

Agriculture to Nutrition (ATONU): Improving Nutrition Outcomes through Optimized Agricultural Investments

Social and Environmental Sustainability Strategy



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ACROYNMS

ATONU	Improving Nutrition Outcomes through Optimized Agricultural Investments
CMs	Consortium Members
ESMP	Environmental and Social Management Plan
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GMOs	Genetically Modified Organisms
IPM	Integrated Pest Management
IVM	Integrated Vector Management
LMOs	Living Modified Organisms
PCBs	Polychlorinated biphenyls
POPs	Persistent Organic Pollutants
UNDRIP	United Nations Declaration on the Rights of Indigenous Peoples
WHO	World Health Organization of the United Nations

1. INTRODUCTION

1.1 Context

Problems of malnutrition – under-nutrition, micronutrient deficiencies and obesity – exist in all countries and cut across socio-economic classes¹. In the poorest countries, under-nutrition and micronutrient deficiencies are by far the greatest problem. The World Health Organisation of the United Nations (WHO) estimates that 167 million children under five years of age in developing countries are chronically malnourished². The social and natural environment surrounding malnutrition is also changing. Emerging and not yet fully understood challenges are leading to the transformation of food and agricultural systems and raising questions about how to meet the world’s food and nutrition needs in sustainable ways. These challenges include globalization, climate change, environmental sustainability and rapid technological shifts and scientific advances. Urbanization in developing countries is having a profound impact on livelihoods and patterns of food acquisition and consumption. By 2020, half the population of Asia will live in urban areas. The same will be true of Africa by 2035. Most of this growth will occur in the smaller cities and market towns of developing countries, many of which are highly dependent on the agricultural economy of the surrounding rural areas

Despite the progress made in reducing global poverty, there has been significantly less progress in managing the environment sustainably. Pollution, overexploitation of fish stocks, biodiversity loss, and overuse of water and land increasingly threaten countries’ development efforts. The immediate and long-term consequences of climate change—from a warmer planet to more-acidic oceans—further threaten progress on poverty reduction and development. Environmental degradation, pollution and overexploitation of natural resources hamper economic progress. Lack of action to address health-impairing air and water pollution, for example, is costing some countries the equivalent of 4% of Gross Domestic Product (GDP) or more a year. Policy failures account for many perverse incentives in the efficient use of natural resources, and without strong institutions and governance frameworks in place, taking action to reduce environmental risks has a low chance of success.³

The changes in the natural environment are accompanied by, and in many cases intricately linked with, profound changes in communities’ socio-economic conditions. The rural space in much of Asia and Sub-Saharan Africa is undergoing a process of rapid transformation from a small-holder population focused on subsistence farming to a complex mix of subsistence, semi-commercial and small, medium and large commercial farmers and ancillary businesses and livelihood systems. Rural households today typically earn a living from a variety of farm and non-farm sources of income. The resulting rural community is highly dynamic and much more dependent on national and international markets and access to food and nutrition is increasingly becoming more diverse and dependent on wider food and nutrition systems.

The current economic model, driven by often unsustainable patterns of growth and consumption, is putting pressure on an already stretched natural and social environment. These potentially unsustainable growth patterns highlight the need for inclusive green growth models.

¹ Food and Agriculture Organization of the United Nations (FAO) 2014. Strategy and vision for FAO'S work in nutrition. Rome Italy

² <http://www.who.int/nutgrowthdb/estimates/en/index.html>, accessed October 23, 2015.

³ Timothy Johns and Pablo B. Eyzaguirre, "Nutrition and The Environment." In Nutrition: A Foundation for Development, Geneva: ACC/SCN, 2002.

1.2 Sustainable Development

Sustainable development is a concept that integrates environmental, economic and social interests in a way that allows today's needs to be met without compromising the ability of future generations to meet their own needs. The key goals of social and environmental safeguarding are to protect the social and natural systems and services that are essential for development.

