Thematic Evaluation Series

Evaluation of FAO's contribution to Sustainable Development Goal 2 - "End hunger, achieve food security and improved nutrition and promote sustainable agriculture"

Phase 2

Annex 7. Detailed theory of change: analysing the synergies and trade-offs within SDG 2 and between SDG 2 and other Goals

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
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Contents

1. Background

1. This appendix reviews efforts to map interactions between Sustainable Development Goal (SDG) 2 and other goals. This amounts to a general (non-FAO specific) "theory of change" for SDG 2. Due to the interconnected and indivisible nature of the 2030 Agenda, it was proposed during the scoping phase that the evaluation should also examine FAO's efforts in supporting targets that enable or undermine SDG 2, as well as those that are directly affected by SDG 2 targets.

2. Highlighting such interactions between SDG 2 and other goals is potentially useful to provide FAO with relevant advice on how to address such links in its own programmes and normative work. Moreover, at country level many planning, programming and policy decisions are undertaken at the sectoral level. An integrated systems approach is needed to understand and manage tensions between goals and leverage potential co-benefits or synergies.

2. Methodology

3. In search for an authoritative source inventorying key linkages between goals, the evaluation team from the Office of Evaluation (OED) of the Food and Agriculture Organization of the United Nations (FAO) reviewed: i) official material presented by the Inter-agency and Expert Group on Sustainable Development Goal Indicators (IAEG-SDG), as the Interlinkages of the 2030 Agenda for Sustainable Development (IAEG-SDGs, 2019) created under the aegis of the United Nations Statistical Commission; ii) the 2019 Sustainable Development Report prepared by teams of independent experts at the Sustainable Development Solutions Network (SDSN) and the Bertelsmann Stiftung (Global Sustainable Development Report 2019); and iii) relevant scientific literature.[1]

4. It was found that the work undertaken by the Independent Group of Scientists (IGS)[2] through the Centre for Development and Environment of the University of Bern (CDE) for the 2019 Sustainable Development Report offered the most extensive database of links between SDG targets. This database[3] also identifies the scientific literature backing each link. It is therefore both a rather comprehensive source and an official one, reason for which it was selected as the main basis for this analysis of synergies and trade-offs between SDG 2 and other goals.

5. The approach taken consisted in reviewing the CDE database information for each and every SDG 2 numbered target (i.e. Targets 2.1 to 2.5[4]) as per how this target is affecting other targets and vice versa. The interactions were then summarized in a matrix, and graphically represented in a diagram.[5]

[1] E.g. ICS 2017: A Guide to SDG Interactions: from Science to Implementation. Paris, International Council for Science; or ICSU 2015: Review of Targets for the Sustainable Development Goals: the Science Perspective.

[2] Group of 15 scientists nominated by Member States and selected by the Secretary-General, and who were charged with developing the 2019 Sustainable Development Report.

[3] https://datablog.cde.unibe.ch/wp-content/uploads/2019/sdg/index.html

[4] The CDE database does not encompass the lettered targets (2.a, 2.b and 2.c in the case of SDG2), which are dedicated to means of implementation.

[5] Initially, attempts were made to represent on the graphic weights or intensity allotted to each specific interaction in the CDE database (so-called "ICSU score" because they are borrowed from ICSU 2015). However this soon proved impractical.

6. Internal interactions between SDG 2 targets have also been depicted in the graphic and described in the matrix. These links internal to SDG 2 are relatively simple and intuitive.

