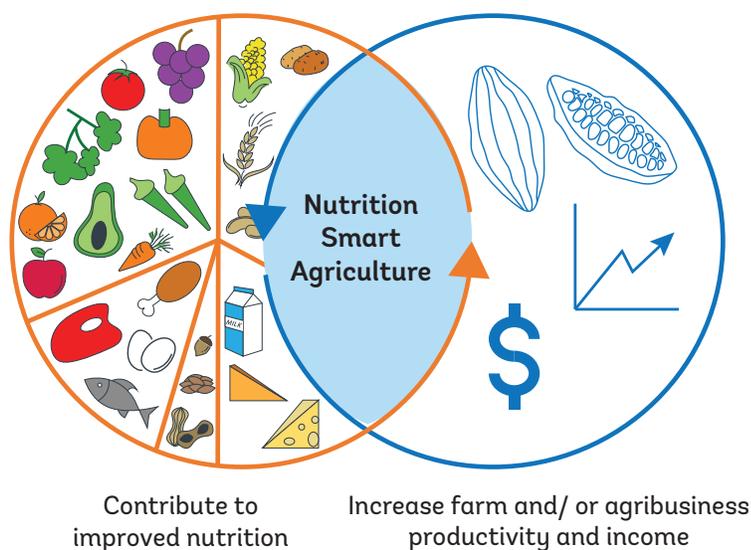


Nutrition Smart Agriculture in the Democratic Republic of Congo



Nutrition Smart Agriculture (NSmartAg) aims to simultaneously improve agriculture incomes and nutrition outcomes through agriculture interventions. NSmartAg practices and technologies contribute to address local nutrition issues and increase farm and/ or agribusiness productivity and income (Figure 1). It is a building block of food systems that promote healthy people, a healthy planet, and healthy economies.

Figure 1: Nutrition Smart Agriculture has two aims



Actions taken in the agricultural sector impact people's nutrition—it's where decisions are made on what and how much to produce, as well as the techniques that can be used to boost a food's nutritional content. Not leveraging the agriculture sector to contribute to nutrition outcomes is a missed opportunity. Agriculture and food production have been shown to be key drivers of nutrition outcomes. Failing to act on nutrition has staggeringly high economic and social costs for countries and the negative effects of poor nutrition can span entire lives and generations. Human capital – the sum total of a population's health, nutrition, skills, knowledge and experience – is estimated to account for over two-thirds of total global wealth [1], and 10-30% of the cross-country differences in gross domestic product (GDP) per capita can be linked to variations in human capital [2]. Malnutrition is intrinsically connected to human capital as undernutrition contributes to 45% of child mortality, and stunting is known to be associated with lost productivity and earnings in adulthood. Adding all these up, the global economic cost of malnutrition is estimated to be US\$ 3

- Child malnutrition is an underlying cause of up to 45% of under-5 deaths in the Democratic Republic of Congo (DRC).
- Three out of five households in DRC have acceptable food consumption, but diet diversity and meal frequency are not adequate.
- Iron, vitamin A and zinc are commonly referred to as problem key micronutrients to be addressed as part of national efforts. In this analysis, protein, as an important macronutrient, was added because a deficiency in protein negatively affects physiological utilization of other important nutrients, such as iron.
- An analysis of available data allows for the identification of major food sources that contribute to the production and consumption of these key nutrients in DRC. An illustration of the contribution of the main food groups produced in DRC in providing the optimal nutrient intake to contribute to a healthy diet (as defined by the EAT-Lancet Commission) reveals that the production of most food groups falls short of that intake.
- NSmartAg practices were identified for selected production systems/ agro-ecological zones in the West, the Kasais, and the East Regions of DRC and by targeted food groups for the primary production and post-harvest/ processing levels. These practices represent opportunities for local agricultural production to step up and fill the gaps.

trillion [3]. The prevalence and costs of overweight/obesity are also rising even in low- and middle-income countries where over 70% of the 2 billion overweight/obese people live today [4]. The total economic impact of obesity is estimated to be US\$ 2 trillion a year, or 2.8% of world GDP [5].

NSmartAg technologies and practices are those focused on primary production, and/or agri-food processing and distribution, i.e. where farmers and agri-businesses make decisions on what and how to produce. NSmartAg supports the overall Nutrition Sensitive Agriculture agenda across the food system (Figure 2).

Existing NSmartAg technologies and practices are available to farmers and agribusinesses in the Democratic Republic of Congo (DRC), but their adoption has been incipient. There is thus an opportunity for these NSmartAg technologies and/or practices to be supported by agriculture public policies and programs, expanding their adoption.

This country profile provides a snapshot of NSmartAg technologies and practices across the country and identifies entry points for their adoption for improved outcomes for farmers and agri-entrepreneurs.

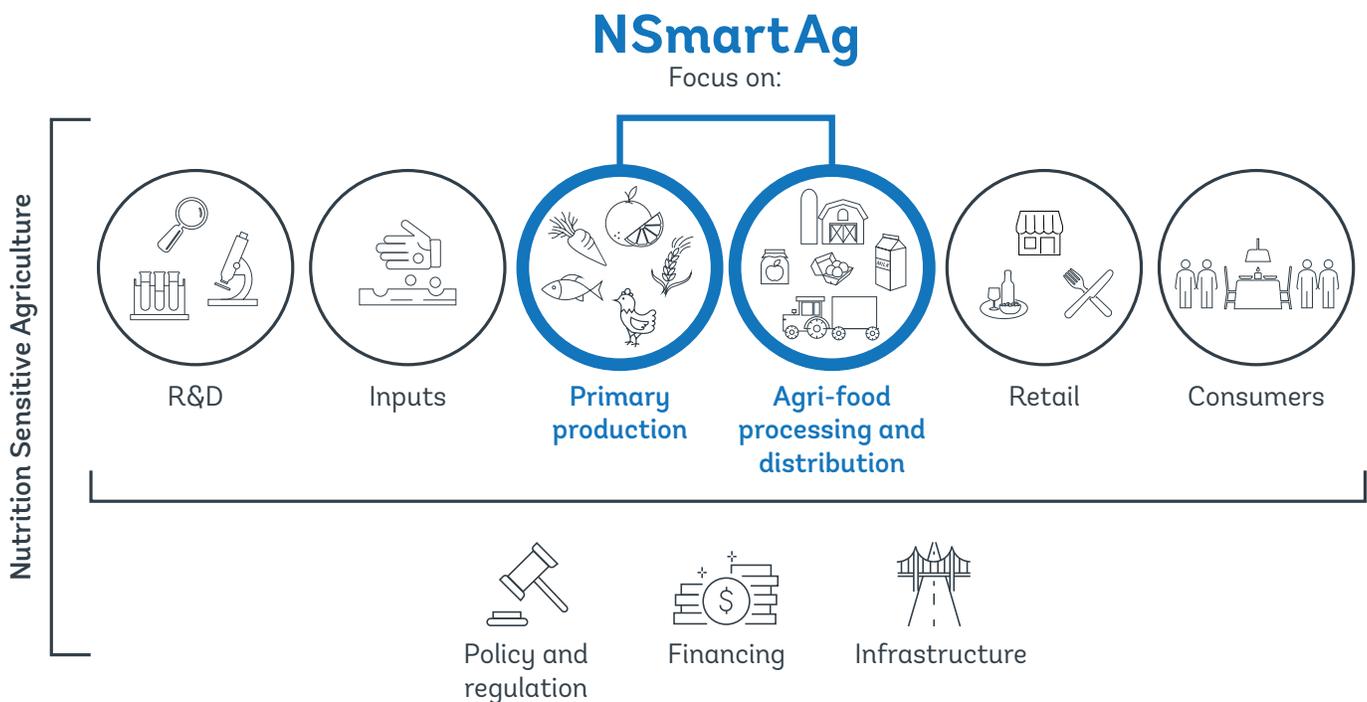
NATIONAL CONTEXT

KEY FACTS ON MALNUTRITION

DRC is the third country in the world with the largest number of poor after India and Nigeria. The incidence of poverty is high, with the highest levels of poverty found in the central, southeastern, and northwestern areas of the country [6]. Despite having relatively low poverty rates compared to the national average, the western region (Kinshasa, Kongo central, Kwilu), the Kasais and the Eastern region (North Kivu, South Kivu and Ituri) are among the provinces with the largest number of poor. Half of the poor (52%) in DRC are concentrated in these provinces¹.

Child malnutrition is an underlying cause of up to 45% of under-5 deaths in the Democratic Republic of Congo (DRC). Stunting, a manifestation of chronic malnutrition, affects 5.6 million children under the age of five (more than 40%). Among children under age five, 8% are wasted (acute malnutrition) [7], indicating little progress since 1995 when the level stood at 10%. Its severe form affects about two million children aged 6 to 59 months and increases their risk of death by 4 to 9 times [8]. These proportions are higher in rural than in urban areas [9].

Figure 2: Nutrition Sensitive Agriculture and NSmartAg



¹ DRC Poverty team calculation based on 2012 poverty rate and WorldPop population projection 2017.