Farming still represents the main source of food to most rural families in Sub-Saharan Africa and much can still be done to help farmers produce, not only more food but also a wide variety of safe and nutritious foods. Agriculture has a close linkage with the natural and social environment - agricultural production is dependent on the availability of natural resources and functioning of natural ecosystems and farming systems are intricately linked to the socio-economic contexts in which they developed.

The agriculture in Africa has changed significantly over the past 20 years with the adoption of new technologies for production, storage and processing. Agricultural technology has the potential to grow economies, provide nutritional benefits and enhance livelihoods and health of human and wildlife populations. It can also cause negative impacts on the biophysical and socioeconomic environment, such as: water and soil quality, proliferation of disease vectors, public health, species diversity, greenhouse gas production, gender equality, settlement, vulnerability to climate and other environmental risks (see Box 1 for a summary and Appendix 2 for a wider discussion of environmental sustainability issues).

Nutrition-sensitive agricultural projects that aim to improve the production of, as well as access to and the consumption of diverse, safe and quality foods have great potential to improve the nutritional status of households and the broader society. If we want to ensure that what we propose today will also benefit future generations, recommendations for *nutrition-sensitive* agricultural projects should take account of basic social and environmental sustainability criteria.

Box 1: The Environment-Nutrition Connection

As community development priorities merge with those of environmental conservation, it becomes increasingly clear that unless human populations meet their basic survival needs, they cannot afford to conserve. At the same time, unless local communities protect the environments around them, they have limited hope to thrive beyond the short term.

Nutrition research provides essential information on how environmental degradation can lead to malnutrition, infectious disease and contamination. When people have reduced access to crucial bio-resources, they may suffer from protein-energy imbalances. Diabetes and coronary heart disease that reflect reduced intake of nutrients and non-nutrients underscore the cost of increased reliance on processed foods or a narrow species base by industrial societies and urban populations.

Major public health problems such as tuberculosis, gastrointestinal diseases, measles and respiratory disease reflect the interaction of nutritional and environmental factors. Environmental contamination from heavy metals, organochlorines, and radio-nucleotides may compromise people's nutritional status and health either directly or through changes in diet. Herbicides and pesticides eliminate uncultivated food sources from agro-ecosystems; other chemicals may make them unfit for consumption. Persistent organic pollutants (POPs) can have adverse impacts far removed from major sites of pesticide use⁴.

⁴ Timothy Johns and Pablo B. Eyzaguirre, "Nutrition and the Environment." In Nutrition: A Foundation for Development, Geneva: ACC/SCN, 2002.

2. ATONU APPROACH TO SOCIAL AND ENVIRONMENTAL SUSTAINABILITY

The Agriculture to Nutrition (ATONU): Improving Nutrition Outcomes through Optimized Agricultural Investments project's Social and Environmental Sustainability Strategy provides a framework for integrating social and environmental issues into project decision-making and outlines a process for establishing targets in all program areas, which have a significant impact on the environment. The Social and Environmental Sustainability Strategy is rooted in eight guiding principles, which are set out below. These principles build upon each other to create a strategy, which will assist ATONU Consortium Members (CMs) and their partners achieve the project's vision of breaking the intergenerational cycle of under-nutrition in four Sub-Saharan African countries. The principles derive from a 'purpose and objectives' statement (Section 2.2) and are complemented by a set of 'standards of achievement' (Section 2.4) derived from widely accepted safeguard standards adopted by the main development actors (World Bank, International Monetary Fund, African Development Bank (AfDB), Adaptation Fund, and various bilateral agencies). The Social and Environmental Sustainability Strategy is part of ATONU's overarching policy on crosscutting issues as described in Section 2.1.

2.1 ATONU's overarching policies on cross-cutting issues

1. Environmental Sustainability. Sustainable management and conservation of natural resources, biodiversity and ecosystem services and functions are fundamental to achieving improved nutrition outcomes through agricultural interventions. ATONU shall ensure that environmental sustainability is systematically mainstreamed into all its Work Packages through the application of relevant environmental standards.

2. Basic Social and Human Rights. ATONU recognizes the centrality of human rights to sustainable development, poverty alleviation and ensuring fair distribution of development opportunities and benefits and will mainstream human rights in all its activities.

