E

联合国粮食及农业组织 | Food and Agriculture Organization of the United Nations | Organisation des Nations Unies pour l'alimentation et l'agriculture | Продовольственная и сельскохозяйственная организация Объединенных Наций | Organización de las Naciones Unidas para la Alimentación y la Agricultura | منظمة الأغذية والزراعة للأمم المتحدة

COMMITTEE ON FISHERIES

Thirty-fourth Session

1–5 February 2021

Position paper on "Ecosystem Restoration" of production ecosystems, in the context of the UN Decade of Ecosystem Restoration 2021-2030

Executive Summary

The FAO co-leads with UNEP the implementation of the UN Decade of Ecosystem Restoration 2021-2030. The implementation strategy for the Decade defines ecosystem restoration as "*encompassing a wide continuum of practices that contribute to conserving and repairing damaged ecosystems*". As the specialized agency of the United Nations leading international efforts to defeat global hunger and malnutrition, FAO takes an active role in framing a vision for the implementation of the Decade for systems we rely on for food, feed and fibre production. This document provides specific guidance on the concept, needs and priorities for "ecosystem restoration" for forest landscapes, farming, livestock and fish-producing ecosystems, as the focus, scale, priorities and trade-offs of restoration interventions will differ between them.

The UN Decade on Ecosystem Restoration provides a unique opportunity to transform food, fibre and feed production systems to the needs of the 21st century, and to eradicate poverty, hunger and malnutrition through effective and innovative landscapes and seascapes management. The restoration of forest landscapes, farming, livestock and fish-producing ecosystems should primarily contribute to restoring these ecosystems to a healthy and stable state, so that they are able to support human needs for sustainable food production and livelihoods. The ultimate objective of these restorative efforts should be to reverse the trend in many unsustainable agricultural systems, optimizing the ecological interactions between plants, animals, humans and the environment, while leaving no-one behind.

I. Background

1. The UN Decade of Ecosystem Restoration 2021-2030 was proclaimed by the United Nations General Assembly (UNGA) through resolution A/RES/73/284 on 1st March 2019, with the aim of supporting and scaling up efforts to prevent, halt and reverse the degradation of ecosystems worldwide and raise awareness of the importance of successful ecosystem restoration.

2. The need for restoration is particularly demonstrated in terrestrial and freshwater ecosystems. Land degradation is costing over 10 percent of the annual global gross product in loss of biodiversity and ecosystem services. It is estimated that one third of land used for food, fibre and feed production are degraded, representing 1.6 billion ha affecting all countries in the world[1], and the restoration of degraded soils is considered central to the function and service provision of many ecosystems.

3. Inland waters and freshwater ecosystems also show among the highest rates of ecosystem decline, with only 13 per cent of the wetland present in 1700 remaining in 2000[2]. Marine ecosystems, from coastal to deep sea, are also showing the increased impact of human action, with coastal ecosystems showing large historical losses of extent and condition. Deterioration of these ecosystems reduces service provision, as well as livelihoods opportunities to coastal communities.

4. FAO and UNEP were invited to "*lead the implementation of the Decade, in collaboration with the secretariats of the Rio conventions, and with other relevant multilateral environmental agreements and entities of the United Nations system*". The implementing partners were asked to identify and develop possible activities and programmes within their mandates, using existing resources and additional voluntary contributions, as appropriate.

5. A strategy for the Decade is being finalized by FAO, UNEP, IUCN and the Global Landscape Forum. In this strategy the scope of "ecosystem restoration" is defined as "*encompassing a wide continuum of practices and targeted ecosystem conditions that contribute to conserving and repairing damaged ecosystems*". However, without a more specific understanding of what this continuum includes, actions may not be as comprehensive and effective as they could be, and monitoring actions may be challenging.

6. "Ecosystem restoration" can be interpreted differently by the various actors operating in different sectors, ranging from "restoration" as a return to a non-degraded (e.g. a fully productive) state to "restoration" as meaning the re-establishment of the original or "natural" state of an ecosystem.

