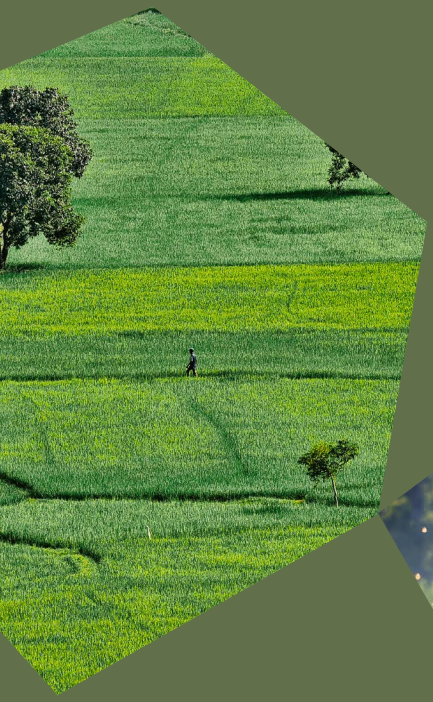
Roadmap to Nature Positive: Foundations for the agri-food system

Row crop commodities subsector

→ *Deep dive: Rice production in the Mekong Delta, Vietnam*



World Business Council *for Sustainable Development*

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Introduction:
Landscape deep dives

To support the journey of agri-food companies to nature-positive system transformation, WBCSD has developed a Roadmap to Nature Positive: Foundations for the agri-food system for the row crop commodities subsector ("row crops summary" hereafter). This deep dive is one in a series of landscape studies linked to the Roadmap.

The Roadmap provides how-to guidance on applying High-level Business Actions on Nature in value chains, assessing and disclosing material risks and opportunities (aligned with the Taskforce on Nature-related Financial Disclosures (TNFD)) and preparing to set science-based targets for nature (aligned with the Science Based Targets Network (SBTN)).

The Roadmap is designed for use along the complete agri-food value chain and across all stages of the corporate nature maturity journey. The initial focus is on row crop commodities as a subsector of the broader agri-food system. WBCSD addresses cross-sector framing, concepts and definitions in the Roadmaps to Nature Positive: Foundations for all Businesses ("foundations guidance" hereafter). These publications form a single package intended for joint use.

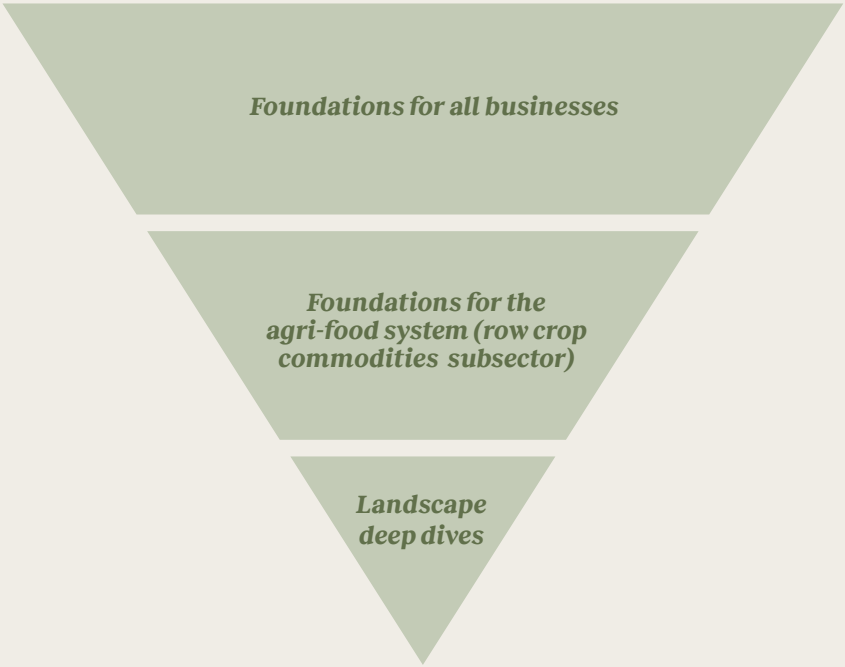
Nature-related dependencies, impacts, risks and opportunities (DIROs) are highly local and actions to address them are distinct from climate change mitigation, which generally includes more global considerations. Recognizing the inherent link between agriculture and the land, WBCSD has undertaken an initial series of nature-positive deep dives into distinct production landscapes.

WBCSD member companies consider these sub-national regions – characterized by growing agricultural production/intensification or containing biodiversity hotspots – as high-priority operating/sourcing regions. In other words, an agri-food company with global exposure would likely determine that these landscapes, if part of its value chain, require specific nature-related assessment, commitment and action.

Each deep dive explores key nature-positive questions for agri-food companies, aligned with the LEAP risk and opportunity assessment approach recommended by the TNFD:

- → **Scope and locate:** Where should I focus, both in my value chain and geographically?
- → **Evaluate materiality:** What should I focus on, considering both nature-related dependencies and impacts?
- → **Assess risks and opportunities:** Why does this matter for my business and key stakeholders?
- → **Prepare to respond and report:** What actions should my company be taking, individually and collectively with others? What barriers and trade-offs do I need to consider? How should I approach nature-related disclosures?