3. Gender Equality and Women's Empowerment. The promotion of gender equality and the empowerment of women are central to ATONU'S activities and such activities shall mainstream gender in their design and implementation.

ATONU's *Social and Environmental Sustainability Strategy* sets out the implementation modalities for the environmental and basic social and human rights policies. A separate document sets out the arrangements for implementation of the gender equality and women's empowerment policy.

2.2 Purpose and objectives of the strategy

The purpose of the *Social and Environmental Sustainability Strategy* is to support ATONU in achieving its overarching objectives of contributing to improved agricultural productivity and nutrition in a socially and environmentally sustainable way. More specifically, it is intended to ensure that project activities will:

- (i) protect human health
- (ii) protect basic social and human rights

- (iii) enhance positive social and environmental outcomes
- (iv) prevent negative social and environmental impacts of individual sub-projects and their cumulative effect.

The objective of the *Social and Environmental Sustainability Strategy* is to support the integration of social and environmental sustainability throughout ATONU's work. The strategy provides guidance to ATONU Work Packages and Country Implementing Partners to ensure that agriculture-nutrition tools, approaches, and investments developed and implemented by ATONU and its partners are socially and environmentally sustainable and improve the opportunities, capacities and resilience of agriculture and nutrition programs. The strategy is also meant to ensure that the ATONU project builds and shares knowledge on the environment, nutrition and agriculture nexus in order to advance knowledge and practice in advocating for sustainable nutrition-sensitive agriculture projects and programs.

2.3 Principles

Principle 1 – Legal compliance: We shall comply with all national legislation on the environment and with host country aspirations under their membership of the main Multilateral Environment Agreements and relevant International Agreements on Social and Human Rights

Principle 2 – Do no harm: We shall identify and assess the potential harm that proposed ATONU activities could cause to the environment and incorporate mitigating actions where necessary.

Principle 3 – Sustainability: We shall assess to what extent the external environment could affect the sustainability of the proposed action, such as, for instance, availability of water and soil fertility and/or particular socio-economic conditions and explore opportunities to pursue nutritional outcomes through the judicious use of natural resources and/or socio-economic assets, such as indigenous knowledge systems, from the wider social and natural environment.

Principle 4 – Resilience and natural hazards: ATONU will screen proposed activities for potential social, environmental and climate risks and ensure that potential adverse impacts are minimized, mitigated, or managed; reasonable additional actions that could enhance communities' resilience to social, environmental and climate shocks shall be incorporated in all ATONU activities, in as far as they are both feasible and cost-effective.

Principle 5 – Co-benefits: we shall endeavour to identify reasonable opportunities that could be considered in ATONU activities to achieve a desired environmental co-benefit, such as efficient water or energy use and C-emissions, in as far as such actions are both feasible and cost effective.

Principle 6 – Human rights: ATONU will uphold the principles of accountability and the rule of law, participation and inclusion, equality and non-discrimination, and will ensure the meaningful, effective and informed participation of stakeholders in the formulation, implementation, monitoring and evaluation of its activities.

Principle 7 – New technologies: We shall ensure that all proposals for the adoption of new technologies will undergo a thorough assessment of the potential social and environmental harm that could ensue from their use and incorporate mitigating actions where necessary.

Principle 8 – Disclosure: We shall fully inform local communities of all reasonable potential social, environmental and climate threats and benefits associated with proposed ATONU activities.

2.4 Standards

The following section sets out the minimum standards that ATONU projects will aim to achieve through the implementation of its environmental sustainability principles. These standards are derived from the common set of social and environmental safeguard standards of international development agencies.

Standard 1: Biodiversity conservation and sustainable natural resource management

Conserving biodiversity⁵, maintaining ecosystem services⁶ and sustainably managing natural resources are fundamental to sustainable development. ATONU seeks to maintain and enhance the goods and services provided by biodiversity and ecosystems in order to secure livelihoods, food, water and health, enhance resilience, conserve threatened species and their habitats, and increase carbon storage and sequestration. ATONU shall integrate biodiversity and ecosystem management into its proposed nutrition sensitive agricultural interventions. In doing so, ATONU will ensure that a *precautionary approach* is applied to the use, development, and management of natural habitats, the ecosystem services of such habitats, and living natural resources.