A little less than a half of women in reproductive age (WRA) suffer from anemia (38%) [7], and more than half of the children under five (60%) are anemic. Although no recent data is available, it was once estimated that over half of pre-school aged children were directly affected by vitamin A deficiency, increasing the risk of death in childhood, vulnerability to infectious diseases such as measles, and blindness [10].

The 2016 Cost of Hunger in Africa (COHA) study found that undernutrition costs DRC 4.6% of its Gross Domestic Product (GDP) – equivalent to US\$ 1.7 billion – every year [11]. This includes loss in productivity, high healthcare costs for the treatment of malnutrition-related conditions and workforce reduction due to early deaths. The COHA model suggests that the equivalent of 7.5% of the working age population

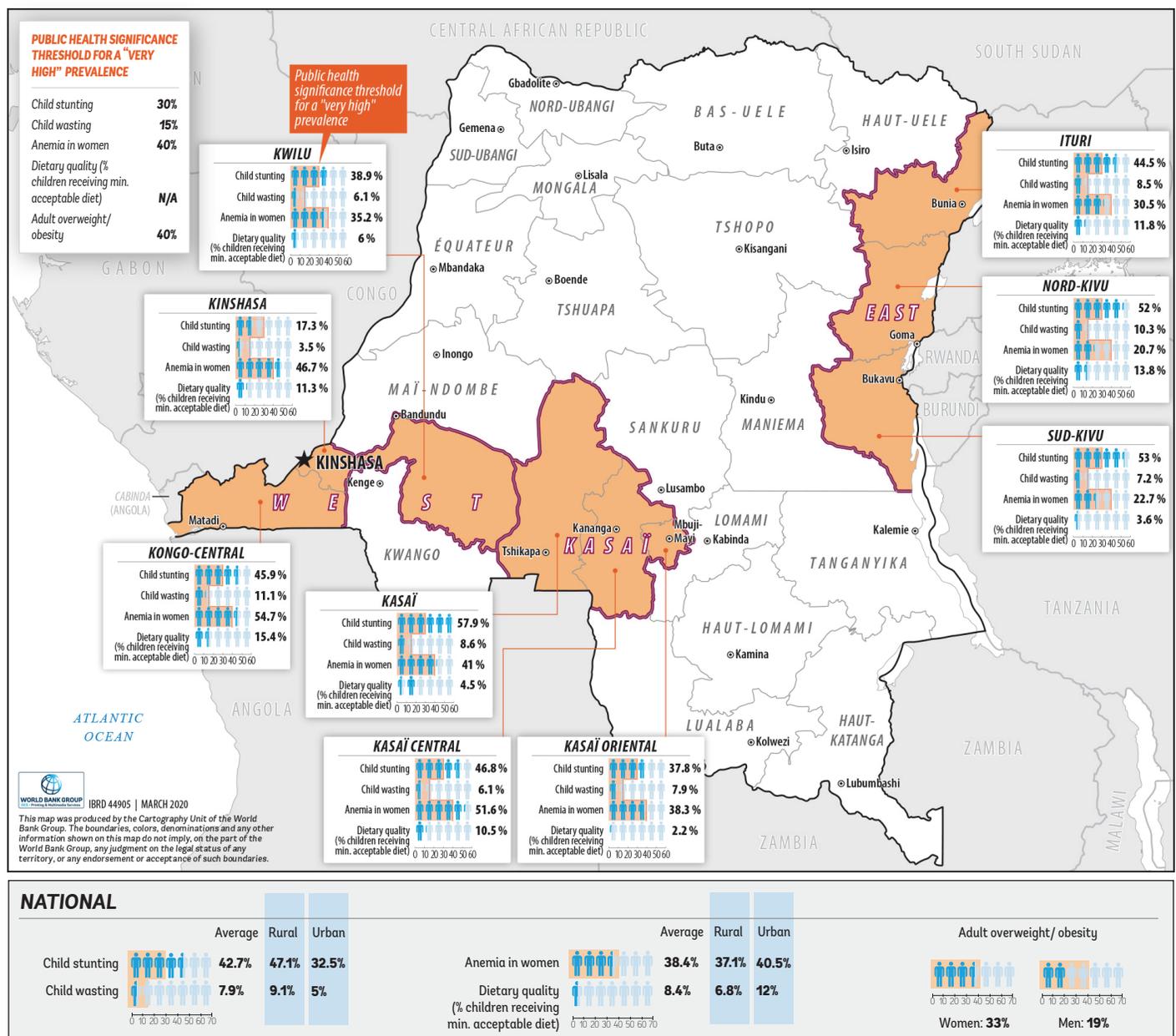
has been lost due to the consequences of undernutrition [12].

The latest available data also reveals that 4% of children under 5 are overweight. The prevalence of overweight and obesity (BMI > 25kg/m²) is 33% among all adult women [13]. Obesity (BMI > 30kg/m²) affects 3.4% of women in reproductive age (15-49 years old) while it is much higher, at 10.2% among the richest households [7].

The estimated impact of undernutrition on the global economy is US\$ 3 trillion per year; the global cost of overweight and obesity is between US\$ 1-2 trillion annually [3], [5].

Map 1 presents Key indicators on malnutrition.

Map 1: Key malnutrition indicators



KEY FACTS ON FOOD PRODUCTION

DRC is the largest country in Sub-Saharan Africa (SSA) in terms of land surface area with over 80 million hectares of fertile, diverse and arable land, and 52% of all fresh water resources in SSA. The agriculture sector of DRC accounts for about 20% of the gross domestic product (GDP) and employs some 70-75% of the economically active population [14]. Related agro-industries employ another 10% of the population.

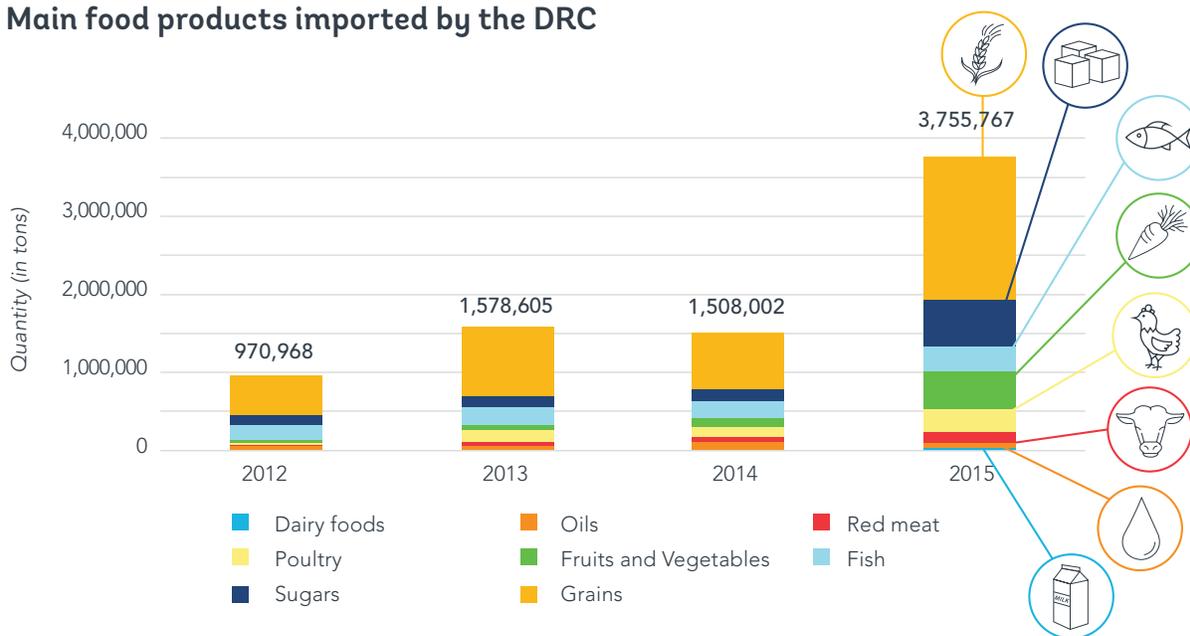
Despite its agricultural potential, DRC remains a net food importer. DRC exports are mainly driven by mining products and cash crops such as coffee and cacao. Between 2012 and 2015, DRC imported nearly 8 million tons of food. In this period, cereals imported accounted on average for 51% of food imports. In addition to cereals, fish and sugars are the two other most imported products, accounting for an average of 14% and 12% of food imports.

Over the last few years, national food production has been increasing (Table 2). From 2012 to 2015, 174 million tons of food were produced in DRC and livestock counted more than 108 million animals. Corn represents on average 69% of cereal production and rice 30%. The bulk of local rice in

DRC in 2015 came from the former eastern province (Ituri, Bas Uele, Haut Uele and Tshuapa) at 34.5%. Kasai² provided another 16.6%, while Kinshasa, Kongo Central and Kwilu each accounted for 13.4% of production. More than 33 million tons of cassava are produced each year. Cassava alone represents on average 79% of all food production in the country. In 2015, the western zone (Kinshasa, Kwilu and Kongo Central) produced 31% of cassava, followed by Kasai (14%), and North Kivu together with South Kivu (9%). Legumes represent less than one percent of DRC's annual food production, and beans are most commonly produced. The Kivus produce most of the beans with more than 68% in 2015. Like vegetables, oilseeds represent 1% of national production, the vast majority of which is peanuts. The western zone accounts for 36.6% of groundnut production, and Kasai for 20.3%. Plantains represented on average 10% of the annual production in DRC between 2012 and 2015. The former eastern province provided 45% of the production and the Kivus 27.2%.