7. As the specialized agency of the United Nations leading international efforts to defeat global hunger and malnutrition, FAO takes an active role in framing a vision for the implementation of the Decade from the perspective of its mandate to make agricultural systems (crops, livestock, forestry, fisheries and aquaculture) more productive, efficient and sustainable, while managing and protecting the environment and the natural resources base that these systems depend upon. For these systems, the primary objective for restoration should be to restore them to the full productive capacity of their goods and services.

8. This position paper intends to provide technical clarifications to the concept of "ecosystem restoration" for systems that society relies on for food, feed and fibre production. In these systems "ecosystem restoration" is primarily seen as contributing to healthy and stable ecosystems, which in turn support human needs for sustainable food production and livelihoods. For this position paper "ecosystem restoration" is defined as the process of assisting in the recovery of ecosystems that have been degraded, damaged, or destroyed, and focuses on establishing the ecological processes necessary to make terrestrial and aquatic ecosystems sustainable, resilient, and healthy under current and future conditions while improving human well-being.

9. At the heart of this position paper is the recognition that food production from various sectors comes frequently at a cost to ecosystem integrity. While in many instances this cost is considered

[1] FAO and ITPS (2015) Status of the World's Soil Resources (SWSR) – Main Report. Food and Agricultural Organization of the United Nations and Intergovernmental Technical Panel on Soils, Rome, Italy.
[2] IPBES 2019. Global Assessment Report on Biodiversity and Ecosystem Services.

acceptable and within the ecosystem carrying capacity, there are always options and opportunities to improve trade-offs between economic, social and ecological objectives, ensuring the sustainability and efficiency of these systems and reducing their overall footprint.

10. Furthermore, restoration of terrestrial and aquatic ecosystems can potentially be seen as a crucial step in the fight to eradicate poverty, hunger and malnutrition, in the context of a growing human population and the increasing need for the provision of ecosystem services, including food.

11. This document provides specific, albeit not necessarily comprehensive, guidance on the term "ecosystem restoration" for forest landscapes, farming and livestock systems and fish-producing ecosystems, as the focus, scale, priorities and trade-offs of management and restoration interventions will differ between these systems. Furthermore, restoration efforts may differ depending on a) their objectives, b) the level of degradation and the legacy of historical use, c) the reference model, d) techniques and technologies in use, and e) the future use of the restored areas, which would all vary between production sectors.

II. Ecosystem restoration from a forest landscapes perspective

12. Global forest landscapes continue to be under threat from over-exploitation, degradation and conversion to other land uses – primarily agriculture. Around 3.3 million hectares of forests were lost every year between 2010 and 2015[3]; Dryland ecosystems, occupying 41 percent of the Earth's surface, are among the most vulnerable, and home to 2 billion people, mostly in developing countries[4]. At the same time, land degradation affects more than 2 billion hectares of land worldwide[5].

13. Restoration of degraded forests and reintroduction of trees in landscapes, including in degraded agricultural land, can help take the pressure off existing forest land, provide forest products, conserve biodiversity, improve hydrological flows and soil fertility, and reduces soil erosion, in addition contribute to climate change mitigation through carbon sequestration, substitution and conservation.

14. According to FAO's Forest and Landscape Restoration Mechanism, forest and landscape restoration (FLR) is "an active process that brings people together to identify, negotiate and implement practices that restore an agreed optimal balance of the ecological, social and economic benefits of forests and trees within a broader pattern of land uses".

15. FLR seeks a balance between restoring ecosystem services and supporting the productive functions of land for agriculture and other related uses. FLR differs from site-level reforestation because it explicitly seeks to restore ecological processes such as hydrological and nutrient cycles, soil development, timber production and wildlife population dynamics that operate at a larger – or "landscape" – scale. Crucially, the combination of restoration activities across a landscape should increase productivity and the provision of environmental services while serving the needs of people.

16. The nature of restoration will vary across a landscape, with different approaches used in different locations, depending on ultimate objectives and societal needs. It can range from repairing selected ecosystem functions in, for example agro-ecosystems, to fully restoring native ecosystems.

17. It is important to note that restoring forest ecosystems goes beyond the planting or assisted natural regeneration of trees. FLR is more than a technical approach; it involves stakeholders in all affected land-use sectors and applies participatory decision-making processes. It makes use of collaborative approaches to harmonize the many land-use decisions of landholders with the aims of improving both ecological integrity and economic outcomes, as well as enhancing the socioeconomic development of local communities.