7. The evaluation team has added to the matrix and graphic below a small number of links between SDG targets that were not mapped in the CDE database, for example:[6]

   i. between Target 4.7 *(ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development)* and Target 2.4 *(ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality)* to reflect the key role of that knowledge and learning about sustainable development played in achieving the 2030 Agenda and in particular Target 2.4 devoted to sustainable agriculture. This link is key to FAO, a knowledge Organization.

   ii. The very important trade-offs between SDGs 13, 14 and 15 (respectively climate action, life under water, and terrestrial ecosystems) and SDG 2 are considered as "direct" in the CDE database, yet in the view of the evaluation team it may be important to distinguish between two types of links: i) interactions pertaining to "non-excludable" ecological services and costs, such as pollination, precipitations or pollution; and ii) interactions about "excludable" eco-services and costs (e.g. soil fertility, irrigation) that require some control and *tenure* over natural resources. The former were graphically represented as direct links between SDG 2 and SDG 13, 14 and 15, while the latter were depicted as passing through Target 1.4 which is about access to, ownership of, and control over resources, including natural resources (*ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance*). This highlights the importance of making the tenure of natural resources more equitable in order to manage them more sustainably.

3. Results

8. The resulting graphic representation of links between SDG 2 targets and with other SDGs is displayed on page 10. Table 2 offers a list of the main interactions between SDG 2 targets, and between SDG 2 and other SDGs.

9. It was originally envisaged to build upon this analysis of inter-linkages between goals to define the scope of this evaluation. However, this is not a trivial step. Just because one SDG target enables or constrains another does not imply that FAO's contribution to them should necessarily be evaluated together. There are too many targets identified as having strong synergies and trade-offs with SDG 2 for FAO to conduct a systematic review of its contribution to all of them.

[6] Links 2 and 17 in Table 2 also represent additions made by the FAO Office of Evaluation(OED) to the list established by CDE.

10. Fortunately, this examination of synergies and trade-offs within the 2030 Agenda also drew attention to the many redundancies contained in the framework. Not only are the SDG targets all interconnected; they are also repeating each other quite a lot. Interconnections between goals are signalled by way of repetition of similar text across the framework. One example is SDG 12 on responsible production and consumption, which pertains to, and summarizes the entire 2030 Agenda. Other examples are presented in Table 1.

11. Such redundancies are not necessarily a problem. In fact, they offer a simple solution to the question of how best to delimitate the scope of the SDG 2 evaluation: *The evaluation should review links with any target that is already mentioned or substantially evoked in the text of SDG2 targets.* For instance:

    i. Target 1.4 is about access to productive resources, which is also mentioned in Target 2.3. Therefore, the evaluation should encompass Target 1.4.
    ii. The concept of resilience is mentioned both in Target 1.5 and in Target 2.4 (superficially), which means that the evaluation can include Target 1.5.
    iii. Gender equality (implied in Targets 2.2 and 2.3) is the subject of Target 5.1, and is related to Target 1.4 already mentioned above, which pleads for the inclusion of Target 5.1 in the evaluation.
    iv. Target 2.a already mentions extension services which offer a form of education, and therefore the addition of Target 4.7 (education for sustainable development) to the scope of the evaluation would merely make the implications of 2.a more explicit.
    v. Target 12.3 (halve food waste and losses) relates to the links between food production (Targets 2.3 and 2.4) and food consumption (Targets 2.1 and 2.2), and is therefore already present in SDG2, although not explicitly so.

12. The "polluting" trade-offs (links 25, 26 and 27) and the trade-offs with sustainable natural resource management (links 7, 8 and 9) may need to be reviewed during the evaluation as well, to ensure that FAO's work in support of SDG 2 does not undermine the achievement of other targets.

13. Some targets from SDG 8, such as Target 8.5 on decent work for all, 8.6 on youth employment, 8.7 on forced labour, and/or 8.9 on sustainable tourism, are also closely linked to Target 2.3, which mentions "non-farm employment".