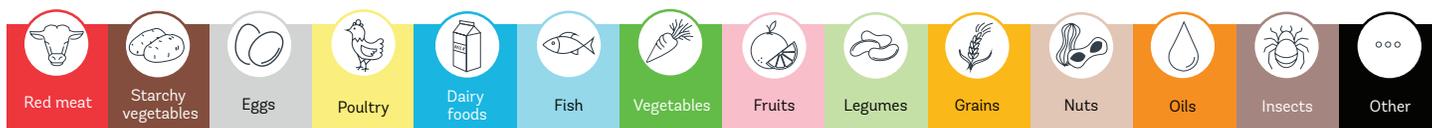
Over the same period, the livestock population has remained approximately constant (Table 3). The most numerous livestock, in terms of number of animals, is poultry followed by goats. Twenty percent of poultry produced in DRC comes

Table 1: Main food products imported by the DRC



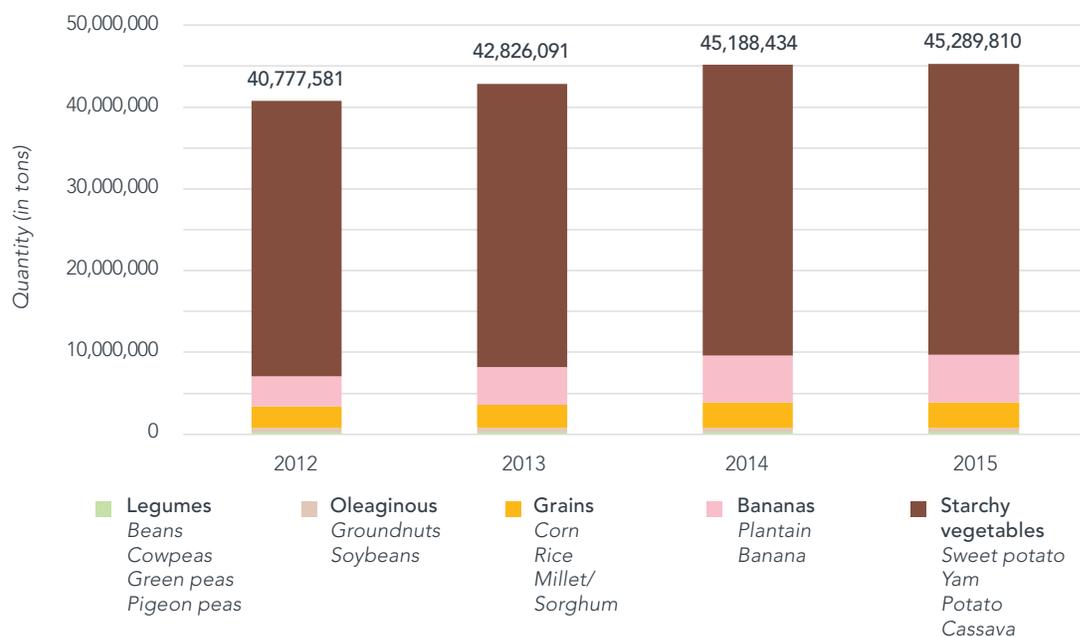
Source: SNSA, Statistical yearbooks 2017 - INS

Key



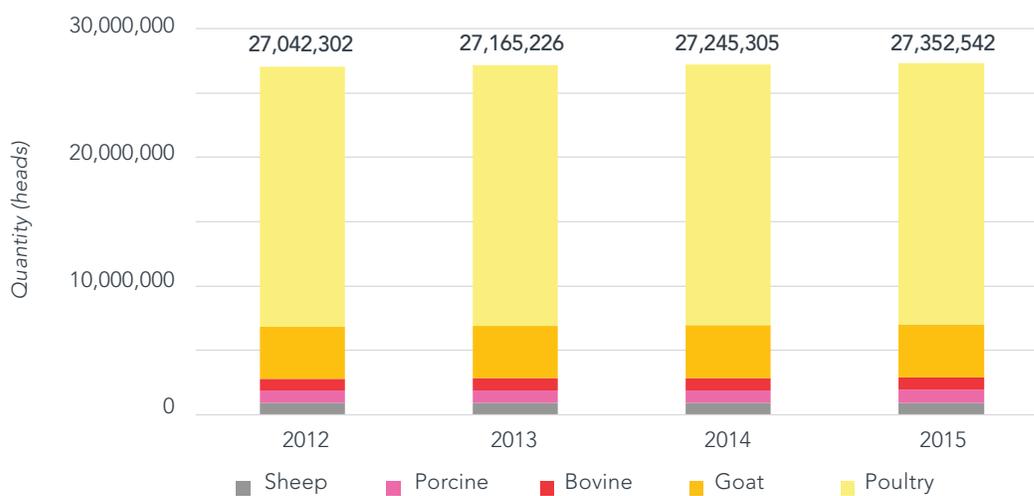
2 Kasai here refers to the former two Provinces of Kasai oriental and Kasai occidental.

Table 2: Food production by category and year



Source: SNSA, Statistical yearbooks 2017 - INS

Table 3: Livestock population



Source: SNSA, Statistical yearbooks 2017 - INS

from the Kasai, 19% from the eastern province, 17% from the western zone and 9% from the Kivus. The Kasai account for half the goat population in DRC, followed by the two provinces of Kivu (14%), and the western zone (11.6%).

An illustration of the contribution of the main food groups produced in DRC on providing the optimal nutrient intake

to contribute to a healthy diet as defined by the EAT-Lancet Commission [15] reveals that the production of most food groups falls short of providing for that intake (Figure 3). By contrast, production of starchy vegetables exceeds the planetary health boundary levels, as set by the EAT-Lancet Commission.³

³ The dotted line represents the production level of the entire country if all that is produced by the households is consumed locally (no exports or imports). This gives an idea of how far away the production of some key food products is from the "self-sufficiency" link representing the average healthy eating plate of that given population. This does not mean that self-sufficiency is being promoted, but it is an indication of an opportunity to increase production of certain foods that clearly show a deficit in terms of nutrient deficiencies of the local population.

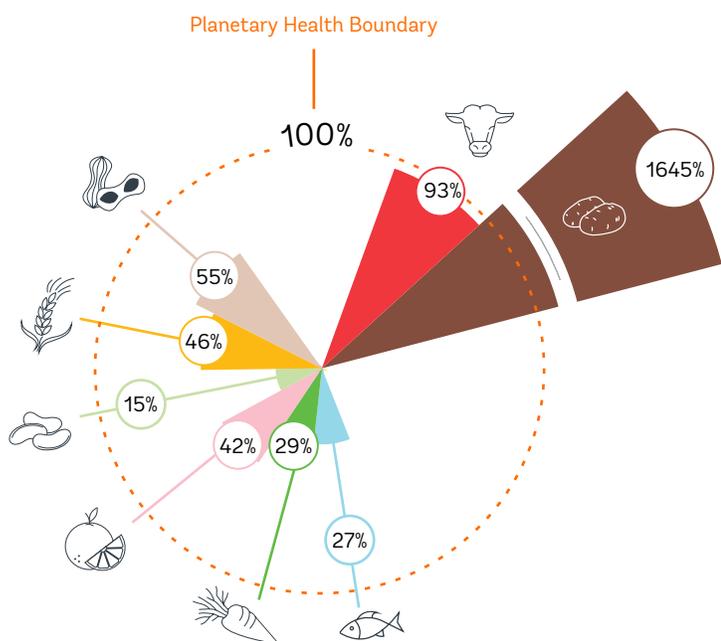
KEY FACTS ON FOOD CONSUMPTION

According to national surveys⁴ conducted over the last ten years, three out of five households in DRC have acceptable food consumption⁵ as defined by the Food Consumption Score.

Nevertheless, diet diversity and meal frequency are not adequate. On average 65% of adults [16] consume only two meals a day, and dietary diversity and meal frequency for children are inadequate even in urban areas [17]. Only one in five children (20%) receive meals that have the minimum acceptable level of diversity, and 35% were fed the minimum acceptable number of times during the day. Overall, only 8% of children aged 6 – 23 months were fed optimally [7].