ATONU will endeavor to identify ways to sustainably use biodiversity and other natural resources to enrich the nutritional outcomes of agricultural projects. We will also ensure that direct and indirect impacts on natural resources, biodiversity and ecosystem services in the Project's area are identified and addressed and further unwarranted conversion or degradation of the habitat and resident species populations are minimized. Mitigation measures will be designed to achieve at least no net loss of biodiversity⁷, where possible. We will give special attention to:

- **Critical habitats:** no project activity will be implemented in areas of critical habitat.
- **Invasive alien species:** No alien species known to be invasive shall be introduced into new environments where project activities are being implemented.
- **Bio-safety:** ATONU shall ensure that Projects involving genetically modified organisms (GMOs)/ living modified organisms (LMOs) are implemented in accordance with the national laws, the Cartagena Protocol on Bio-safety and any other measures to manage any risks identified in the risk assessment.
- **Water resources:** For projects that involve water resources, ATONU shall promote an integrated water resources management approach that seeks the coordinated development and management

⁵ The Convention on Biological Diversity (CBD) defines biological diversity (i.e. biodiversity) as “the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part: this includes diversity within species, between species, and of ecosystems.” CBD, Article 2, available at <http://www.cbd.int/>.

⁶ Ecosystem services are the benefits that people derive from ecosystems. Ecosystem services are organized into four types: (i) provisioning services, which are the goods people obtain from ecosystems (i.e., food, freshwater, timber, fibers, medicinal plants); (ii) regulating services, which are the benefits people obtain from the regulation of ecosystem processes (e.g. surface water purification, carbon storage and sequestration, climate regulation protection from natural hazards); (iii) cultural services, which are the nonmaterial benefits people obtain from ecosystems (e.g. sacred sites, areas of importance for recreation and aesthetic enjoyment); and (iv) supporting services, which are the natural processes that maintain the other services (e.g. soil formation, nutrient cycling, primary production).

⁷ “No net loss” is defined as the point at which Project-related impacts on biodiversity are balanced by measures taken to avoid and minimize the Project's impacts, to undertake on-site restoration and finally to offset significant residual impacts, if any, on an appropriate geographic scale.

of water, land and related resources in order to maximize the economic and social welfare in an equitable manner and without compromising the sustainability of ecosystems.

Standard 2: Resource efficiency, pollution prevention and management of chemicals and wastes

ATONU will, wherever possible, seek to promote more sustainable uses of resources, including energy and water and prevent pollution, in order to avoid or minimize adverse impacts on human health and the environment originating from project activities that depend on intense resource utilization and the use of hazardous chemicals, including pesticides. Project teams will explore technically and financially feasible approaches that will result in the efficient use of resources such as energy and water and the safe and efficient use of chemicals, in line with the concept of cleaner production and for using raw materials, energy, and water sustainably.

When significant consumption of water is anticipated, alternative water supplies or water consumption offsets to reduce the total demand for water resources will be considered.

Procurement of chemical pesticides will only be supported when integrated pest management (IPM) or integrated vector management (IVM) approaches have been demonstrated to be ineffective.

Where use of pesticides or fertilizers is needed, the chemical composition will be declared at screening stage, together with recommendations for management. Persistent organic pollutants⁸ will not be used on our project activities.

Standard 3: Climate change mitigation and adaptation

Climate change has the potential to stall and even reverse human development through its impacts on key development sectors and activities, including agriculture and food production, water, ecosystems and other natural resources, disaster risk management and health. It may exacerbate extreme weather events, increasing the risk of high-impact disasters. Communities that are already subjected to impacts from climate change may experience an acceleration and/or intensification of impacts due to project activities that do not integrate and anticipate climate change risks.

ATONU activities shall be screened and assessed for climate change-related risks and impacts; and shall ensure that its activities are climate smart, i.e. not overly sensitive to sudden / prolonged changes in weather and/or atmospheric conditions, reduce emission of greenhouse gases (GHG) and do not contribute to increased vulnerability to climate change⁹ risks.