Table 1: Some examples of text repetition across the 2030 Agenda

Access to resources		
Target 2.3: By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment	**Target 1.4:** By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance	**Target 5.a:** Undertake reforms to give women equal rights to economic resources, as well as access to ownership and control over land and other forms of property, financial services, inheritance and natural resources, in accordance with national laws
Resilience[7]		
Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters	**Target 11.5:** By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations	**Target 13.1:** Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries
Knowledge and skills for sustainable development		
Target 4.7: By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development	**Target 12.8:** By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature	**Target 13.3:** Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning
Sustainable consumption and production[8]		
Target 8.4: Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-Year Framework of Programmes on Sustainable Consumption and Production, with developed countries taking the lead	**Target 12.1:** Implement the 10-Year Framework of Programmes on Sustainable Consumption and Production Patterns, all countries taking action, with developed countries taking the lead, taking into account the development and capabilities of developing countries	
Biodiversity		
Target 2.5: By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks [...], and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed	**Target 15.5:** Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species	**Target 15.6:** Promote fair and equitable sharing of the benefits arising from the utilization of genetic resources and promote appropriate access to such resources, as internationally agreed

[7] These targets share two indicators: "1.5.1 / 11.5.1 / 13.1.1 - number of deaths, missing persons and directly affected persons attributed to disasters per 100 000 population", as well as "1.5.3 / 11.b.1 / 13.1.2 - number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015–2030".

[8] These targets share the same indicator: "8.4.1 / 12.2.1 - material footprint, material footprint per capita, and material footprint per GDP". Target 8.4 also shares an indicator with 12.2: "8.4.2 / 12.2.2 - domestic material consumption, domestic material consumption per capita, and domestic material consumption per GDP".

Freshwater ecosystems	
Target 6.6: By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes	**Target 15.1:** By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements
Waste reduction	
Target 12.3: By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses	**Target 12.5:** By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse
Social protection	
Target 1.3: Implement nationally appropriate social protection systems and measures for all, including floors, and by 2030 achieve substantial coverage of the poor and the vulnerable	**Target 10.4:** Adopt policies, especially fiscal, wage and social protection policies, and progressively achieve greater equality

Table 2: Main synergies and trade-offs between SDG 2 and other SDGs

#	From SDG or target	To SDG or target	Direction	Type	Description
Interaction within SDG 2 targets					
I	2.1	2.2	Both ways	±	While access to nutritious food helps combat malnutrition so the two targets are mutually supportive; however, a tension is also evident between Target 2.1, which reflects a quantitative understanding of hunger as the lack of staple food, and 2.2, which deals with diet quality. 2.2 is therefore more ambitious than 2.1, and calls for the production and commercialization of more diverse food (e.g. animal-based products, fruits and vegetables).
II	2.1, 2.1	2.3, 2.4	Both ways	+	Food production (2.3, 2.4) evidently enables food consumption (2.1, 2.2). Vice versa, food consumption incentivizes and informs food production via markets and prices, so the arrow goes both ways. Note that Target 12.3 (halve food losses and waste) belongs there, in the value chains between food production and consumption.
III	2.b, 2.c	Interaction II	One way	+	2.b and 2.c are about fair and predictable food commodity markets; these two targets therefore support a fairer and more efficient link between food production and food consumption, i.e. interaction II.
IV	2.3	2.4	Both ways	±	2.3 and 2.4 are in a complex relationship. The targets are mutually supportive inasmuch as higher incomes for small-scale food producers can support their investment in sustainable agriculture, and agroecology can tap into more profitable markets. However, there is also a well-known tension between short-term profits and long-term sustainability.
V	2.a	2.3, 2.4	One way	+	2.a is about the support systems to agriculture (extension, research, rural infrastructure, etc.) so it naturally supports 2.3 and 2.4. However, most agriculture research programmes and support systems are historically geared towards increasing agriculture production and productivity (2.3), especially of staple crops. So far, less institutional support has been extended to sustainable agriculture (2.4).
VI	2.5	2.a, 2.4	One way	+	Maintaining agricultural biodiversity would support agricultural research (part of 2.a) by securing the availability of certain genetic traits that might be usefully bred into commercial varieties. More