Figure 1: **WBCSD's initial nature-positive guidance for agri-food companies includes three supporting deep dive assessments**



The deep dives explore nature-related DIROs, leading practices, context-specific resources, and unresolved challenges for three of the commodity crops that largely underpin the global food system: soy, corn and rice.[1] These crops are conventionally farmed under intensive methods in a small number of global breadbasket regions. The SBTN considers them high-impact commodities, meaning "raw and value-added materials used in economic activities with material links to the key drivers of biodiversity loss, resource depletion and ecosystem degradation."[2] These crops are among those with the largest land-use footprint in areas of high conservation value, posing the greatest nature-related risk.[3] Each deep dive centers on a single commodity but includes a representative annual crop rotation to reflect a holistic understanding of, and approach to, year-round land use.

WBCSD has worked with a diverse group of agri-food and professional services companies and gathered input from key local and global stakeholders to create an approach that is both scientifically rigorous and practical for business implementation. Looking ahead, WBCSD will continue to engage with leading voices from the private sector and civil society. In the next phase, the Roadmaps to Nature Positive will provide deeper guidance on metrics and indicators and the target-setting and reporting processes. This may also include additional deep dives and case studies to expand the illustrative portfolio of diverse crops and global landscapes.

→ ***Note that this deep dive relies on concepts and methods explained in the*** Foundations guidance and row crops summary. Please refer to these resources for detailed supporting guidance

Deep dive: Rice production in the Mekong Delta, Vietnam

Stage 1: *Assess (materiality screening)*

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Stage 1:
Assess (materiality screening)

→ ***Note*** that each stage of the deep dive begins with a high-level statement linking to the **Foundations guidance**

Stage 1.1 - Scope & locate

Agri-food businesses (meaning any company engaged in this value chain) should first identify their main sectors, sub-sectors and parts of the value chain and where they are located. If a company sources, supplies, or finances rice from the Mekong Delta (MKD) region, this would be a priority location in its nature-positive strategy and this guidance will be relevant. Certain aspects of this guidance may also be relevant for row crop commodity production in other landscapes but it is important to assess each location independently. See Annex 1 for further detail on this location and tools supporting this stage.

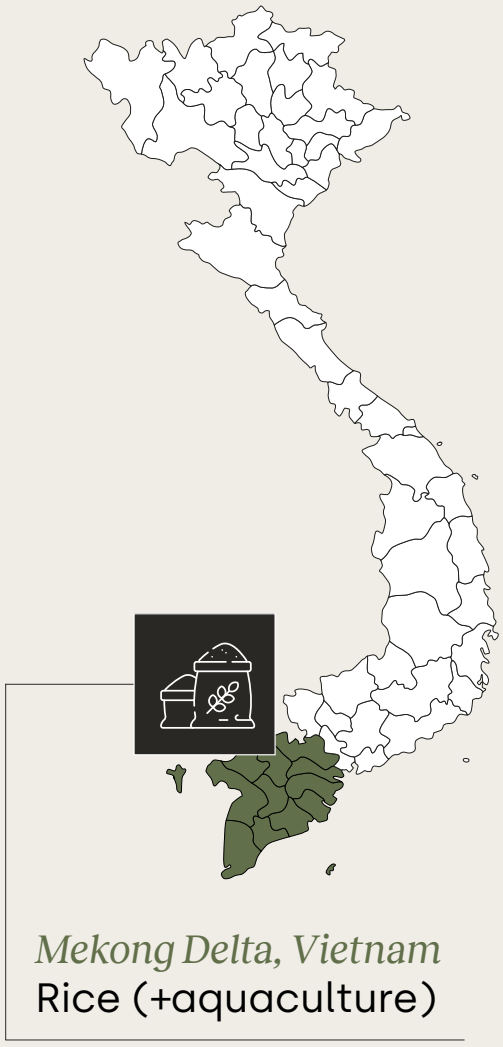
The Mekong Delta

The MKD at Vietnam's southern tip is one of the world's most fertile regions. It covers about 4 million hectares with freshwater habitats ranging from floodplains, wetlands and mangrove forests, to mudflats, sea grasses, riparian vegetation, paddy land and peatlands.[4] The MKD holds a diverse biota despite humans having substantially modified it, primarily to support rice-based agriculture. Due to its low-lying coastal geography, the MKD is among the world's most vulnerable deltas to the impacts of climate change.[5] In a region that depends on small-scale agricultural production, this can be devastating to the economy and significantly impact farmers' livelihoods.

Rice is vital to the food security of over half the world's population; in many lower-income countries in Asia, up to 70% of people's dietary energy comes from rice.[6] Rice is the most important crop in Vietnam, the world's fifth largest rice producer; rice farming is concentrated in the MKD, often referred to as Vietnam's "rice basket" as it produces over 55% of the country's annual rice crop and 95% of its rice exports. Approximately 70% of MKD rice is exported each year, with the remainder entering the domestic market.[7] This production system supports around 1.5 million small-scale rice farmers and some 17 million people in total (around 20% of the national population).[8] Some 80% of the MKD population is involved in rice farming, making it a major aspect of local culture, tradition and livelihoods.[9]

Rapid intensification in MKD rice farming in recent decades has increased production and exports and to some extent farmer incomes. But has also increased dependence on a single crop and exposed farmers to market-based and environmental risks. At the same time, MKD rice quality, efficiency and competitiveness remain low. There are growing concerns about environmental impacts and food security, as rice quality, prices and local availability are largely exposed to climate change and market dynamics. These challenges are particularly acute given that smallholder farmers typically have low financial and technical ability to adapt their own farming practices. Today, emigration away from rural MKD is on the rise as farming becomes less attractive to youth, threatening traditional ways of life and land cultivation.