18. In order to guarantee long-term sustainability the effects of restoration efforts have to trickle down to where they matter most: to rural communities in fragile ecosystems, whose livelihoods

[3] FAO, 2016. Global Forest Resources Assessment 2015. How are the world's forests changing?
[4] FAO, 2019. Trees, forests and land use in drylands: the first global assessment – Full report. FAO Forestry Paper No.184. Rome.
[5] GPFLR, 2011. A World of Opportunity.

depend on the health, productivity and resilience of the vegetation and land around them. A big leap is therefore needed to mainstream and scale up forest/vegetation and landscape restoration.

19. Technically, FAO has a lot of knowledge and a strong comparative advantage in landscape restoration on the ground and championing best practices in sustainable land and forest management, that are making a real contribution to climate change adaptation and mitigation, while improving the livelihoods of rural communities, particularly women and youth. Upscaling restoration will allow FAO to address some of the key drivers of land degradation at the nexus between over-exploitation, local livelihoods, climate change and environmental security.

20. FAO is ready to upscale restoration from drylands (for example supporting Africa's Great Green Wall programme) to all other degraded forest landscapes (especially though the Forest and Landscape Restoration Mechanism), helping practitioners to restore a balance of the ecological, social and economic benefits of forests and trees within a broader pattern of integrated land use and landscape approach.

Key areas and examples of restoration needs and approaches in forestry

21. Most deforested and degraded land offers opportunities for "mosaic restoration", where forests and trees are combined with agriculture, waterways, protected areas and settlements on a landscape scale. Croplands and densely populated areas may also benefit from having more trees through various combinations of urban forestry and agroforestry interventions.

22. Restoration of closed canopy forests might include introduction of new tree provenances or species to increase resilience to drought, or the alteration of forest structure to reduce fire risk or increase habitat for wildlife or recreation, for example. In some places, commercially oriented plantation monocultures could be established to increase production of wood products, while efforts elsewhere might focus on restoring the original forest ecosystems (i.e. ecological restoration or reconstruction).

23. Forest restoration efforts might involve the re-introduction of some (but not necessarily all) the forest tree species originally found in the landscape (often referred to as rehabilitation) and transferring tree germplasm thought to be better adapted for anticipated climatic changes in a given site (assisted migration). In extreme cases, reclamation of land devoid of vegetation using forestry species may be undertaken; this may involve multiple interventions over several decades to achieve a desired function.

24. Drylands are among the ecosystems most affected by environmental degradation and their restoration has been one of FAO's key priorities for many years. This investment is paying off and FAO now disposes a blueprint for large-scale land restoration for small scale farming, putting the latest innovations in land reclamation/rehabilitation and in plant science at the service of local communities, and showing that land degradation is not necessarily irreversible.

25. After nearly a decade of involvement in dryland restoration in the context of Africa's Great Green Wall programme, FAO's action on the ground has brought over 50,000 hectares of degraded land under restoration, planting 25 million trees and shrubs in combination with diverse herbaceous/grass fodder species and reaching over half a million people. Its approach puts local, resource-poor communities who depend on low-cash livelihoods, at the heart of the restoration effort, delivering multiple ecological and socio-economic benefits.

26. FAO has developed two major specific tools to engage in unparalleled monitoring and evaluation of biophysical work: Collect Earth – a free and open-source software to analyze and monitor land use - and Earth Map - a tool for historical and predictive analyses of environmental and climate parameters. Importantly, the technical capacity of partners and national authorities was developed in order for them to be able to use these tools independently at their own desks and to continuously contribute to data collection.

27. FAO also recognizes that restoration of mangrove ecosystems is a global need and opportunity. They are vital nursery and breeding habitats for aquatic fauna, natural barriers and defence against storm surges, tsunamis, rising sea levels and costal erosion. FAO has already initiated

restoration interventions in the Pacific (e.g. Fiji) and in Africa (e.g. Senegal). However, this will need special attention and more interventions to protect costal ecosystems.

28. It is important that, in order to guarantee the long-term benefits of restoration efforts, these benefits trickle down to rural communities in fragile ecosystems, whose livelihoods depend on the health, productivity and resilience of the vegetation and land around them. A big leap is therefore needed to mainstream and scale up forest/vegetation and landscape restoration, and FAO has the mandate and is uniquely placed to play a key role.