In the absence of food-based dietary guidelines (FBDGs) or recommendations for DRC, the EAT-Lancet Commission's planetary health plate was applied where a boundary marked by 100% represents the healthy eating plate, and the different food groups are mapped in terms of distance

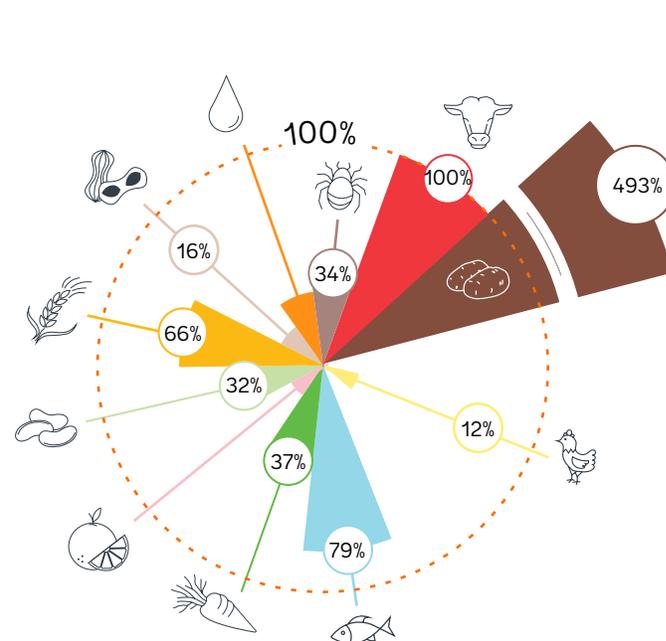
Figure 3: Main food groups produced and contributing to optimal nutrient intake



to the line⁶ (Figure 4). Consumption of all major food groups, except for starchy vegetables and red meat, falls below the recommended EAT-Lancet Commission's planetary health threshold.

In DRC, the review of national policies/strategies and other literature, reveals that iron, vitamin A and zinc are commonly referred to as problem key micronutrients to be addressed as part of national efforts⁷ (Box 1). In this analysis, protein, as an important macronutrient, was added because a deficiency in protein negatively affects physiological utilization of other important nutrients, such as iron. Deficiencies in these macronutrients are associated with compromised health and well-being of individuals, including growth failure in childhood and decreased immunity. Further, evidence suggests that protein intakes tend to fall significantly short of the recommended levels in many developing countries [18]. Non-availability is compounded by non-affordability (Box 2). Overweight and obesity are an emerging nutritional problem in DRC and many other countries, yet evidence

Figure 4: Main food groups consumed and contributing to optimal nutrient intake



4 Comprehensive Food Security and Vulnerability Analysis (CFSVA) 2008 and 2012; Multiple Indicator Cluster Survey (MICS) 2010, and 2017-18.

5 The Food Consumption Score (FCS) is an index that was developed by the World Food Programme (WFP), and is computed by grouping together the food items for which consumption was assessed over a seven-day recall period. WFP's standard Food Consumption Groups include poor, borderline and acceptable. Acceptable consumption corresponds to a household's diet that consists of daily consumption of starches, vegetables, oil, more pulses/beans/nuts as essential sources of vegetal protein (5 days a week) to which are added 3 days a week of meat/fish consumption as source of animal protein and 3 days a week of sugar; fruits and dairy products are rarely consumed.

6 As the EAT-Lancet's boundary is not an endorsed tool to be used as a dietary reference/benchmark for any particular population groups, it is used only for an illustrative purpose, rather than to quantify deficiencies/excess against the 100% line. Consumption of all major food groups, except for starchy vegetables and red meat, falls below the recommended EAT-Lancet Commission's planetary health thresholds.

7 To note, DRC only had recent nationally representative prevalence data on anemia, which is presumably caused in large part by iron deficiency and therefore often linked with programmatic interventions to increase iron intake. Data on deficiencies of the other key micronutrients are very limited (e.g. there is vitamin A deficiency prevalence data from 1999 which showed very high rates) or non-existent.

Box 1: What are the consequences of iron, zinc, and vitamin A deficiencies?

Iron deficiency often causes anemia, which is a condition where the capacity of the blood to carry oxygen to the body's tissues is reduced, resulting in symptoms such as fatigue, weakness, dizziness and shortness of breath, among others. These physiological conditions also affect the overall health status, cognitive development in children and productivity in later life. Iron is found in both plant and animal sources, yet the bioavailability (i.e. the absorption rates in the body) of plant-sourced iron is much lower than the animal sourced one.

Zinc deficiency limits childhood growth and decreases resistance to infections as zinc is an important essential nutrient for cellular growth, cellular differentiation and metabolism. Zinc is found more commonly in animal-sourced food items while some plant sources, such as nuts, contain zinc which has lower bioavailability.

Vitamin A deficiency diminishes the ability of our body to fight against infections, and thus increases the risk, especially among young children, of dying from common preventable diseases such as measles, diarrhea, and acute respiratory infections. It is also the leading cause of childhood blindness and maternal night blindness.

Box 2: Food Environment: Diverse and nutritious diets are not affordable

The food environment in DRC is low in nutrient-dense, animal-sourced foods, particularly in rural areas. The limited availability of a diverse range of foods renders the meeting of nutrient requirements difficult especially in rural areas. In Kasai Central, the Cost of Diet (CoD)* study revealed high non-affordability of an energy-only diet and a nutritious diet: 53% of households cannot afford to meet their energy needs and cannot afford a nutritious diet. More studies compound these sobering findings. The EAT-Lancet diet, which represents the first global benchmark diet capable of sustaining health and protecting the planet, has been deemed unaffordable for the world's poor. Hirvonen et al. (2020) estimated that the cost of an EAT-Lancet diet exceeded household per capita income for at least 1.58 billion people. For DRC, the cost of the EAT-Lancet reference diet represents 71.2% to 173.5% of the mean daily per capita household income [19].

Although increases in production of food does not necessarily lead to increase the affordability of foods, it is expected that making more nutritious food available over time will make it less costly and more accessible for more households.

**CoD is an assessment tool that uses software to estimate the amount and combination of local foods needed to provide a typical family with a diet that meets their average needs for energy and recommended intakes of protein, fat, and micronutrients.*

related to the impact of specific agriculture interventions on overweight/obesity is still limited. Malnutrition issues related to undernutrition and micronutrient deficiencies are still more prevalent and receive policy and program attention. Specific interventions that directly try to address overweight and obesity issues therefore were not analyzed while an 'obesity lens' was applied in selecting the recommended menu of options⁸.

An analysis of available data⁹ allows for the identification of major food sources that contribute to the production and consumption of these key nutrients in DRC. At a national level,

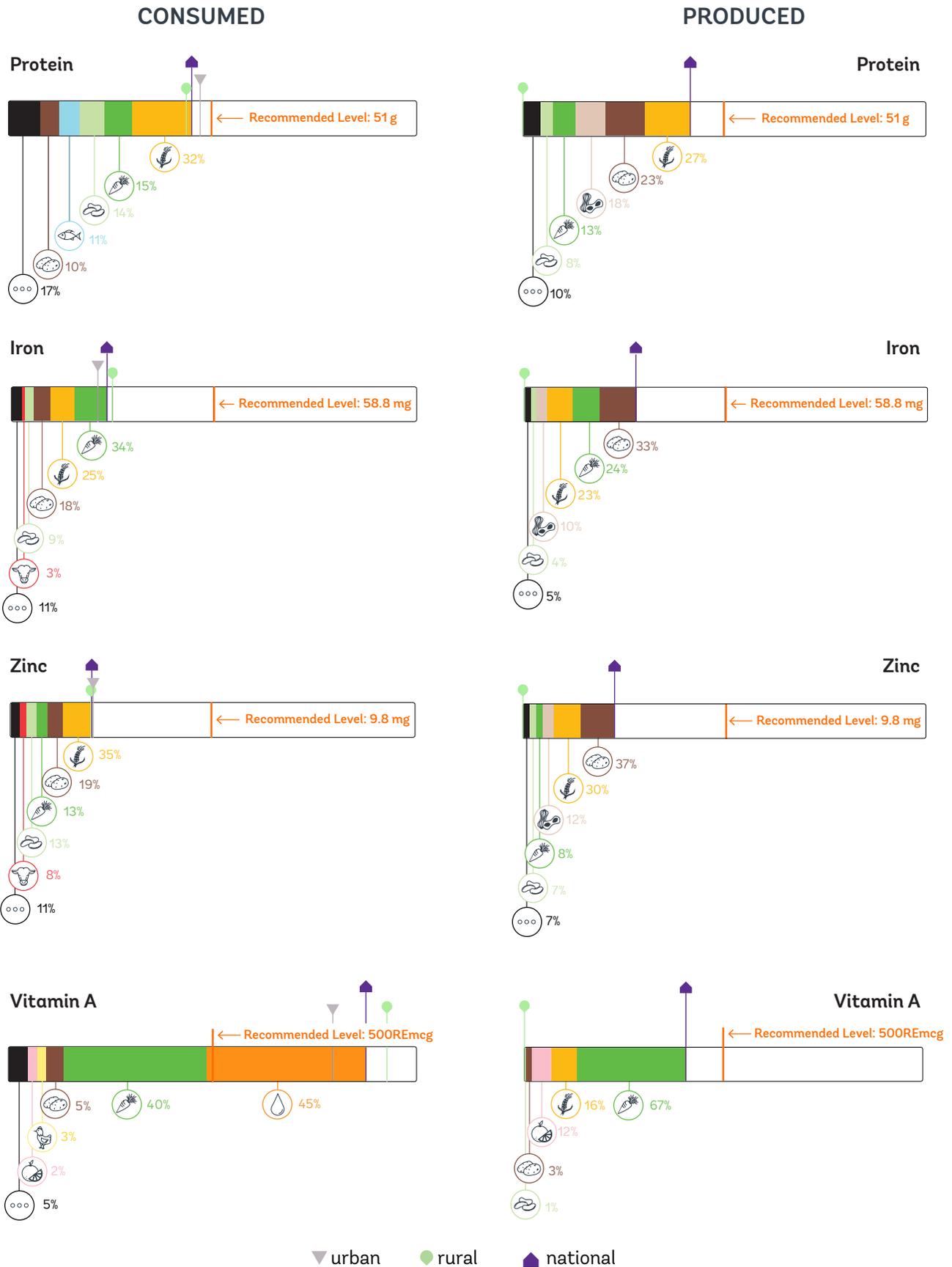
consumption of food constituting a main source for three of key nutrients does not meet the reference threshold set for "planetary health boundary" (Figure 5). In other words, foods rich in protein, iron and zinc are not adequately consumed. At a national level, grains constitute major food sources of zinc and protein while vegetables (mainly *pondu*¹⁰) play that role for iron. Needs in vitamin A are met, albeit largely by consumption of red palm oil. While red palm oil is a good source of vitamin A consumed widely and regularly, over-consumption can contribute to overweight/obesity. Further, an extremely high intake of vitamin A can have a toxic effect during pregnancy. At a national level, DRC