Figure 2: The Mekong Delta, known as Vietnam's "rice basket", holds significant biodiversity and is highly vulnerable to climate impacts

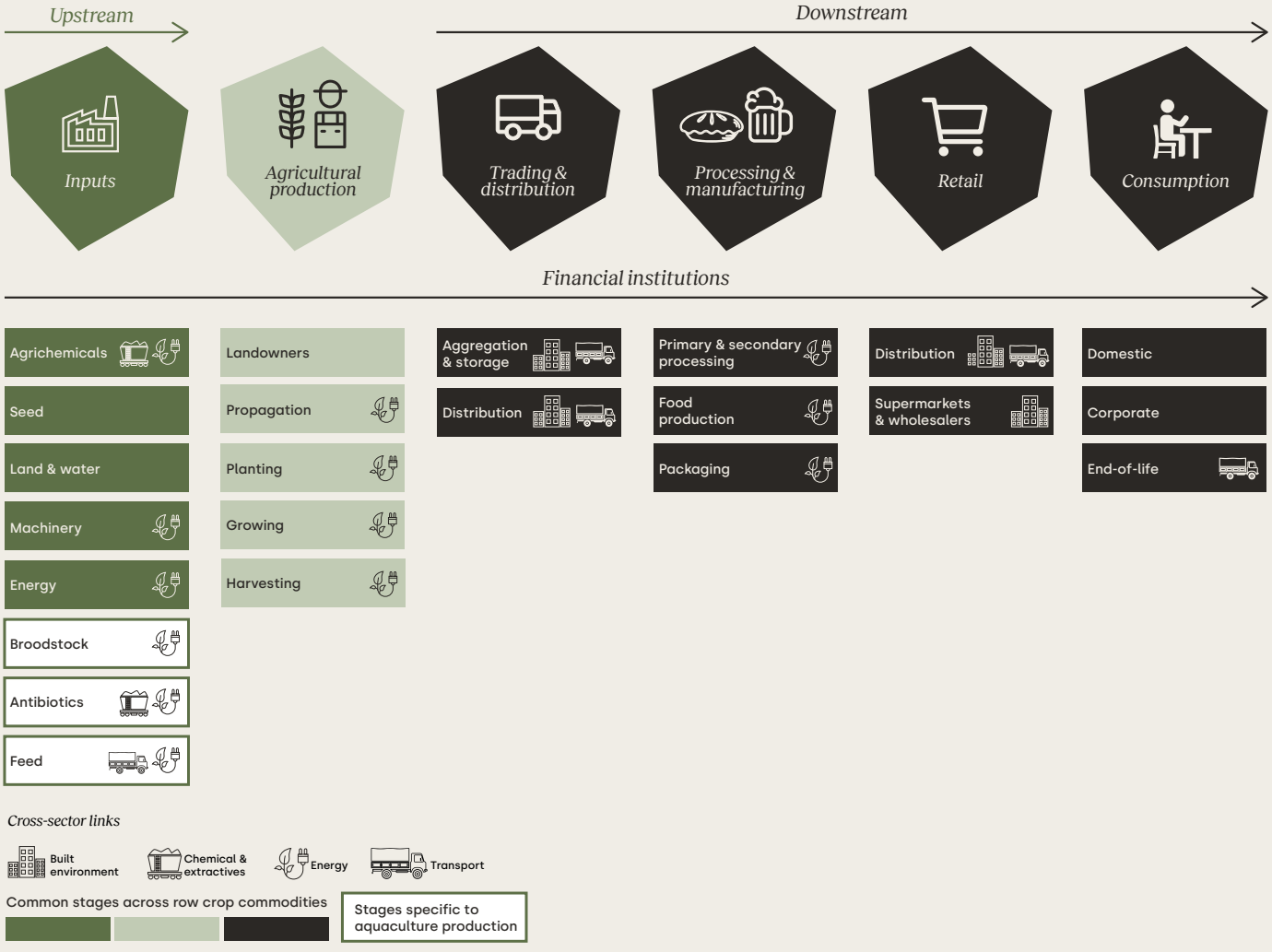


The rice value chain

In alignment with TNFD and SBTN guidance, companies should assess their complete value chain, including direct operations and relevant upstream and downstream activities. This Roadmap considers six value chain stages, grouped under three broad headings.

The main focus is on agricultural production as the primary land-use stage, though upstream and downstream activities have also been assessed with a lighter touch. The main crop assessed in this deep dive is rice, but it also includes freshwater aquaculture (shrimp and catfish) as common complementary land-use activities in the region.