III. Restoration from an agriculture production perspective

29. Restoration and sustainable management of productive ecosystems and landscapes is fundamental to implementing FAO's Common Vision on Sustainable Food and Agriculture and SDG2.

30. Food production currently utilizes 50 percent of habitable land, and the expansion of agricultural and grazing lands continues to be the main driver of deforestation. Furthermore, about 20 percent of the planet's vegetated surface shows declining trends in productivity with fertility losses linked to erosion, soil nutrient depletion and pollution in all parts of the world.

31. Agriculture also accounts for 69 percent of freshwater withdrawals and plays an important role in ensuring that other sectors have enough water for their needs. This means that any savings in water for agriculture would benefit environmental flows.

32. At the same time return flows from agriculture need to be of a good quality to protect ecosystem health. Fertilizers and pesticides used in agriculture pollute return flows, affecting downstream water use for all sectors and increasing the cost of treatment of the water and mostly, affecting the health of ecosystems and their biodiversity.

33. Ecosystem restoration demands an integrated approach, which recognizes the complex social, political, economic and environmental factors leading to degradation of agricultural landscapes. Such approaches can also empower stakeholders to find and apply sustainable restorative solutions.

34. Understanding the root causes and drivers of degradation by using inclusive consultation processes through participatory assessments of land degradation, is critical for the design of effective ecosystem restoration strategies through soils, crops, livestock and wildlife management interventions.

Key areas and examples of restoration needs and approaches in agriculture landscapes

35. FAO brings a host of experiences, technical know-how, and innovative tools to promote ecosystem restoration through the continued work on agroecology, rangeland and grassland management, ecosystem services, soil health, legume integration and pollination services.

36. Recovering the capacity of agricultural landscapes to deliver multiple ecological functions can be achieved through a variety of nature-based solutions. Restoration and sustainable use of biodiversity enhances carbon and nutrient cycling and overall soil health. As a result, biodiversity may be enhanced by sequestering more carbon in the soils, increasing the availability of nutrients to crops and plant biomass in pastures and grazing lands, increasing recycling of nutrients in the system (e.g. manure and crop residues), reducing feed-food competition, improving habitats for bees and other pollinators and the biological control of pest and diseases, all supporting sustainable agricultural livelihoods.

37. As a policy issue, efforts should be devoted to the restoration of degraded soils and landscapes by using regenerative approaches that promote system diversification and sustainable land management (SLM) practices and rangeland management. Such practices enhance the recycling of organic matter, including from manure, into soil. Regenerative grazing with different ruminant species can also reverse bush encroachment in rangelands and improve pasture productivity. Better livestock management contributes to enhancing overall biodiversity and hence restoring agroecosystems.

38. Legume cover can also contribute simultaneously towards greater carbon sequestration and soil nitrogen availability to crops and pastures, as well as protein sources for human and animal

nutrition. Such practices enhance soil health as they are based on the addition of soil organic matter and the functioning of soil biodiversity, the recycling of organic matter.

39. Efforts for land management including soil restoration in drylands in the Sahel through micro catchment structures and the Great Green Wall could contribute to restoration of such ecosystems.

40. Heightened activities for the observance of plant health such as use of good genetic material, use of clean seeds and seedlings, use of organic material to enhance soil structure, proper use of non-toxic pesticides and judicious use of fertilizers are key in the restoration of agricultural systems.

41. Conservation agriculture practices, such as zero tillage, use of organic mulch material from farm debris and planting of leguminous shrubs, trees and mixed cereal and legumes crops, provide useful opportunities for land restoration.

42. The inclusion of trees, shrubs and fodder trees in agricultural land through different forms of agroforestry practices has been shown to contribute to:

a. enhanced climate resilience of farming systems through improved soil moisture conditions in dryland areas,

b. enhanced biological control services by fostering suitable habitats for predators and natural enemies of pathogens,

c. Enhanced nutrition and livelihoods through silvopastoral systems,

d. Enhanced erosion control through soil stabilization and deep soil nutrient capture by tree roots, and

e. Reduced crop yield variability, enhanced crop productivity in degraded lands, and provision of more feed to livestock in the form of crop residues under drastic climatic regimes.