8 Foods high in sugar/oil/salt, ultra-processed foods and red meat that are known to contribute to overweight/obesity or diet-related non-communicable diseases, such as cardiovascular diseases, are not promoted.

9 Household Consumption and Expenditure Survey (HCES) 2012-13, called the 123 Survey.

10 *Pondu*, also known as 'saka saka', or 'feuille de manioc' in French, is derived from the leaves of the cassava plant.

Figure 5. Food group sources for key nutrients (produced and consumed) at the national level



does not produce enough food sources to meet threshold consumption for any of the four key nutrients – protein, iron, zinc and vitamin A (Figure 5). This represents an opportunity for local agricultural production to step up and contribute to meet these consumption gaps.

The bar graphs in Figure 5 display the estimated average nutrient production and consumption levels¹¹, per day, per adult female equivalent¹², for the population of DRC. For each graph, the estimated production or consumption level of each nutrient of interest is compared to the corresponding recommended intake level¹³ for the adult female category (center). The top food categories contributing to the intake are displayed as colored segments sized accordingly to their contribution.

NUTRITION SMART AGRICULTURE TECHNOLOGIES AND PRACTICES

NSmartAg technologies and practices present opportunities for contributing towards a double objective: improving nutrition of the local population, while also increasing farm and/or agribusiness-level productivity or revenue. In combination, these are the drivers for agribusiness investments. For this profile, these practices were identified based on observation/evidence of what farmers and agribusinesses are engaged in.

Table 4 showcases NSmartAg practices that were identified for selected production systems/ agro-ecological zones in the West, East and Kasais regions of DRC¹⁴ and by targeted food groups for the primary production and post-harvest/ processing levels.¹⁵ The same analysis presented in Figures 3 and 4 was done at the provincial level (results shown in the Supplementary Materials), comparing the consumption and production levels by food group against the planetary health thresholds. In the absence of agriculture census and enterprise survey data in DRC, both primary production and post-harvest/ processing activities are identified through field observations.

Based on the provincial-level results, the food groups that are neither consumed nor produced optimally were selected for further analysis. The food groups that are only produced

at negligible levels were excluded as they may not represent immediately exploitable business opportunities. Based on the selected food groups for each province, a list of food items to be promoted for primary production was formulated. Once specific food groups are identified as being produced locally, and if overall production and productivity trends have been positive (in other words, if the product is not disappearing from the local production systems), then the food product appears in the NSmartAg menu of options. Additionally, at post-harvest food transformation/processing and handling level, field visits are undertaken to agro-entrepreneurs that handle such food groups in order to assess whether they engage in NSmartAg practices and/or technologies. The field survey intends to assess the degree to which the activity increases productivity or revenue and the extent that the key nutrients are maintained/preserved, without adding unhealthy ingredients (sugars, trans fat, etc.), or at least doing so only in acceptable quantities.

The food groups identified for each province were: grains, legumes, fish, poultry and nuts for Kasai Central; nuts, fruits, vegetables, fish and poultry for Kasai Oriental; fruits, vegetables, fish and nuts for Kasai; poultry, fish, vegetables, fruits, legumes, grains and nuts for Ituri; fish, vegetables, poultry, legumes, grains and nuts for South Kivu; vegetables, fruits and nuts for North Kivu; poultry, vegetables, legumes, grains, nuts, and eggs for Kinshasa; poultry, fish, vegetables, fruits, legumes, grains, and nuts for Kongo Central; and fish, vegetables, fruits and poultry for Kwilu.

The identification of food products/ groups to promote does not imply a call to self-sufficiency. It constitutes simply an indication of an economically viable opportunity to increase production of certain foods that clearly show a deficit in terms of key nutrient deficiencies of the local population. Unless indicated otherwise, the practice or service is relevant for all the provinces. Lastly, before integrating into a program/ operation/ project, this indicative (and not exhaustive) menu of options needs to be analyzed for cost/ benefits to ensure that investment yields positive returns.

11 Bio-available and after losses average nutrients intake.

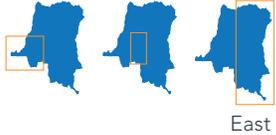
12 Special statistical measures were applied to compute an adult female equivalent, instead of per capita (see more detailed methodologies in the supplementary materials), as physiological nutrient requirements and individual dietary patterns are different by age/sex and women tend to be more vulnerable to nutrient deficiencies. A child equivalent was not used due to lack of reliable information about intra-household food allocations in the DRC context.

13 The 'recommended intake level' for each nutrient of interest refers to a set of internationally recognized and used reference values; in this profile, "Recommended Nutrient Intakes (RNIs)" developed by WHO and FAO were applied.

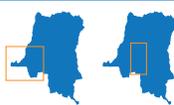
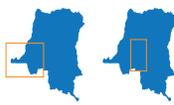
14 In each Region, three Provinces were selected: Kinshasa, Kongo Central, and Kwilu in the West, specifically; Ituri, North Kivu and South Kivu in the East; and Kasai, Kasai Oriental and Kasai Central in the Kasais. The selection criteria reflected government priorities, agricultural production potential, diversity of agro-ecological zones, and Bank investment areas.

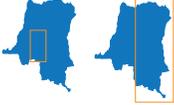
15 Annex III in Supplementary Material presents an indicative list of case studies on nutrition smart agriculture technologies and practices.

Table 4: Nutrition Smart Agriculture practices in DRC

		NSmartAg		
Value Chain Segment	Practices and Technologies	Contribution to nutrition	Market potential	Where
PRODUCTION	Adoption of biofortified cassava (vitamin A)	Addresses micronutrient deficiencies (mainly vitamin A)	Small market size; expectation for market growth (Kasais: Kasai Oriental, Kasai)	 West Kasais
	Adoption of biofortified beans (iron)	Addresses micronutrient deficiencies (mainly iron) and may contribute increased protein intake if consumed more.	Small market size; expectation for market growth (West: Kongo Central, Kinshasa; Kasais: Kasai Oriental, Kasai)	 East
	Adoption of biofortified maize (vitamin A)	Addresses micronutrient deficiencies (vitamin A)	Small market size; expectation for market growth	
	Adoption of Quality Protein Maize (QPM)	Provides an additional source of protein consumption; increase intakes of high-quality protein that contribute to child growth	Positive outlook for commercial viability of the product; existing demand; small market size; expectation for market growth	
	Adoption of Orange Fleshed Sweet Potato (OFSP) (vitamin A)	Addresses micronutrient deficiencies (mainly vitamin A)	Small market size; expectation for market growth	
	Fish	Addresses micronutrient deficiencies (iron, zinc and vitamin A), and provides an additional source of protein consumption	Large market size; expectation for market growth [East (Ituri, South Kivu)] Positive market outlook; existing demand; Large market size; expectation for market growth (Kasais)	
	Production of fruits	Addresses micronutrient deficiencies (mainly vitamin A)	Large market size; expectation for market growth [Kasais; East; West (Kongo Central ¹⁶ , Kwilu)]	
	Production of vegetables	Addresses micronutrient deficiencies (mainly iron and vitamin A in selected vegetables)	Large market size; expectation for market growth [Kasais (Kasai Oriental, Kasai)]	
	Production of nuts (peanuts)	Addresses micronutrient deficiencies (mainly iron and zinc); provides additional source of protein consumption	Large market size; expectation for market growth	
	Production of poultry	Addresses micronutrient deficiencies (iron, zinc and vitamin A), and provides an additional source of protein consumption	Large market size; expectation for market growth; limited competition	
	Production of pulses	Addresses micronutrient deficiencies (mainly iron) and may contribute increased protein intake if consumed more.	Small market size; expectation for market growth	

16 Increase in fruit production is identified for Kongo Central because the current “excess” production in this food group is mainly due to palm nuts.