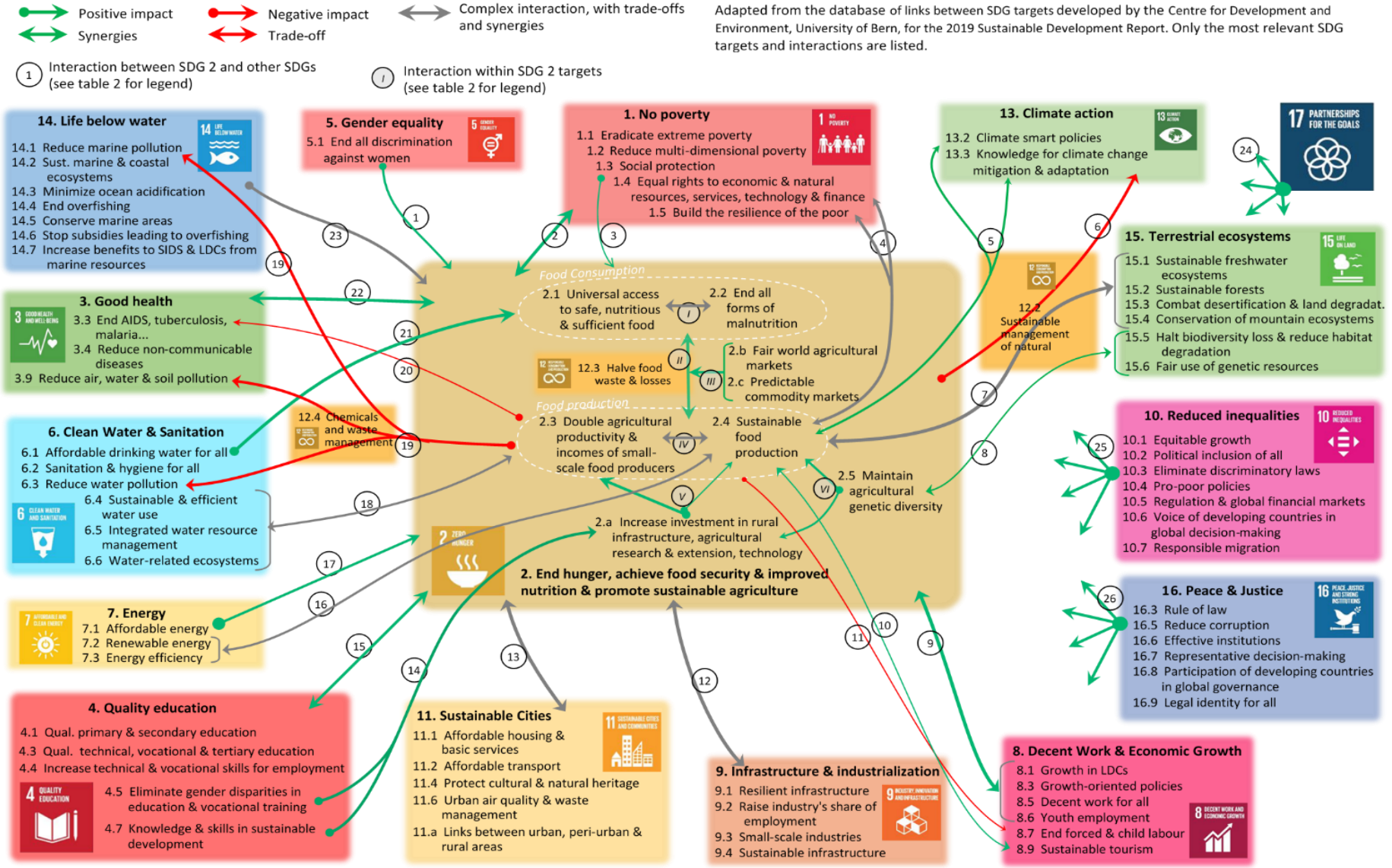
#	From SDG or target	To SDG or target	Direction	Type	Description
					directly, the target is key to a successful transition to sustainable agriculture since traditional races and varieties tend to be hardier, more nutritious and less input-dependent than high-yielding commercial varieties.
Interaction between SDG 2 and other SDGs					
1	5.1	2	One way	+	Female farmers tend to have limited access to productive resources (e.g. land, extension and credit), and greater gender equality in access to land, natural resources, technology, finance, etc. can spur increased food production. In some contexts, greater gender equality within households may also result in more equal access to food within the household and less malnutrition and hunger for women and girls.
2	1	2	Both ways	+	General synergies between poverty and hunger reduction: hunger is one manifestation of extreme poverty; and malnutrition is correlated to income level because the most nutritious food tends to be expensive. Vice-versa, well-nourished individuals are able to be more productive.
3	1.3	2.1, 2.2	One way	+	Social protection buttresses the food and nutrition security of the poor by affording them the resources to access food, allowing them to invest more time and resources in productive activities, and strengthening their capacities to manage risks.
4	1.4, 1.5	2.3, 2.4	Both ways	±	More equal access to resources can spur a growth in food production, e.g. by ensuring that female farmers have access to the same extension and financial services as male farmers, or by making sure that indigenous people's right to productive land is respected. However, agriculture remains a competitive business and efforts to ensure equality in access to means of production may in certain contexts reduce the overall productivity of the sector (e.g. in some cases of land reform). Similarly, resilient food production helps ensure the stability of food access over time, during good years and bad years, which is a critical dimension of food security. But in order to do so, resilient food producers need to limit their exposure to risks, which often come at a cost in terms of overall productivity, like subscribing to an insurance policy would imply paying a premium. Conversely, increasing agricultural productivity without paying attention to sustainability (2.4) will increase vulnerability to climate-related extreme events and other shocks.
5	13.2, 13.3	2.4	Both ways	+	Target 2.4 (sustainable agriculture) implies climate-smart agriculture, and therefore Targets 13.2/13.3 (climate-smart policies and knowledge for climate change adaptation and mitigation) and 2.4 are mutually supportive.
6	2	13	One way	-	Agriculture already account for about 20% of all GHG emissions. Achieving universal access to safe and nutritious food (2.1), ending malnutrition (2.2), doubling agricultural productivity (2.3) and increasing investment in agriculture (2.a) will almost certainly come at a cost in terms of CO2 emissions, and thus might negatively affect the attainment of SDG 13 - climate action. Vice-versa, policies for climate change mitigation can constrain agriculture production.
7	15.1, 15.2, 15.3, 15.4	2.3, 2.4	Both ways	±	Terrestrial ecosystems provide resources to food producers (e.g. water, wood, land, pollination, erosion control, etc.), and vice-versa farmers can also help restore ecosystems (e.g. through