43. Sustainable Land and Water Management (SLWM) is a key requirement in maintaining multiple ecosystem services in a more sustainable manner. A Decision Support Framework (DSF) that enhances informed decision-making at various levels can assist policy makers and managers to mainstream and scale-out SLWM over large areas.

44. While water quality can be degraded by discharge of nutrients from animal manure, better manure management, including through storage and application as organic fertilizer, can contribute to improve water quality. Good husbandry production practices making an efficient use of nutrients would allow to prevent water pollution. FAO works with countries in adopting technologies for the treatment of wastewater for agriculture to improve the health of ecosystems while contributing to food security.

45. The Livestock Environmental Assessment and Performance (LEAP) Partnership published a series of guidelines on soil carbon stocks and stock changes (FAO, 2019), nutrients cycles and impact assessment (FAO, 2018) and biodiversity assessment (FAO 2019), which can be used for ecosystem restoration.

46. Assessing the current condition of the ecosystem is fundamental to guide restoration and monitor activity. Available information systems including GLOSIS and AQUASTAT constitute a good basis for this. Soil assessment can be done through soil surveys, soil analysis and direct observations. In order to support countries in this process, the FAO's Global Soil Partnership established the Global Soil Laboratory Network (GLOSOLAN), to harmonize and enhance laboratory capacities in soil analysis.

47. A number of tools (e.g. SHARP, PRAGA) have been developed by FAO to enhance relevance of technical support through enhanced participation of multiple stakeholders concerned with the sustainable management of agricultural landscapes. More recently, the Tool for Agroecology Performance Assessment (TAPE) has been developed and used to assess and monitor the multiple dimensions of sustainability in agricultural landscapes, providing valuable tools for the inclusive multidimensional assessment of current conditions as well as monitoring of agricultural transitions towards sustainable agriculture and food systems.

48. Integrated Landscape Management (ILM) and Land Resource Planning (LRP) approaches that aim at life-cycle analyses of agricultural food provide means to reverse the current degradation trend. Adaptable SLWM options have high potential of success to support implementation and scaling-out programmes, supported by proper policies, financial mechanisms and conducive enabling environment.

49. FAO has collaborated with several partners, including the Ramsar Convention, in understanding the interactions between wetlands, fisheries and agriculture for a sustainable multiple strategy response[6], and is currently working on guidelines for the sustainable management of inland wetlands in Africa to recognize the need to manage wetlands taking into account their ecological importance in order to preserve or improve the services that they provide.

50. Saline agriculture (including aquaculture) can also provide new opportunities to mitigate the impact of saline intrusions, either through cultivation halophytes and other salt tolerant crops or by treating saline water to a quality that is acceptable for agriculture. FAO is working with partners, through the Global Framework on Water Scarcity in Agriculture (WASAG) to maximize the benefits and opportunities that saline agriculture and aquaculture offers to countries which face intrusion of saline seawater.

51. FAO brings in knowledge, tools and lessons in areas of effective land use planning that assist local land use plans, and sustainable land management; these also prioritize the concept of circular economy and the re-use/recycle of available resources. Therefore, an *Ecosystem Restoration Approach* has, as core element, the regenerative approaches of agricultural production models to address degraded grazing and croplands, reclaim salt affected lands and in general restore productive potentials of agricultural lands.

IV. Restoration from a fisheries and aquaculture perspective

52. Capture fisheries is the only major food production system that relies entirely on wild resources and their natural production cycles. The integrity and health of the ecosystems that sustain these resources is essential to the services they provide. Combined with aquaculture, these sectors produced 156 million tonnes of fish[7] for direct human consumption in 2018, with an additional 22 million tonnes used as ingredients in the feed industries.

53. Supporting over 60 million jobs in direct employment, and several times that in the transformation sector, capture fisheries and aquaculture are estimated to sustain the livelihoods of ten percent of the world's population, most of them in developing States, including Small Island Developing States and many landlocked countries.