Value Chain Segment	Practices and Technologies	Contribution to nutrition	Market potential	Where
	Production of Sakasaka, or pondu (cassava leaves milled and cooked with added water)	Addresses micronutrient deficiencies (mainly iron, zinc and vitamin A)	Positive outlook for commercial viability of the product; existing demand; large market size; expectation for market growth	
	Processing of fish (light treatment of fish for final consumption, kept fresh or conserved with salt, smoked fish)	Addresses micronutrient deficiencies (iron, zinc and vitamin A), and provides an additional source of protein consumption	<p>Positive outlook for commercial viability of the product; large market size; expectation for market growth (West for salted fish) & stable market growth (East for salted fish)</p> <p>Positive outlook for commercial viability of the product; existing demand; large market size; expectation for market growth (Kasais for salted fish)</p> <p>Positive outlook for commercial viability of the product; existing demand; large market size; stable/growing market growth (Kasais for smoked fish)</p>	
	Production of fruit juices (no sugar added)	Addresses micronutrient deficiencies (mainly vitamin A)	<p>Small market size; expectation for market growth (West)</p> <p>Positive outlook for commercial viability of the product; existing demand; large market size; expectation for market growth (East)</p> <p>Positive outlook for commercial viability of the product; existing demand; Small market size; expectation for market growth (Kasais)</p>	
	Fruit and vegetable drying (no sugar added)	Addresses micronutrient deficiencies (mainly vitamin A and iron in some selected vegetables)	<p>Small market size; expectation for market growth (West)</p> <p>Positive outlook for commercial viability of the product; existing demand; large market size; expectation for market growth (Kasais)</p>	
	Production of peanut butter (peanut paste)	Addresses micronutrient deficiencies (mainly iron and zinc); provides an additional source of protein consumption	<p>Small market size; expectation for market growth; limited competition (West)</p> <p>Positive outlook for commercial viability of the product; expectation for market growth (East)</p> <p>Positive outlook for commercial viability of the product; existing demand; large market size; expectation for market growth (Kasais)</p>	
	Production of peanut milk	Addresses micronutrient deficiencies (mainly iron and zinc); provides an additional source of protein consumption	Positive outlook for commercial viability of the product; existing demand; large market size; expectation for market growth (Kasais)	
	Production of soy milk	Addresses micronutrient deficiencies (mainly iron and zinc); provides an additional source of protein consumption	Positive outlook for commercial viability of the product; existing demand; large market size; expectation for market growth	
	Transport of fish	Addresses micronutrient deficiencies (mainly iron and some zinc), and provides an additional source of protein consumption	Positive outlook for commercial viability of the service; existing demand; large market size; stable market growth	

Value Chain Segment	Practices and Technologies	Contribution to nutrition	Market potential	Where
POST-HARVEST/ PROCESSING	Storage of fish	Addresses micronutrient deficiencies (mainly iron and some zinc), and provides an additional source of protein consumption	Positive outlook for commercial viability of the service; existing demand; large market size; expectation for market growth (East and Kasais)	
	Storage of chicken meat	Addresses micronutrient deficiencies, (iron, zinc and vitamin A) and provides an additional source of protein consumption	Positive outlook for commercial viability of the service; existing demand; large market size; expectation for market growth (Kasais: Kasai Oriental)	
	Processing of chicken meat (smoked)	Addresses micronutrient deficiencies, (iron, zinc and vitamin A) and provides an additional source of protein consumption	Positive outlook for commercial viability of the product; existing demand; small market size; expectation for market growth	
	Mix of minimally processed ingredients as basis for complementary food (e.g. corn, rice, and roasted soybeans, wheat, sorghum, sesame, and peanuts)	When micronutrient/protein rich products, such as soybeans, sesame and peanuts, are included in sizable proportions, it addresses micronutrient deficiencies (iron, zinc and/or vitamin A, depending on the ingredients) and provides an additional source of protein consumption	Positive outlook for commercial viability of the product; existing demand; small market size; expectation for market growth	
	Production of soy – sorghum flour	Addresses micronutrient deficiencies (iron and zinc); provides an additional source of protein consumption	Positive outlook for commercial viability of the product; existing demand; large market size; expectation for market growth	
	Providing service of milling of soy – sorghum flour	Addresses micronutrient deficiencies (iron and zinc); provides an additional source of protein consumption	Positive outlook for commercial viability of the service; existing demand; large market size; expectation for market growth	
	Production of flour from dried plantain	Addresses micronutrient deficiencies (mainly vitamin A, iron and zinc); provides an additional source of some protein consumption	Positive outlook for commercial viability of the product; existing demand; small market size; expectation for market growth	
	Production of soybean flour mixed with peanut flour	Addresses micronutrient deficiencies (mainly iron and zinc); provides an additional source of protein consumption	Positive outlook for commercial viability of the product; existing demand; large market size; expectation for market growth	

The range of NSmartAg practices is diverse and spans across the most important food groups (Highlights 1 and 2). The agro-entrepreneurs who are mostly owners of a micro, small or medium enterprise, and engage in these practices feel overwhelmingly optimistic for the commercial viability of the enterprise, and confident they have identified a growing segment of the agriculture and food market. Most of them sell their products directly to food consumers, who are located mostly in market cities and urban areas, followed

by wholesalers and retailers. Notably, most of them do not follow an official health code or have a sanitary permit for an agri-food business. Constraints identified are related to the general business environment as well as the purchasing power of consumers. The majority of owners of businesses active in NSmartAg activities are women. The majority of practices found is concentrated on processing and conservation of agricultural products. The rendering of services and in the areas of storage and transport, specifically, is very limited.

Highlight 1: Pongu in Kinshasa

Name of agribusiness: Congo bio-vegetal

A female-owned micro, small and medium enterprise (MSME) that produces amongst other products pongu by drying cassava leaves, and packaging them in ready to use portions. The product contributes to key micronutrient (like iron, zinc and vitamin A) intakes.

The MSME has a business plan, is operating in a profitable and growing market selling to wholesalers, and does not have any direct competitors.

Key considerations for further support:

The owner aspires to modern processing facilities. Finance, and investment more broadly, targeted to agri-food MSMEs can help to address these kind of barriers.



Highlight 2: Smoked and dried fish in Kasai Oriental

Name of agribusiness: Fopakor

A female-owned association of producers is engaged in drying and smoking local fish. Their processing techniques ensure the retention of nutrients, and their final product (smoked fish) contributes to protein, energy, and key micronutrient (like iron, vitamin A and some zinc) intakes.

The association has identified a profitable business opportunity, and is operating in what they consider a stable market with no competition.

Key considerations for further support:

According to self-reporting, sanitary and/ or food safety certifications were lacking. The government regulatory authority should work with agro-food operators to provide a complete food safety management system to ensure availability of safe quality food to consumers.

The company also lacked a business plan, and aspired for modern dryers. Providing technical assistance in entrepreneurial skills, as well as programs to help budding enterprises grow, would be welcome.



INSTITUTIONS AND POLICIES THAT SUPPORT AGRICULTURE SOLUTIONS FOR NUTRITION

Since the early 2000s, the Government of DRC has been increasingly recognizing investments in nutrition as priorities in national plans for poverty reduction and economic development. In 2000, the Government adopted a National Nutrition Policy and created the National Nutrition Program (Programme National de Nutrition, PRONANUT). PRONANUT is led by the Ministry of Public Health and ensures coordination of nutrition programs and policies. Initially both the Policy and the Program concentrated on curative interventions for acute malnutrition delivered through the health sector. In 2010, a nutrition component was included in the National Health Development Plan for 2011-2015. The plan focused on reaching the Millennium Development Goals (MDGs). A second National Nutrition Policy came into being in 2013 that importantly recognized the role of other sectors beyond just health in addressing maternal and child malnutrition [20]. In May of the same year, DRC joined the Scaling Up Nutrition (SUN) Movement paving thus the way for multisectoral solutions to malnutrition, including through agriculture, at all administrative levels.

The Prime Minister (Primature), became the president of the national SUN platform and the Minister of Public Health – its first vice-president. In 2017, DRC adopted a National Multisectoral Strategic Nutrition Plan (Plan Stratégique National Multisectoriel de Nutrition, PNSMN, 2016-2025) that operationalized the Nutrition Policy¹⁷ [20]. PNSMN explicitly calls for the agriculture sector to respond to malnutrition with increasing availability and access to diversified foods, including bio-fortified crops and fortified foods. PRONANUT, which serves as the SUN platform's executive secretariat, is mandated to oversee and coordinate the implementation of the Plan.