Figure 3: The generic rice-aquaculture value chain, including key cross-sector links



Stage 1.2 - Evaluate impacts & dependencies

Agri-food companies should next prioritize potentially high impacts and dependencies on nature typical for the business and associated value chains for further assessment. This section summarizes the process and key findings of WBCSD's landscape assessment, based on desk research and interviews with key local stakeholders across the private, public and civil society sectors. The process outlined here – and in further detail in the **row crops summary** – is applicable for any agri-food company evaluating nature-related materiality in its operating or sourcing regions, while the specific findings below are relevant for those engaged directly or indirectly in the MKD. See the materiality matrixes (tables 1, 2, 3 and 4) for the primary outputs of this materiality screening, aligned with the structure and methods of the leading nature-related assessment tools and frameworks.

Overview

Sustainable rice cultivation is inseparable from the health of its surrounding ecosystem, particularly regarding the provision of critical ecosystem services such as freshwater supply, filtration, dilution and erosion control. Rice is a highly resource-intensive crop with several significant nature-related impacts, including sizeable greenhouse gas (GHG) and water footprints. Globally, rice production accounts for around 10% of GHG emissions from agriculture, 12% of total global methane emissions, and up to 40% of irrigation water use.[10] Rice landscapes are among the world's largest sources of human-modified wetland habitats; globally, human-modified wetlands, including rice paddy fields and reservoirs, have expanded by over 200% in the last 50 years.[11]

Current farming practices that are water- and agrichemical-intensive contribute to the conversion, diversion and degradation of wetlands, due to drainage, infilling and water pollution. Projections show global rice production will need to increase by some 25% by 2050 in order to meet nutrition needs. Meanwhile, approximately 15-20 million hectares of land in rice-producing regions - including parts of the MKD – may experience water stress due to climate-driven temperature rise and shifting precipitation patterns,[12] threatening to greatly reduce both rice yields and nutritional value.[13] Overall, global rice production could fall by some 15% by 2050 due to climate change (with estimates closer to 4% for the South-East Asia macro-region).[14]

Specific challenges in the MKD include:

- → Water and soil pollution from fertilizer and pesticide overuse and misuse.
- → Climate change worsening long-running challenges for farmers, such as crop disease and pests, and adding saline intrusion, drought and others.[15]
- → Smallholder-dominated production systems: in the MKD, some 85% of rice is produced on plots of 2 hectares or less. Although it is technically profitable on average, the system largely maintains farmer livelihoods near the official poverty line.[16]

This socioeconomic structure – with dispersed production, low education levels, high poverty and lack of investment capability – can often compound and complicate the environmental challenges caused by rice farming. In recent years, the local rice sector has faced additional production-related challenges, including:

- → Horizontal growth, low competitiveness, unsustainable production, slow organizational and institutional reform and low brand recognition on the international market;
- → Low export price and low competitiveness, hence an inability to meet the diverse needs of domestic and international markets;
- → Low production efficiency, despite geographic advantages and high potential for yield improvement;
- → Low incomes of rice farmers compared to other actors involved in rice trading and resulting low motivation and ability for farmers to invest in improved farming methods.[17]

These combined environmental and social/business effects have contributed to mass emigration from the region and the erosion of traditional MKD culture over time, which further contributes to chronic underinvestment in the local rice sector.[18] More environment-friendly technologies and practices are available but the public, private and civil society sectors must take large-scale collective action to create the right enabling conditions for farmers. Indeed, efforts to improve practices and support farmer livelihoods in a nature-positive direction continue to gain momentum.

Agri-production

Freshwater ecosystem disruption

Beginning in the mid-1970s, the Vietnamese government massively increased investment in water control and irrigation to promote intensive rice production, leading to the widespread adoption of double- and triple-cropping systems. Over time, it accelerated drainage and canal construction for rice production in the MKD, which now has over 10,000 km of major canals that have modified the hydrology and agroecosystems of the region. The push for intensification has continued into recent times – the area in which three rice crops are harvested each year increased roughly nine-fold from 2000-2015, to nearly 900,000 hectares.[19]

Rice intensification and the associated water retention infrastructure systems have significantly increased yields (approaching 6 tons per hectare today, ahead of the regional average)[20] but have also exhausted the delta's natural systems and created a host of environmental issues. Closed dyke systems have cut off the natural freshwater cycle that traditionally replenishes rice fields with alluvia (also referred to as "**buffering and attenuation of mass flows**") and flushes out toxins. In turn, this has led to increasingly intensive, and often inefficient, use of mineral fertilizers and pesticides in order to maintain yields, contributing to further ecosystem degradation.[21]

Freshwater ecosystem disruption has also caused increased inundation in downstream provinces in the flood season and increased salinization in coastal provinces in the dry season. Other effects include declining fishery resources; degradation of surface water quality; overexploitation and pollution of groundwater resources; land subsidence induced by excessive groundwater extraction, sand mining in waterways and reduced sedimentation due to impoundment in dams higher up in the water basin; and ecosystem loss and degradation, including loss of the coastal mangrove belt.[22]

The water intensity of rice cultivation coupled with dwindling water resources in many rice-growing areas represent a serious obstacle to improving yields and indeed even to maintaining current levels of production.[24] In parts of the MKD today, the third annual crop has become impossible due to climate-driven droughts. In certain areas, rice production is likely to become unfeasible altogether in the coming years.[25]

"In many areas, natural wetlands have been converted to rice paddy and then subsequently to aquaculture ponds. To continue to meet the demand for rice, further natural wetlands have then been converted to agriculture to replace the areas lost to fish production. This is particularly the case for floodplain wetlands and seasonally flooded grasslands, and swamp forests, especially in the Mekong Delta."