54. Given that coastal and oceanic marine ecosystems and freshwater ecosystems provide a range of services, including regulating (e.g. climate control), supporting (e.g. nutrient cycling) and cultural services, in addition to provisioning services such as food and employment for humans, ecosystem restoration offers an opportunity to balance between sustainable production of renewable resources and the need for maintenance of biodiversity and ecosystem function, carefully considering trade-offs between ecological, social and economic objectives.

55. Direct restorative actions in this context would include efforts to minimize impacts on ecosystems structure and function by collateral effects of human activities. This includes rebuilding fish stocks "*to maintain or restore populations of harvested species at levels which can produce the maximum sustainable yield*" (UNCLOS, Article 61.3), thus supporting existing international agreements.

56. However, the narrow view of maximizing yield is neither sufficient nor desirable, and a broader ecosystem level consideration is needed, which includes ecosystem integrity, biodiversity, structure and functioning, as well as additional ecosystem services other than food provision.

[6] www.fao.org/3/a-i0314e.pdf

[7] The term "fish" indicates fish, crustaceans, molluscs and other aquatic animals, but excludes aquatic mammals, reptiles, seaweeds and other aquatic plants

57. Estuarine systems and coastal lagoons, for example, provide important habitats to many marine fish species for their breeding, which require adequate salinity levels resulting from the mixing of saline seawater with upstream freshwater from the river. Upstream water abstractions for agriculture reduce the amount of freshwater reaching these lower river bodies, leading to higher saline intrusion and threatening the breeding and nursery habitat of such fish species, which are often an important source of protein in subsistence fisheries.

58. Like other transformative food systems, many aquaculture[8] systems rely on modifying the natural system to maximize production. The concept of restoration in this sector is by necessity focusing on maintaining ecosystem structure and function to support food provisioning while minimizing impacts, rather than restoring ecosystems to an initial state before aquaculture started. Such management actions and system changes can, for example, reduce the effects of nutrient releases, reduce demands for marine fish–based feeds, and prevent the removal of sensitive coastal or aquatic habitats, when these apply.

59. An important restorative element in aquaculture would be the control of veterinary medicines and their release into the aquatic environment through leaching, effluent releases and the presence of residues in faecal materials, to avoid environmental degradation, including the development of antimicrobial resistance in aquatic bacteria.

60. The expansion of aquaculture has also led, in some cases, to the emergence of aquatic animal diseases that can negatively impact wild populations and biodiversity. Disease management should be an integral part of ecosystem restoration and management practices, focusing on higher risks of pathogen introduction through risk analysis and contingency planning.

61. The FAO Code of Conduct for Responsible Fisheries and FAO aquaculture technical guidelines provide relevant principles and procedures that will minimise the impacts of wastes (offal sludge, dead or diseased fish), excess veterinary drugs and other hazardous chemical inputs to the environment including the need for appropriate risk assessments, of interest and application in restoration practices.

62. When considering restoring options for an ecosystem it is essential to determine how it was damaged in the first place, what has driven the damage, and what is the specific objective of the restoration process. For aquatic systems used for food production the primary objective of any restoration action should be to ensure that these ecosystems can retain (or restore) their full productive capacity in the medium to long term.

63. Finally, different restoration responses are required not just depending on the levels of degradation and transformation of a particular ecosystem, but also on the scale at which restoration actions are needed, be it at the whole ecosystem level, or more narrowly within a local production system or conservation context.

Key areas and examples of restoration needs and approaches in aquatic systems

64. Large/oceanic marine ecosystems supporting or affected by fisheries production require interventions primarily to rebuild fish stocks to levels which can produce their maximum sustainable yield (MSY), and reduce adverse impacts on the environment, such as impacts on Vulnerable Marine Ecosystems (VMEs), especially in areas beyond national jurisdiction, incidental catch of non-target species or impacts of abandoned, lost or otherwise discarded gears.

65. For coastal ecosystems with linkages to fisheries, restoration interventions call for policy development, management strategies and implementation mechanisms focused on:

a. Increasing the number of regulated fisheries supported by science-based monitoring and scientific advice;

[8] The practice of culturing finfish, crustaceans, molluscs, aquatic plants and seaweeds.

b. Reducing impacts on marine ecosystem components through inter alia: Gear selectivity and design, reductions of bycatch and discards, as well as abandoned, lost or otherwise discarded (ALDG) fishing gear;

c. Implementing constructive combinations of spatial, seasonal, input and output management measures;

d. Restoring damaged marine habitats through protection and zoning;

e. Restoring and managing mangroves, seagrasses and reefs;

f. Creating artificial reefs and setting up restocking programmes.