#	From SDG or target	To SDG or target	Direction	Type	Description
					agroforestry). Access to natural resources is also a vital component of many resilience-building strategies of poor people in rural areas, e.g. nomadic grazing, collection of wild fruits, berries and mushrooms, or charcoal making. However, the interactions between SDG 15 and SDG 2 also include trade-offs, via encroachment of natural habitat and unsustainable use of natural resources by food producers.
8	15.5, 15.6	2.5	Both ways	+	As noted in Table 1, this link is more of a repetition of the same issue (protection of biodiversity) across different targets of the 2030 agenda than a true synergy. This being said, target 2.5 pertains specifically to domesticated species while 15.5 and 15.6 pertain to wild species.
9	8 (esp. 8.1, 8.3, 8.5, 8.6)	2	Both ways	+	Policies designed to spur decent jobs (8.5), youth employment (8.6), pro-poor growth in Least Developed Countries (8.1), and ease of doing business (8.3) could spur growth and job creation in the food production, transformation, trade and retail sectors.
10	8.9	2.3, 2.4	Both ways	+	Agrotourism and ecotourism provide alternative livelihoods and supplementary income in rural areas. Vice-versa, centuries of agriculture have produced culturally important and tourist-appealing landscapes.
11	2.3, 2.4	8.7	One way	-	Increased food production may result in increased incidence of child labour, since child labour is mostly found in farming, livestock, forestry, fishing and aquaculture.
12	9	2	Both ways	±	Agriculture can provide some foundation for industrial development and vice-versa (agro-industries). Good rural infrastructure (rightly mentioned as part of Target 2.a as well) supports food production and trade. But industry is also frequently competing with agriculture for land, labour, policy attention, investment, etc., and industrial pollution can reduce agriculture productivity. (similar to #19)
13	11	2	Both ways	±	In an urbanizing world, cities offer the main market for ag. produces and are often a locus of ag. production (urban and peri-urban agriculture); however, they also compete with agriculture for labour, land, water and other resources, and urban pollution can reduce agriculture productivity. (similar to #18)
14	4.5, 4.7	2.a	One way	+	Increased knowledge and skills in sustainable development (4.7) are essential for strengthening extension services and other support systems to agriculture (2.a) and facilitate a transition to sustainable agriculture. This is a key area of work for FAO (e.g. through Farmer Field Schools). Likewise, eliminating gender disparities in vocational training (extensionists, veterinarians, etc.) can help support an agricultural sector that is increasingly feminized in many countries.
15	4	2	Both ways	+	Broad set of synergies between quality education, agriculture productivity and food security, e.g.: school meals contribute both to the nutrition of school-aged children and to their education (4.1); nutrition education is a key determinant of consumer choices and cooking practices; technical, vocational and tertiary education (4.3, 4.4) has led to increased agriculture productivity through better trained farmers, extensionists, etc.
16	7.2, 7.3	2.3, 2.4	Both ways	±	Greater use of renewable energies and increased energy efficiency in rural areas will help reduce the environmental footprint of agriculture (2.4); biofuels (either at the *expense* of food production