Indo-Burma Ramsar Regional Initiative[23]

GHG emissions

Rice farming activities are a major source of global GHG emissions; the conventional flooding of fields and the associated anaerobic biomass decomposition emit methane, while the burning of on-field residues produces a mix of GHGs. In Vietnam, rice production contributes nearly half of annual agricultural GHG emissions, including around three-quarters of the country's methane footprint. Specific drivers of high GHG emissions in this landscape include natural ecosystem conversion, methane emissions, fertilizer overapplication, fuel-related emissions from irrigation systems, improper management of on-field residues (straw and husks), and overall high energy use and poor efficiency in agriculture.[26] Reducing GHGs is a key opportunity for improving the climate and nature footprint of MKD rice; globally, absolute methane reduction potential from rice production is considered similar to that for livestock.[27]

Water & soil pollution

In the rural MKD, rice farming is often associated with the indiscriminate use of agrichemicals (fertilizers and pesticides), which increasingly threatens local ecosystems. Mineral fertilizer overuse and incorrect application (such as without sufficient lime to counter acidification) can degrade soil health, pollute water resources and emit nitrous oxide (N_2O), a potent GHG.

Use of mineral fertilizers (nitrogen, phosphorous and potassium, or "NPK"-derived fertilizers) in MKD rice farming has increased considerably in the past 20 years, driven by crop intensification and soil degradation. Notably, during 2018-2021 the number of fertilizers registered in Vietnam increased tremendously – more than 500% for organic fertilizer and around 50% for mineral fertilizer. Fertilizer use in the MKD is now higher than the national average; in parts of the region farmers are known to apply 20–30% more fertilizer than recommended.[28] The resulting soil degradation and decreased use of organic fertilizer are fueling even more mineral fertilizer use, creating a feedback loop with adverse effects on nature and farmer livelihoods. In addition to the environmental effects, overfertilization of rice in the MKD comes at an annual economic cost of USD $150 million to local farmers.[29]

Pesticide use trends are similar and concerning levels of pesticides have been found in the MKD's water, soil and sediments in recent years. Vietnam is near top-quartile globally for pesticide use – the average use in the MKD (5.3 times per rice crop) is higher than national and regional benchmarks.[30]

The domestic pesticide market is complex and often confusing for farmers, including over 1,700 active ingredients and more than 4,000 different trade names. Farmers' continued use of banned pesticides is partly due to their availability and relatively low prices and their broad spectrum of pest toxicity. Farmers frequently use pesticides as a preventive measure.[31] In addition, quality management and control of hazardous chemical use is generally weak.[32] Reports show many substances are labelled incorrectly and ingredients not fully listed. Smallholder farmers often lack the training to identify crop threats (for example, to understand whether caused by insects or fungi, lack of nutrients or disease, and so on) and to undertake appropriate and safe pesticide use. Improperly disposed garbage bundles contaminated with toxic substances are also harming the local environment.[33]

Biodiversity

The MKD is a globally recognized **biodiversity hotspot** and contains **key biodiversity areas** (KBAs). It is home to some 470 species of fish, of which 28 are endemic and four are found only here, as well as two mammals and at least 37 species of birds of conservation significance. The MKD also contains a number of distinct vegetation communities, though today most are reduced to small remnants.[34]

In the MKD, the primary biodiversity impacts of agri-production are a result of natural ecosystem disruption and conversion – affecting the habitats of many species – and agrichemical overuse. The overapplication of fertilizers in or near wetlands increases nitrogen and phosphorus contamination of surface water and groundwater, resulting in nutrient enrichment, with significant ecological effects including eutrophication, invasive species expansion and shifts in species composition. Pesticide accumulation in wetlands is a growing concern as toxic residues can pollute the aquatic environment through direct run-off and leaching, which are extremely harmful to fish and other aquatic species.[35]

→ ***See the*** **row crops summary** for more detail on generalized practices and impacts related to conventional row crop production

Biodiversity – the variability among living organisms – is a key feature of nature, cutting across all other dimensions. All nature-related impact drivers can contribute directly or indirectly to biodiversity outcomes and, in turn, biodiversity affects the quality of many critical ecosystem services upon which agricultural production relies (such as soil health, bioremediation, etc.). See Annex 1 for further biodiversity screening data on this landscape.

Upstream

Vietnam is a net importer of mineral fertilizers, taking in between 3.5 million and 4.5 million tons per year on average. Similarly, pesticide imports have grown significantly over time, increasing in volume more than 10-fold since the early 1980s.[36] These trade patterns – combined with the embedded impacts of agrichemical products, including the high GHG footprint of nitrogen fertilizer production – contribute to the significant carbon and nature footprint of MKD rice and freshwater aquaculture.[37]

Downstream

The rice value chain in the MKD is a large and complex system, linking some 1.5 million small-scale farmers to large numbers of downstream actors including traders, processors, wholesalers, retailers and exporters.[38] Being a staple food crop, downstream environmental pressures are relatively lower for rice compared with other row crop commodities that require more processing. In rice processing, drying can result in a paddy-to-rice conversion rate of up to 72% but smaller and older mills are typically far less efficient. This is a key point for improvement for both environmental and economic results, particularly in regions like the MKD where small, manual operations are dominant. With some 70% of MKD rice going into export markets, downstream trading and distribution activities add to the overall carbon footprint of rice from the region.