At a national level, the Prime Minister signed a decree creating, organizing and defining the operation of the National Multisectoral Nutrition Committee (CNMN) in December 2015. This body, under the Prime Minister's authority, brings together over a dozen ministers¹⁸, and is charged with utilizing a multi-sectoral and multi-stakeholder approach to end malnutrition. It has however not been operational. At the sub-national level, there are Provincial CNMNs that have been operational, however, only in two Provinces. At Province level, there is also a provincial intersectoral committee for nutrition (Comité intersectoriel provincial de

nutrition, CIPN) that is under the authority of the Province's Governor and ensures coordination with the CNMN. The Provincial Nutrition Coordinator is the CIPN's secretary. At the territorial level, the intersectoral committee for nutrition for the territory (Comité Intersectoriel de Nutrition du Territoire, CINT) is led by the Territory Administrator, and comprises public administration representatives of sectors relevant to nutrition. The CINT coordinates and monitors nutrition activities in the territory [21].

Policies and plans have been evolving to respond to the increasing calls for all sectors to step up in the fight against malnutrition culminating in the National Policy on Food and Nutritional Security (Politique Nationale de Sécurité Alimentaire et Nutritionnelle, PNSAN, 2018-2030). PNSAN states that the institutional coordination of food security and nutrition rests with the Prime Minister who is assisted by the Ministers of Public Health and Agriculture in collaboration with other ministries and technical and financial partners.

Institutionally, the Ministry of Agriculture is receiving Technical Assistance by the Food and Agriculture Organization (FAO) of the United Nations (UN) to establish a nutrition unit to help mainstream nutrition in policies and interventions (Programme de Sécurité Alimentaire et Nutritionnelle en Agriculture, PROSANA).

Although policy documents governing currently the agriculture sector do not address nutrition in a direct manner, the ministries of agriculture and of fisheries and livestock are deeply committed to advancing nutrition. A 2010 Food Security National Program (Programme National de Sécurité Alimentaire, PNSA) provided the framework for advancing coherence and integration of actions to be carried out by various technical ministries in order to achieve food security. Foreseen strategic axes and sub-programs included provisions on improving nutrition (through investing in sustainable food production, urban and peri-urban agriculture, health monitoring systems, etc).

The 2013 National Agriculture Investment Program (Programme National d'Investissement Agricole, PNIA) rests on a pillar intending to manage food and nutrition security, and strategic food reserves, and calls for actions to improve nutrition but without providing guidance on what those could entail. The second generation PNIA will reportedly be a PNIASAN, (Programme National d'Investissement Agricole et Sécurité Alimentaire et nutritionnelle, SAN), i.e. incorporating a specific focus on advancing food security and nutrition.

¹⁷ PNSMN ends in 2020. A new plan will be developed from 2021.

¹⁸ Health; Agriculture; Planning; Gender, Family and Child; Social Affairs, Humanitarian Action and National Solidarity; Budget; Finance; Primary and Higher Education; Labor and Social Security.

The proliferation of activities in the policy and institutional space surrounding nutrition, has prompted the government to, in collaboration with the World Food Program (WFP), to lead a Zero Hunger strategic review (Revue Stratégique Faim Zéro, RSFZ). The review took stock of the policies and programs implemented to respond to food security and nutrition concerns.

Governance over food safety is fragmented lacking a working coordinating entity, and related legislation is critically outdated. Box 3 provides a short overview.

Table 5 lists key actions led by the government in DRC recognizing the role of agriculture sector interventions in addressing malnutrition and calling for such investments.

Box 3: Food safety – current status

Oversight of food safety spans across three agencies from two Ministries. The **Ministry of Fisheries and Livestock** is the competent authority on food safety through its Directorates of Fisheries and of Veterinary Services that overlooks live animals, and products and byproducts of animal origin. The **Ministry of Agriculture**'s Plant Protection Department oversees plant and plant products. In addition, the **Ministry of Health** is charged with protecting health of national consumers, and the **Ministry of Trade** is responsible for the safety of exported products.

The country is a member of the Codex Alimentarius Commission (CAC). The most recent adoption of the Codex Alimentarius concerns 94 Codex Standards** from different Codex Committees including matters such as labelling (Codex Committee for Food Labelling, CCFL), nutrition and food for special dietary uses (Codex Committee for Nutrition and Food for Special Dietary Uses, CCNFSDU)***, commodities, and food irradiation. At the regional level, DRC participates in different Regional Economic Communities (RECs) and food safety technical instances.

The food safety regulatory framework in DRC has two major constraints: legislation is critically outdated; and the system is fragmented, lacking a working coordinating entity. Both Decrees on public health and sanitation and on trade and manufacture of foodstuffs are from the early 1900s. There is no authority leading the work towards updating food safety legislations, even though there is general acknowledgment of the need of it. Even though the roles and responsibilities of the food safety system in DRC are documented, in practical terms there is lack of clarity about its functioning and at subnational level the system is practically non-existent.

***Codex Alimentarius currently comprises a total of 224 Standards; 79 Guidelines; 54 Codes of Practices; Maximum Residue Limits (MRL) for 66 veterinary drugs and Risk Management Recommendations (RMR) for 13 veterinary drugs; and over 4300 MRLs for more than 200 pesticides. These Standards are established by Committees that work on general subjects or specific commodities, and task forces established to assess specific food safety matters. There are a total of 34 committees of which 15 are currently active and the rest have been either adjourned or dissolved.*

****Foods for Special Dietary Uses are defined by Codex Alimentarius as foods which are specially processed or formulated to satisfy particular dietary requirements which exist because of a particular physical or physiological condition and/or specific diseases and disorders and which are presented as such. The composition of these foodstuffs must differ significantly from the composition of ordinary foods of comparable nature, if such ordinary food exists.*

Table 5: Key actions

2013 National Agricultural Investment Program (Programme National d'Investissement Agricole, PNIA)	<ul style="list-style-type: none"> • Rests on a pillar intending to manage food and nutrition security, and strategic food reserves. • Calls for actions that contribute to improved nutrition.
National Multisectoral Strategic Nutrition Plan (Plan National Stratégique Multisectoriel de Nutrition, PNSMN) 2016-2025	<ul style="list-style-type: none"> • Calls for the agriculture sector to respond to malnutrition with increasing availability and access to diversified foods, including bio-fortified crops and fortified foods; and • Calls for the strengthening of governance and multisectoral coordination for nutrition
National Policy on Food and Nutritional Security (Politique Nationale de Sécurité Alimentaire et Nutritionnelle, PNSAN) 2018-2030	<ul style="list-style-type: none"> • Calls for increasing local agricultural productivity; improving physical and economic access to food; and • Aims to develop sustainable value chains in family farms and small and medium-sized agro-enterprises.
National Plan for Fortification (Plan national pour la fortification, PNF)	<ul style="list-style-type: none"> • Aims to promote the addition of vitamins and minerals, iron, iodine in locally processed food products.

ONGOING AND PLANNED INTERVENTIONS LINKING AGRICULTURE AND NUTRITION

The purpose of this section is to present in a succinct fashion (Table 6) what Nutrition Smart Agriculture practices and technologies are supported where and by whom so that synergies, opportunities and gaps can be easily identified. Information is not exhaustive.

Table 6: Relevant interventions

NSmartAg activity	Program name (duration)	Development partner	Target areas	Brief description as related to NSmartAg
Biofortification	Multisectoral child nutrition and health project (2019-2025)	World Bank	Kwilu, Kasai, South Kivu	Roll out of biofortification (maize, beans, cassava, orange fleshed sweet potato)
NSmartAg menu of options	National Agriculture Development Program (under preparation)	World Bank	Kwilu, Kasai, Kasai Central, North Kivu, Kongo Central	Direct farmer support to agricultural productivity
Primary production; post-harvest	Programme de Développement Agricole au Kwilu et Kwango (PRODAKK)	Enabel – Belgian Development Agency	Kwilu, Kwango	Value chain development including for bananas and pisciculture
Primary production; post-harvest	Agricultural value chain strengthening project (2017 – 2022)	USAID	South Kivu	Value chain development for soybeans and beans
Primary production; post-harvest	Integrated Rural Economic Development Support Project (PROADER) (2020 –2025)	African Development Bank (AfDB)	Kongo Central, Kwilu, Kasai, Kasai Central and Kasai Oriental	Value chain development (various agro-products)
Primary production; post-harvest	Project for Youth Entrepreneurship in Agriculture and Agro-Business (PEJAB) (2017-2023)	African Development Bank (AfDB)	Kinshasa, Ituri, South Kivu, Kasai, Kasai Central, and Kasai Oriental	Value chain development (various agro-products)

OUTLOOK FOR NUTRITION SMART AGRICULTURE IN DRC

DRC has the potential to be a major agricultural producer, both for national and regional food markets. Nutrition Smart Agriculture can help realize this potential, while also contributing to improved nutritional outcomes of the country's population. The field surveys undertaken in the three selected Regions of DRC shed some light on that potential. Indicatively, agro-entrepreneurs in the West singled out the opportunities for investing in processing facilities and equipment for fruit and vegetables, as well as for proper storage facilities. In the East, where fish production is both a currently profitable and a promising entrepreneurial activity, locals point to the potential for improving storage and processing through cold chain investments. In the Kasais, there is room for increasing production and productivity at the primary level as current production levels are low, as well

as for disseminating conservation awareness techniques, and investing in processing capacity. These opportunities were also accompanied by a series of common constraints for ag sector development in the two Regions, including: (i) poor transport infrastructure; (ii) lack of access to appropriate and affordable packaging material (most use recycled bottles, or other vessels); (iii) lack of knowledge on biofortification as a production option and for producing related food products (i.e. flour made out of biofortified crops); (iv) competition with cheap imports; and (v) limited consumer awareness of nutritional value of food products.