66. In coastal ecosystems with linkages to coastal aquaculture specific interventions would include:

a. Ensuring aquaculture growth is commensurate with ecosystem carrying capacity;

b. Careful site selection and density control of aquaculture installations;

c. Selection of species and culture systems suited for the given site and with the least impact;

d. Increasing non-fed aquaculture (including for nutrient stripping of aquatic ecosystems);

e. Promoting Integrated Multi Trophic Aquaculture (IMTA);

f. Removing pond bunds and restoring hydraulic conditions;

g. Limiting coastal land conversion through integrated aquaculture practices (e.g. shrimp-mangrove;

h. Introducing feed and disease treatment management schemes;

i. Applying species selection management and mitigation measures for escapees.

67. Finally, regarding freshwater/aquatic coastal ecosystems, restorative opportunities and interventions would include:

a. Reversing loss of connectivity in freshwater systems and developing fish passage/irrigation reforms, and integrating fisheries and aquaculture into irrigation systems;

b. Creating additional refuge/aquatic environments and managing them as environments worthy of protection (e.g. Globally Important Agricultural Heritage Systems, GIAHS);

c. Enforcing e protected areas (protection propagation and juvenile nursing) and seasonal banning of fishing in inland waterbodies;

d. Implementing strict banning of destructive fishing gears and methods;

e. Restocking freshwater bodies with native species;

f. Use of aquaculture, including integrated agriculture-aquaculture, as means to mitigate degraded systems and as part of broader agro-ecological approaches;

g. Implementing nutrient stripping (from land-based sources) in coastal waters;

h. Introducing watershed management and erosion control approaches.

68. The above list provides some examples of appropriate restoration measures along the continuum of restoration opportunities in the fisheries and aquaculture sectors. These measures include transformations in management and production processes to maximize service provision if the damage was a result of it (e.g. overfishing, habitat destruction from fishing gear, mangrove removal in aquaculture), as well as transformations in associated industries if the damage is external (e.g. agricultural runoff impacts on water quality and flow, coastal development impacts on seagrasses or coral reefs).

V. An integrated approach to ecosystem restoration

69. Restoration plans are likely to be location- and system-specific. However, integrated solutions would enhance the delivery of benefits, particularly between sectors that depend on the same natural resource base for sustainable trade-offs: for example, between agriculture and urban development for land, in recognizing that cities rely on the food produced from agriculture. Integrated restorative solutions are likely to be best to fully optimize the interactions between humans and the environment, taking into consideration not only environmental aspects but also the social and economic aspects that need to be addressed for a sustainable food and agriculture systems.

70. It is also important that restoration efforts are inclusive, leave no one behind, and strive to create opportunities for disadvantaged and marginalized societal groups. Developing local capacity and empowering communities to conceive, develop, implement and benefit from restorative projects promotes innovative diversification practices, enhances synergies and complementarities, and minimizes trade-offs, hence boosting ecosystem services in agricultural systems. The use of indigenous and local knowledge should be prioritized and mainstreamed in restorative actions.

71. Furthermore, restoration requires holistically ambitious approaches. Rewilding and natural system valuation are two examples of very different but integrative approaches that offer opportunities to local communities to develop new and sustainable livelihoods. Restoration mist also implies the development of alternative livelihoods and large-scale financial incentives, so that restoration is truly transformative.

72. In conclusion, the UN Decade on Ecosystem Restoration provides a unique opportunity to transform food, fibre and feed production systems to the needs of the 21st century, and to eradicate poverty, hunger and malnutrition through effective and innovative landscapes and seascapes management.

73. The restoration of forest landscapes, farming, livestock and fish-producing ecosystems should primarily contribute to restoring these ecosystems to a healthy and stable state, so that they are able to support human needs for sustainable food production and livelihoods. The ultimate objective of these restorative efforts should be to reverse the trend in many unsustainable agricultural systems, optimizing the ecological interactions between plants, animals, humans and the environment, while leaving no-one behind.