We will consider alternatives and implement technically and financially feasible options to reduce project-related GHG emissions, including alternative locations, the use of renewable or low-carbon energy sources, sustainable agriculture, forestry and livestock management practices.

⁸ See Appendix 1

⁹ At times referred to as maladaptation, defined as "business-as-usual development which, by overlooking climate change impacts, inadvertently increases exposure and/or vulnerability to climate change. Maladaptation could also include actions undertaken to adapt to climate impacts that do not succeed in reducing vulnerability but increase it instead." OECD, Integrating Climate Change Adaptation into Development Co-operation: Policy Guidance 2009, available at <http://www.oecd.org/dac/43652123.pdf>.

Standard 4: Displacement and involuntary resettlement

Involuntary resettlement comprises both physical displacement of individuals or communities and economic displacement through loss of assets or involuntary restrictions on access to legally designated parks and protected areas. Such activities, including through land acquisition or restrictions on land use or access to resources, pose impoverishment risks. Potential impacts may include loss of livelihoods, homelessness, food insecurity, and other adverse impacts. These impacts may lead to social unrest and political instability.

ATONU will seek to avoid physical and economic displacement in its projects. Projects to be implemented shall be designed so as not to result in involuntary displacement and resettlement. If any such project is identified at screening level and no alternatives found, a full resettlement action plan will be required.

Standard 5: Indigenous peoples

“Indigenous peoples”, defined as “*distinct collectives, regardless of the local, national and regional terms applied to them¹⁰, who satisfy any of the more commonly accepted definitions of indigenous peoples¹¹, are equal to all other peoples and possess collective human rights which are indispensable for their existence, well-being and development as peoples. They are entitled to enjoy and exercise their human rights without discrimination.*

ATONU activities will not violate the human rights of indigenous peoples as affirmed by Applicable Law and the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP).

At the earliest possible stage, mechanisms will be identified and implemented to guarantee the meaningful, effective and informed participation of indigenous peoples on all ATONU activities where necessary.

Standard 6: Community health, safety and working conditions

The Community Health and Safety Standard recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts. Protecting workers and local communities from hazards caused and/or exacerbated by project activities is a fundamental human right.

ATONU will ensure that project activities do not undermine the safety of workers and the affected communities; and where this is inevitable, potential impacts shall be assessed and appropriate measures shall be put in place before hand to avoid or minimize impact.

¹⁰ For example, “tribal people”, “first peoples”, “scheduled tribes”, “pastoralist”, “hill people.”

¹¹ Including but not limited to those provided for in the Convention concerning Indigenous and Tribal Peoples in Independent Countries (ILO Convention No. 169), the Study on the Problem of Discrimination against Indigenous Populations (the “Martínez Cobo Study”), and the Working Paper on the Concept of “Indigenous People” prepared by the Working Group on Indigenous Populations.

All ATONU activities shall be in compliance with national and international labour and occupational health and safety laws; in accordance with international best practice, workers¹² shall be provided with a safe and healthy working environment.

Standard 7: Protection of tangible cultural heritage

Cultural Heritage refers to (i) tangible forms of cultural heritage, such as tangible moveable or immovable objects, property sites, structures, or groups of structures, having archaeological (prehistoric), paleontological, historical, cultural, artistic, and religious values; (ii) unique natural features or tangible objects that embody cultural values, such as sacred groves, rocks, lakes, and waterfalls; and (iii) certain instances of intangible forms of culture, defined as the practices, representations, expressions, knowledge, skills – as well as the instruments, objects, artifacts and cultural spaces associated therewith – that communities, groups and, in some cases, individuals recognize as part of their cultural heritage.

ATONU recognizes the importance of Cultural Heritage for current and future generations and shall ensure that Cultural Heritage is protected in the course of implementation of nutritional sensitive interventions in accordance with relevant national and international legislation through: *avoidance* – by considering alternative Project siting and design and/or *mitigation* where potential adverse impacts are unavoidable. Where potential adverse impacts may be significant, a Cultural Heritage Management Plan shall be developed as part of the Environmental and Social Management Plan (ESMP).