Mainstreaming NSmartAg into programs, in particular for post-harvest investments, will require support for the adherence with food safety standards (Box 4). Furthermore, NSmartAg investments would benefit from policies that promote the identified NSmartAg opportunities in agricultural research & development (R&D) (such as biofortification);

Box 4: Food safety – recommendations

There is a strong need for capacity building in food safety at all levels of decision-making and service provision. Also, DRC needs to update its food safety regulatory framework to include latest technological and scientific developments, to adapt to epidemiological and demographic changes, and to the double burden of undernutrition and overweight in the country. The country could make better use of the resources made available by CAC and harmonize its national regulatory framework with CAC standards. While all Codex Alimentarius standards are relevant, DRC could focus on the committees dealing with food hygiene (CCFH), nutrition and food for special dietary uses (CCNFSDU)¹⁹, fish and fisheries products (CCFP), contaminants (CCCP), pesticide and veterinary drugs residues (CCPR and CCRVDF), and additives (CCFA).

For the national food safety system to improve, DRC could prioritize the updating of three pieces of legislation on the basis of their date of issuance, relevance in catalyzing progress in food safety, and their role towards regional integration in the context of the African Continental Free Trade Area (AfCFTA). These are:

1. The Decree on Public Health and Sanitation, issued in 1926, which sets the rules on hygiene and public health.
2. The Decree of July 26, 1910 on the trade and manufacture of foodstuffs.
3. The Ordinance-Law of April 24, 1899 establishing and organizing the hygiene committees at district capital level (last updated in 1947).

Lastly, the country would benefit from designating a lead coordinating entity on all matters related to food safety. This entity could lead the efforts in updating the legislative framework, and function as the secretariat for participation in CAC and RECs, amongst other.

training of agricultural advisory and extension services on NSmartAg; and adapting financial instruments embedded in development operations for agri-MSMEs (such as agrifinance and matching grants) that could encourage the adoption of NSmartAg practices.

Most NSmartAg practices and production systems identified in DRC were geared towards urban markets, however rural markets could also benefit if such NSmartAg interventions were coupled with efforts to increase awareness of business opportunities among the rural population.

Finally, supporting an enabling agribusiness environment for NSmartAg would be important, including the continuous public policy advocacy for the need to implement policies

and programs that recognize the potential for agriculture to contribute to nutrition (and not just food security). The institutionalization of nutrition expertise within the agriculture sector ministries (at national and provincial levels) would allow for the practical application of that understanding in a consistent manner across projects and initiatives. Further investments in infrastructure and food safety, and continuous cooperation with other ministries in educating consumers on the benefits of a diverse diet will remain fundamental in combating malnutrition.

Efforts and opportunities to disseminate this Country Profile in agri-business fora and to financial institutions could be pursued to promote the adoption of NSmartAg by agribusinesses.

¹⁹ Foods for Special Dietary Uses are defined by Codex Alimentarius as foods which are specially processed or formulated to satisfy particular dietary requirements which exist because of a particular physical or physiological condition and/or specific diseases and disorders and which are presented as such. The composition of these foodstuffs must differ significantly from the composition of ordinary foods of comparable nature, if such ordinary food exists.

The Covid-19 crisis

The Covid-19 crisis is disrupting livelihoods and communities around the world. The pandemic poses a serious threat to food security and nutrition in developing countries. A majority of households are net food buyers and the poor spend most of their income on food. Experience from past pandemics and the 2007/08 world food price crisis highlight food security and nutrition as major concerns.

At the time of publication, the main impact of Covid-19 on the food system in DRC was an increase in food prices in the main urban centers (especially Kinshasa) due to the establishment of checkpoints at the entrances / exits of the affected cities to control population movement. Officially, checkpoints allow food products to go through, but often they require informal fees or bribes, which increase the final food prices and have created disruptions in the food supply.

Increases in the price of food, coupled with a decrease in the purchasing power of households – due to several economic activities closing because of the pandemic – reduce the consumption of food, in particular higher cost micronutrient-dense fruits and vegetables. This compromises the quality of diets and leads to malnutrition.

In turn, malnutrition weakens the immune system, increasing the susceptibility to infections such as Covid-19. There are several specific micronutrients being produced in DRC (and part of the NSmartAg opportunities presented in this country profile) that help strengthen the immune system, such as vitamin A, zinc and iron. Deficiencies in these micronutrients are already causing problems in many low- and middle-income countries. Protein, one of the main macronutrients and represented in the food groups selected by this profile, plays a vital role in building and repairing body tissues and supports physiological utilization of other important nutrients, such as iron. An optimal consumption of protein in diet helps maintain the immune system. Promoting NSmartAg technologies and practices, as well as broader nutrition-sensitive support is of great importance in the response to Covid-19 to contribute to the resilience of the most vulnerable populations.

REFERENCES

- 1 Lange, G. et al., 2018. "The Changing Wealth of Nations 2018: Building a Sustainable Future." Vol. 9.
- 2 Kraay, A. 2018. Methodology for a World Bank Human Capital Index. World Bank.
- 3 FAO. 2013. "The State of Food and Agriculture: Food Systems for Better Nutrition." Food and Agriculture Organization of the United Nations, Rome.
- 4 Shekar, M. and Popkin, B. 2020. "Obesity: Health and Economic Consequences of an Impending Global Challenge." Human Development Perspectives series. World Bank.
- 5 Dobbs, R., Sawers, C., Thompson, F., Manyika, J., Woetzel, J., Child, P., McKenna, S., Spatharou, A. 2014. "Overcoming obesity: An initial economic analysis." Discussion Paper. McKinsey Global Institute.
- 6 Adoho et al., 2018. "Developing a poverty map for the Democratic Republic of Congo: Improving the targeting of development programs."
- 7 Ministère du Plan et Suivi de la Mise en oeuvre de la Révolution de la Modernité (MPSMRM), Ministère de la Santé Publique (MSP) et ICF International. 2014. Enquête Démographique et de Santé en République Démocratique du Congo 2013 – 2014. Rockville, Maryland, USA.
- 8 Plan Stratégique National Multisectoriel en Nutrition 2016 – 2020.
- 9 The Multiple Indicator Cluster Survey (MICS Palu) DRC 2017 – 2018.
- 10 Shekar, M., Mattern, M., Laviolette, L., Dayton Eberwein, J., Karamba, W., Akuoku, J. K. 2015. "Scaling Up Nutrition in the Democratic Republic of Congo: What Will It Cost?" Health, Nutrition and Population Discussion Paper; World Bank.
- 11 World Food Programme (WFP). 2017. The Cost of Hunger (COHA) Report for DRC. WFP.
- 12 Institut Congolais de Recherche en Développement et Études Stratégiques (ICREDES). 2019. «Éliminer la faim en République Démocratique du Congo», Rapport de la Revue Stratégique Faim Zéro.
- 13 Estimated by NCD-RisC (<http://ncdrisc.org/country-profile.html>).
- 14 World Bank. 2017. DRC agriculture sector review.
- 15 EAT-Lancet Commission on Food, Planet, Health adapted summary report of the Commission Food in The Anthropocene: the EAT-Lancet Commission on Healthy Diets From Sustainable Food Systems. 2019. Available at: <https://eatforum.org/eat-lancet-commission/>
- 16 Household Consumption and Expenditure Survey (HCES) 2012 – 13, called the 1-2-3 Survey.
- 17 Democratic Republic of Congo (DRC): Chronic Food Insecurity Situation 2016-2020. Available at: <http://www.ipcinfo.org/ipc-country-analysis/details-map/en/c/1037095/>
- 18 Schönfeldt, H., and Gibson Hall, N. "Dietary protein quality and malnutrition in Africa." 2012. British Journal of Nutrition. 2012;108(S2); S69-S76.
- 19 Hirvonen, K.; Bai, Y.; Headey, Derek D.; and Masters, W. A., 2020. "Affordability of the EAT–Lancet reference diet: A global analysis." Lancet Global Health. 8(1): e59-e66. [https://doi.org/10.1016/S2214-109X\(19\)30447-4](https://doi.org/10.1016/S2214-109X(19)30447-4)
- 20 World Bank. 2019. Project Appraisal Document, DRC Multisectoral Health and Nutrition Project (P168756). World Bank.
- 21 Politique Nationale de Sécurité Alimentaire et Nutritionnelle (PNSAN) 2018 – 2030.