Complementary land-use activities: freshwater aquaculture

Integrated rice-aquaculture systems enable the production of rice and fish or other aquatic animals on the same field, often while maintaining or enhancing rice yields. This can provide a significant source of additional income as well as nutrition for farming families, thereby improving local food and nutrition security. But it can also compound environmental risks if not implemented in an integrated, sustainable way. Freshwater aquaculture is a growing practice in the MKD, where some 70% of Vietnam's aquaculture land-use already takes place; the MKD contributes about 95% of national pangasius (catfish) production and 80% of shrimp, including the bulk of Vietnam's aquaculture exports.

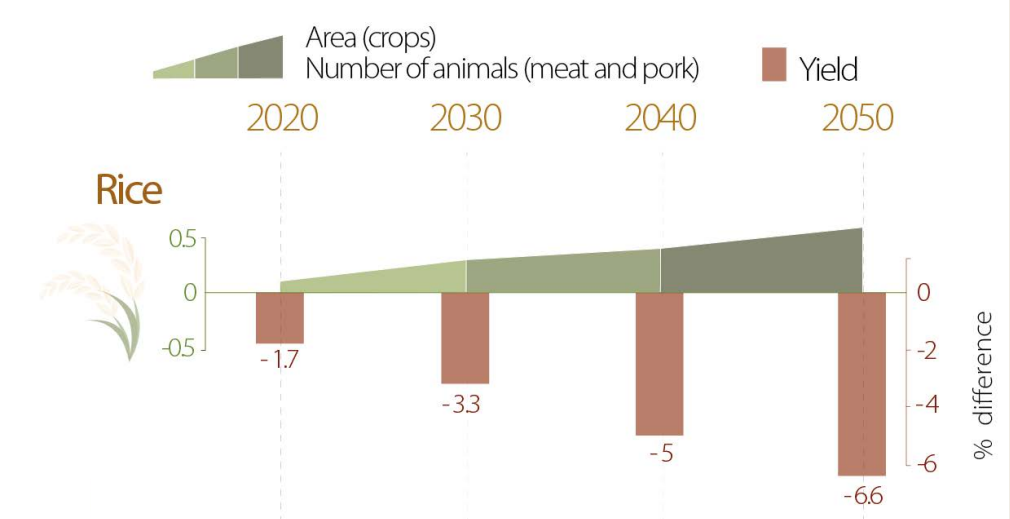
In general, assessing the environmental performance of aquaculture is difficult because activities and potential impacts are extremely diverse. However, catfish farming in Vietnam has been described as one of the most intensive and productive food production systems on Earth. Combined with shrimp farming, it is causing significant pollution in the MKD as a result of pond construction and treatment, water intake, stocking, nurseries, water exchange, sludge discharge, harvesting and pond emptying.[39] Additionally, a broad range of antibiotics are typically used, in addition to pesticides and disinfectants. These include several antibiotics that the World Health Organization has characterized as critically and highly important for human health. Thus, contamination of waterways can have serious impacts not only for the environment, but for human health as well (e.g., risk of developing antibiotic resistance).

With interest in understanding the climate impacts of aquaculture increasing, life-cycle analysis data indicates that aquaculture's GHG contributions are largely linked to feed production.[40] Since Vietnam imports a large proportion of the raw material used for fish feed (mainly soy from the US and Argentina), shipping of these raw materials contributes significantly to the carbon footprint of MKD freshwater aquaculture.

Looking ahead

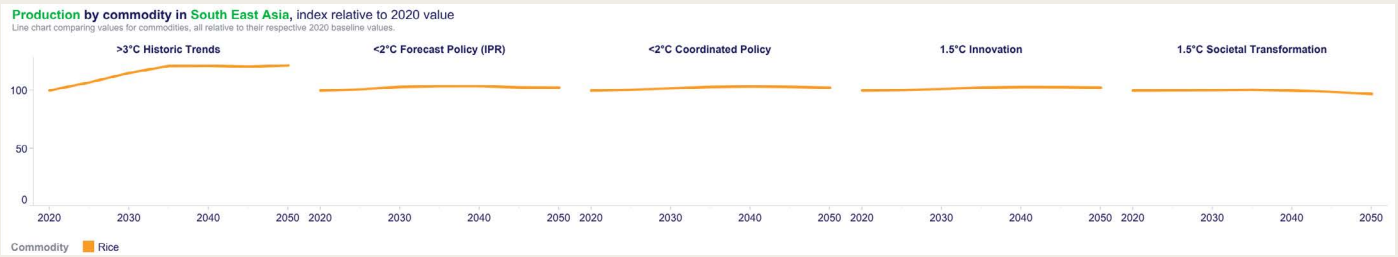
Many factors threaten the future of rice production, ecosystem health and farmer livelihoods in the MKD and climate change will make conditions even more challenging. Studies show the effects of warming, increased pest incidence and droughts could lower MKD rice yields by over 4% by mid-century.[41] Sea-level rise could inundate over half the Delta in the coming years and saltwater intrusion is already seriously affecting nearly all provinces in the MKD. The resulting increase in freshwater and soil salinity could come at an economic cost of about USD $17 billion by 2030.[42] These impacts will reshape the geography of the region and affect the footprint of rice production, likely driving it to areas more suitable for multi-cropping.