Where a Project proposes to utilize a Cultural Heritage, including the knowledge, innovations, or practices of local communities, affected communities will be informed of their rights under Applicable Law, the scope and nature of the proposed development, and the potential consequences of such development. It will not proceed without meaningful, effective participation of affected communities.

Standard 8: Gender equality

Gender equality is fundamental for sustainable development. ATONU activities will ensure that both women and men are able to participate meaningfully and equitably, have equitable access to project resources, and receive comparable social and economic benefits¹³, and that project activities do not discriminate against women or girls or reinforce gender-based discrimination and/or inequalities.

To ensure this, we will identify and integrate the different needs, constraints, contributions and priorities of women, men and youths into all project activities, decision making and access to resources; and such activities shall ensure gender empowerment where necessary. More details about how ATONU will consider gender issues in its activities can be found in ATONU's gender strategy document.

¹² Including nonemployee workers engaged by contractors or other intermediaries to work on Project sites or perform work directly related to the Project's core functions.

¹³ See UNDP Gender Equality Strategy 2014-2017: The Future We Want: Rights and Empowerment, available at <http://www.undp.org/content/dam/undp/library/corporate/Executive%20Board/2014/first-regular-session/English/dp2014-4.doc>.

Appendix 1: Persistent Organic Pollutants (POPs)

- Synthetic (man-made) organic chemicals – they are all synthetic chemicals, either intentionally or non-intentionally produced/released. Some are pesticides, others are industrial products or unintended by-products resulting from industrial processes or combustions (see next slide).
- Persistent in the environment – their persistence in the environment is remarkable – it may take them decennia or centuries to be degraded.
- Long-range transport leads to global pollution – Some POPs will almost always be found if tested for in tissues or environmental samples from different parts of the world. As is the case with many environmental pollutants, it is most difficult to establish that illness or disease are directly attributable to exposure to a specific persistent organic pollutant or to a group of POPs. This difficulty is further underscored by (a) the fact that POPs rarely occur as a single compound, and (b) that individual field studies are insufficient to provide compelling evidence of cause and effect in their own right.
- Lipophilic – they have a tendency to remain in fat-rich tissues. This affinity for the adipose tissues means that POPs are likely to accumulate, persist and bio-concentrate and could, eventually, achieve toxicologically relevant concentrations – even though exposure episodes may appear limited.
- Accumulate in food chain – POPs enter into a cycle in nature, accumulating in the bigger animals as they eat the smaller ones.
- Highest levels found in marine mammals – immune dysfunction is considered as a plausible cause for increased mortality among marine mammals. It is postulated that the consumption by seals of fish contaminated with POPs may lead to vitamin and thyroid deficiencies and cause increased susceptibility to microbial infections and reproductive disorders.
- Acute, high-level toxicity is well characterized – acute effects after high-level exposure have been described for some of the organochlorine pesticides (e.g. aldrin, dieldrin and toxaphene). Polychlorinated biphenyls (PCBs) have caused well documented episodes of mass poisoning called "Yusho" and "Yu Cheng", that occurred in China, Province of Taiwan, and in Japan. Pregnant women exposed had no or minor symptomatology, but their children presented adverse effects and developmental disorders. Some are potential endocrine disrupters.

Source: www.pops.int/documents/background/assessreport/en/ritteren.pdf

Also, see the Stockholm convention:

<http://chm.pops.int/TheConvention/ThePOPs/ListingofPOPs/tabid/2509/Default.aspx>

Appendix 2: Issues in environmental sustainability

Sustainable development requires that the nutritional benefits from agricultural improvements are received by future generations. Figure 1 below summarises the core social and environmental factors that have a bearing on the long-term benefits from agricultural interventions.