#	From SDG or target	To SDG or target	Direction	Type	Description
					or as a *part* of it, e.g. biogas) present an important form of renewable energy.
17	7.1	2	One way	+	Affordable energy facilitates agricultural productivity, food transport, storage and trade, as well as food transformation and preparation.
18	6.4, 6.5, 6.6	2.3, 2.4	Both ways	±	Irrigation consumes roughly 70% of the world's freshwater; agriculture can encroach on water-related ecosystems; cattle rearing in drylands is determined by water availability; etc. etc.
19	2.3	6.3, 3.9, 14.1	One way	-	The use of pesticides in agriculture can lead to pollution of air, water and soil. Soil erosion as well as the leaching of chemical fertilizers into the sea can also negatively affect water quality in coastal ecosystems.
20	2.3	3.3	One way	-	Irrigation schemes provide breeding habitat for anopheles mosquitoes, the vector of malaria, and the expansion of irrigation is Africa has been linked with a significant increase in malaria incidence.
21	6.1	2.1, 2.2	One way	+	Water is a nutrient in its own right, and clean drinking water is necessary for washing and cooking food.
22	3	2.1, 2.2	Both ways	+	Biological synergies between nutrition and health: good nutrition is essential to good health, while unsafe food may trigger food-borne diseases. Vice-versa, healthy bodies absorb and retain nutrients better than unhealthy ones.
23	14	2	One way	±	Both capture fisheries and aquaculture generate highly nutritious food, thus contributing to 2.1 and 2.2, as well as incomes for small-scale food producers (2.3). However, efforts to reduce overfishing (14.4) and conserve marine areas (14.5) might result in less seafood becoming available in the short term, while protecting their long-term availability.
24	17	All	One way	+	SDG 17 – "strengthen the means of implementation and revitalize the global partnership for sustainable development" – seeks to support the whole 2030 Agenda.
25	10	All	One way	+	General effect over the entire 2030 agenda of reduced inequalities and more equitable policies.
26	16	All	One way	+	General effect of peace and justice on the entire 2030 agenda through "peace dividends" (resources freed thanks to low risk of conflict), transparent and effective institutions and political inclusion of all.

This list is not exhaustive, and focuses on the strongest interactions listed in the CDE database, with adjustments described above under "methodology". The numbers in the first column refer to the circled numbers in the graphic representation on p.9.

Figure 1: Main synergies and trade-offs between SDG 2 and other goals



Source: FAO Office of Evaluation (OED), 9 January 2020