Figure 4: Projections for rice land expansion (hectares (ha)) and yield (kilogram (kg) per ha) for Vietnam through 2050. This modeling highlights the link between climate-driven yield losses and resulting pressure for rice land expansion – unless sustainable production can be massively accelerated on existing farmlands.



Source: International Center for Tropical Agriculture (CIAT), Food and Agriculture Organization (FAO). **Climate Smart Agriculture in Vietnam**

Figure 5: Rice production projections for the South-East Asia macro-region under five different climate transition scenarios. In general, farming and supply chain improvements may somewhat balance physical climate impacts (which will decrease production), leading to relatively flat net production growth across the macro-region.



Source: WBCSD, **Climate Scenario Tool**

Note: See the **row crops summary** for more on this tool

Materiality matrixes

The following tables illustrate the results of the landscape materiality screening conducted, which is intended as a starting point for refinement by any agri-food company engaged in this landscape and crop cycle. This is a generalized assessment, highlighting only those dependencies and impacts evaluated to have potentially high or very high materiality (according to the methods used in the **ENCORE (Exploring Natural Capital Opportunities, Risks and Exposure) tool**), with the rationale that these are the most likely to require further risk and opportunity evaluation and to inform the development of priority actions and targets.

Arrows indicate ratings of nature-related dependencies and impacts relative to the aggregated assessment included in the **row crops summary**, meaning the major differences to consider at this landscape level compared with a more generalized global screening. The tables align with the classifications available in the ENCORE tool and the Global Assessment Report on Biodiversity and Ecosystem Services by the Intergovernmental Platform for Biodiversity and Ecosystem Services (**IPBES**). See the row crops summary for notes on methods followed.

Table 1: Rice in the MKD – Key dependencies

Value chain stages	Dependencies																		
	Direct physical inputs					Enable production processes					Mitigate direct impacts				Protect from disruption				
	Animal-based energy	Fibers & other materials	Genetic materials	Groundwater	Surface water	Pollination	Soil quality	Water flow maintenance	Water quality	Ventilation	Bio-remediation	Dilution by atmosphere & ecosystems	Filtration	Mediation of sensory impacts	Buffering	Climate regulation	Disease control	Flood & storm protection	Mass stabilization & erosion control	Pest control
Inputs									Important for operations & product quality		Mitigate pollution from operations	Mitigate pollution from operations	Mitigate pollution from operations			Operations affected by temperatures				
Agri-production (irrigated)				↓	Where irrigated (primary source today)		Essential for crop health & yield ↓	Replenish surface & groundwater	Essential for crop health & yield ↑		Mitigate pollution from farm operations	Mitigate pollution from farm operations	Mitigate pollution from farm operations		Replenish eroded soil & support soil health	Crop health & yield affected by temperatures	Natural crop protection	Natural barriers & root systems ↑	Essential to maintain soil structure	Natural crop protection
Agri-production (rainfed)							Essential for crop health & yield ↓	Replenish surface & groundwater	Essential for crop health & yield ↑		Mitigate pollution from farm operations	Mitigate pollution from farm operations	Mitigate pollution from farm operations		Replenish eroded soil & support soil health	Crop health & yield affected by temperatures	Natural crop protection	Natural barriers & root systems ↑	Essential to maintain soil structure	Natural crop protection
Trading & distribution																Operations affected by temperatures		Transport corridors exposure to weather		
Processing & manufacturing				Needed for operations	Needed for operations				Important for operations & product quality							Operations affected by temperatures		Facilities exposure to weather		
Retail																				

High materiality | Very high materiality | ↑ ↓ Rating difference vs row crops summary, if any

Table 2: Rice in the MKD – Key impacts

Value chain stages	Impacts											
	Land-/water-/sea-use change			Resource exploitation		Climate change	Pollution				Invasive species & others	
	Terrestrial ecosystem use	Freshwater ecosystem use	Marine ecosystem use	Water use	Other resource use	GHG emissions	Non-GHG air pollutants	Water pollutants	Soil pollutants	Solid waste	Disturbance	Biological alterations/ interferences
Inputs	Land-use in mining operations			Mining & industrial processes	Mining of minerals	Mining & industrial processes	Mining & industrial processes		Mining & industrial processes		Noise & light pollution	
Agri-production (irrigated)	Land-use change & soil loss	Altering hydrology, e.g., dams and canals ↑		For irrigation (where practiced)		Land-use change & farm operations	Fuel use & agrichemical emissions/ drift	Agrichemical runoff & leaching	From agrichemicals			From GMOs
Agri-production (rainfed)	Land-use change & soil loss	Altering hydrology, e.g., dams and canals ↑				Land-use change & farm operations	Fuel use & agrichemical emissions/ drift	Agrichemical runoff & leaching	From agrichemicals			From GMOs
Trading & distribution	Land clearing for transport infrastructure		Ocean transport & port construction			Fuel use in transport	Fuel use in transport				Noise & light pollution	Spread of disease & invasive species
Processing & manufacturing					↓		↓	↓	↓			
Retail						Distribution & waste				Food loss & waste		

High materiality | Very high materiality | ↑ ↓ Rating difference vs row crops summary, if any