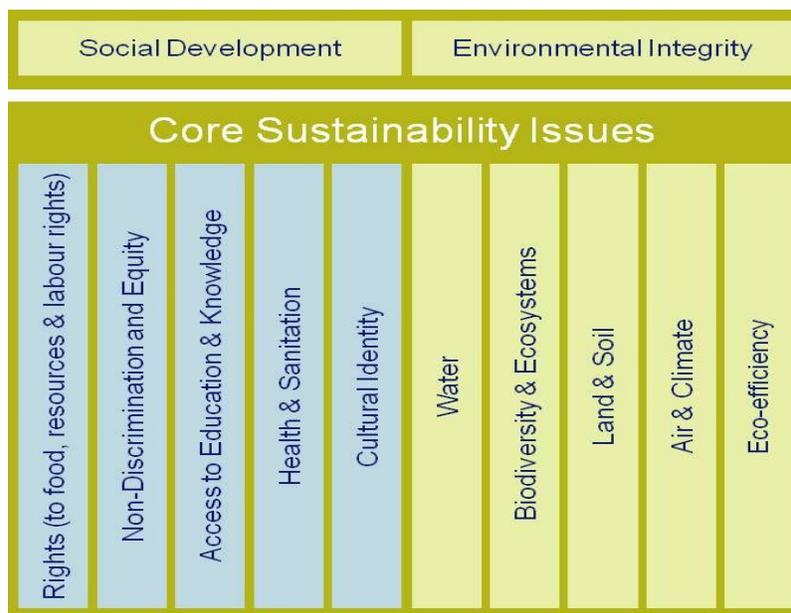


Figure 1: core social and environmental factors affecting the sustainability of agricultural interventions

The main *environmental* issues that are likely to represent a potential threat to ATONU's sustainability ambitions are summarized below.

1. Agricultural soil quality and nutrient use. An adequate supply of nutrients in the soil, particularly nitrogen, phosphorus, and potassium is essential for crop growth. Soils are both a medium for and a source of those essential nutrients. Improper agricultural and land management practices, including weak erosion control, may lead to soil degradation and reduced crop productivity. Nutrients are lost from the soil through crop production, leaching, soil erosion and, in the case of Nitrogen, by conversion to nitrogen gas or volatilization of ammonia. Excessive nutrients in the soil can contribute to problems of lake water eutrophication, pollution of drinking water, soil acidification and climate change. Soil erosion may also reduce the capacity for soil to fix carbon dioxide and to act as a greenhouse gas sink. It also impairs soil water storage capacity which undermines water availability to plants.

2. Agricultural pesticide use. Pesticides have contributed greatly to increased agricultural productivity and crop quality, but once in the environment can accumulate in soil and water, and damage flora and fauna as concentrations in food-chains become high enough to harm wildlife. Pesticide residues also impair drinking water quality, contaminate food for human consumption, cause adverse health effects from direct exposure to farm workers, while some pesticides contain bromide compounds which, when volatilized, convert into stratospheric ozone-depleting gases.

3. **Agricultural water use.** Agriculture uses water from rainfall, surface and groundwater sources. The intensification of agricultural practices in many countries has increased the abstraction rates of limited surface and groundwater resources. For agriculture to tend towards the sustainable use of surface and groundwater resources, efficient use and management of water resources is important.

4. **Agricultural land use and biodiversity conservation.** The pattern and trends in agricultural land use can have significant impacts for natural resources, biodiversity, wildlife habitats and landscape. Moreover, while agricultural land use can lead to degradation of the environment, certain agricultural practices can also play a role in conserving natural resources, such as soil quality, minimize soil erosion; and provide wildlife habitats.

5. **Agricultural land use and climate change.** Agriculture is both a contributor to greenhouse gas emissions and is at risk from the consequences of global warming. Increasing mechanisation still relies mainly on fossil fuel energy, forest conversion for agricultural use represents a sizeable proportion of the global carbon dioxide emissions budget and practices such as flooded rice and cattle production contribute significant amounts of Methane to the atmosphere. Steadily increasing atmospheric temperatures represent a significant threat to crop production and there is some evidence that this is already taking place. Climate change also affects the amount, intensity, distribution and regularity of rainfall, all of which affect crop production. Extreme events such as droughts and torrential storms are also affected and heighten the risk to farming across the world.