Table 3: Aquaculture (freshwater shrimp & catfish) in the MKD – Key dependencies

Value chain stages	*Dependencies*																		
	Direct physical inputs					**Enable production processes**					**Mitigate direct impacts**				**Protect from disruption**				
	Animal-based energy	Fibers & other materials	Genetic materials	Groundwater	Surface water	Maintain nursery habitats	Soil quality	Water flow maintenance	Water quality	Ventilation	Bio-remediation	Dilution by atmosphere & ecosystems	Filtration	Mediation of sensory impacts	Buffering	Climate regulation	Disease control	Flood & storm protection	Mass stabilization & erosion control	Pest control
Inputs		Plant & animal-derived inputs for feed							Important for operations & product quality		Mitigate pollution from operations	Mitigate pollution from operations	Mitigate pollution from operations			Operations affected by temperatures				
Aquaculture Production			Critical for growing live fish & shrimp		For pond creation (primary source today)	Critical for growing live fish & shrimp		Replenish surface & groundwater	Important for operations & product quality							Fish health & yield affected by temperatures		Natural barriers & root systems	Essential to maintain soil structure	
Trading & distribution								Replenish surface & groundwater								Operations affected by temperatures		Transport corridors exposure to weather		
Processing & manufacturing				Needed for operations	Needed for operations				Important for operations & product quality											
Retail																				

Note that ratings differences vs other benchmarks are not included here as aquaculture materiality assessment is relatively less advanced today compared with other agri-production systems

High materiality | Very high materiality

Table 4: Aquaculture (freshwater shrimp & catfish) in the MKD – Key impacts

Value chain stages	*Impacts*											
	Land-/water-/sea-use change			Resource exploitation		Climate change	Pollution				Invasive species & others	
	Terrestrial ecosystem use	Freshwater ecosystem use	Marine ecosystem use	Water use	Other resource use	GHG emissions	Non-GHG air pollutants	Water pollutants	Soil pollutants	Solid waste	Disturbance	Biological alterations/ interferences
Inputs	Land-use in mining operations			Mining & industrial processes	Mining of minerals	Mining & industrial processes	Mining & industrial processes		Mining & industrial processes			
Aquaculture Production	Land-use change & soil loss	Altering hydrology, i.e., pond creation	Cultivation in coastal areas	Pond water cycling & cleaning		Land-use change & farm operations		Agrichemical runoff & leaching	From agrichemicals			From GMOs
Trading & distribution	Land clearing for transport infrastructure		Ocean transport & port construction			Fuel use in transport	Fuel use in transport		From agrichemicals		Noise & light pollution	Spread of disease & invasive species
Processing & manufacturing				Industrial processes & in products		Industrial processes	Industrial processes					
Retail										Food loss & waste		

Note that ratings differences vs other benchmarks are not included here as aquaculture materiality assessment is relatively less advanced today compared with other agri-production systems

High materiality | Very high materiality

Stage 1.3 - Assess risks & opportunities

Agri-food companies should next assess nature-related risks and opportunities for the business and for key stakeholders in order to prioritize further action. The process outlined in the row crops summary will be relevant for any agri-food company in assessing its nature-related risks and opportunities; the summary also contains corresponding findings applicable across global row crop commodities. The findings here will be relevant for those engaged directly or indirectly in rice production in the MKD.

Given the material issues linked to freshwater ecosystem disruption and pollution, high GHG emissions and farmer livelihoods, the main risks and opportunities for agri-food companies involved in this landscape and crop cycle also revolve around these primary drivers of nature pressures.

Physical risks to farm operations include the various impacts of soil degradation, namely reduced yields and resulting increased inputs expenditures; increasing levels of water stress; and the region's high vulnerability to climate impacts including saltwater intrusion and sea-level rise. These risks can cascade from agri-producers to both downstream and upstream actors. The precarious financial situation of smallholder farmers who supply most of the MKD rice crop – and in turn depend on it for their livelihoods – presents business continuity risk to both downstream and upstream value chain players; this situation is further exacerbated by climate impacts and ecosystem degradation.

The carbon footprint of rice production is under increasing scrutiny, presenting both transition risk (such as carbon border adjustments) and opportunity (nature-based solutions (NbS) market development).

As for many agri-food value chains, **transition risks** may include lost revenue, profitability or financing if customers, consumers or lenders move away from producers or even entire regions that are perceived as unsustainable or unethical (i.e., with regard to farmer incomes and supply chain labor issues). This can also put at risk a company's legal or community license to operate.

Physical and transition risks can cascade from agri-producers to both downstream and upstream actors, including supply disruption, increased supply chain costs, lost business and depreciated or stranded physical assets such as land holdings and processing facilities.

Business opportunities include the benefits of avoiding these risks through careful planning and investment; increased revenue, profitability and financing options through improved (such as precision/mechanized and regenerative) practices and with the use of high-quality, climate-resilient varieties; and shifting of business models to meet changing consumer and stakeholder demands. Government programs can help catalyze public-private collaboration to accelerate and scale these opportunities.

→ *See the* row crops summary for further explanation of nature-related risks and opportunities common across row crop commodities.

Figure 6: Interconnections between key dependencies and impacts related to one key impact area – freshwater ecosystem use – in conventional rice production in the MKD and the resulting risks for farmers and agri-food companies

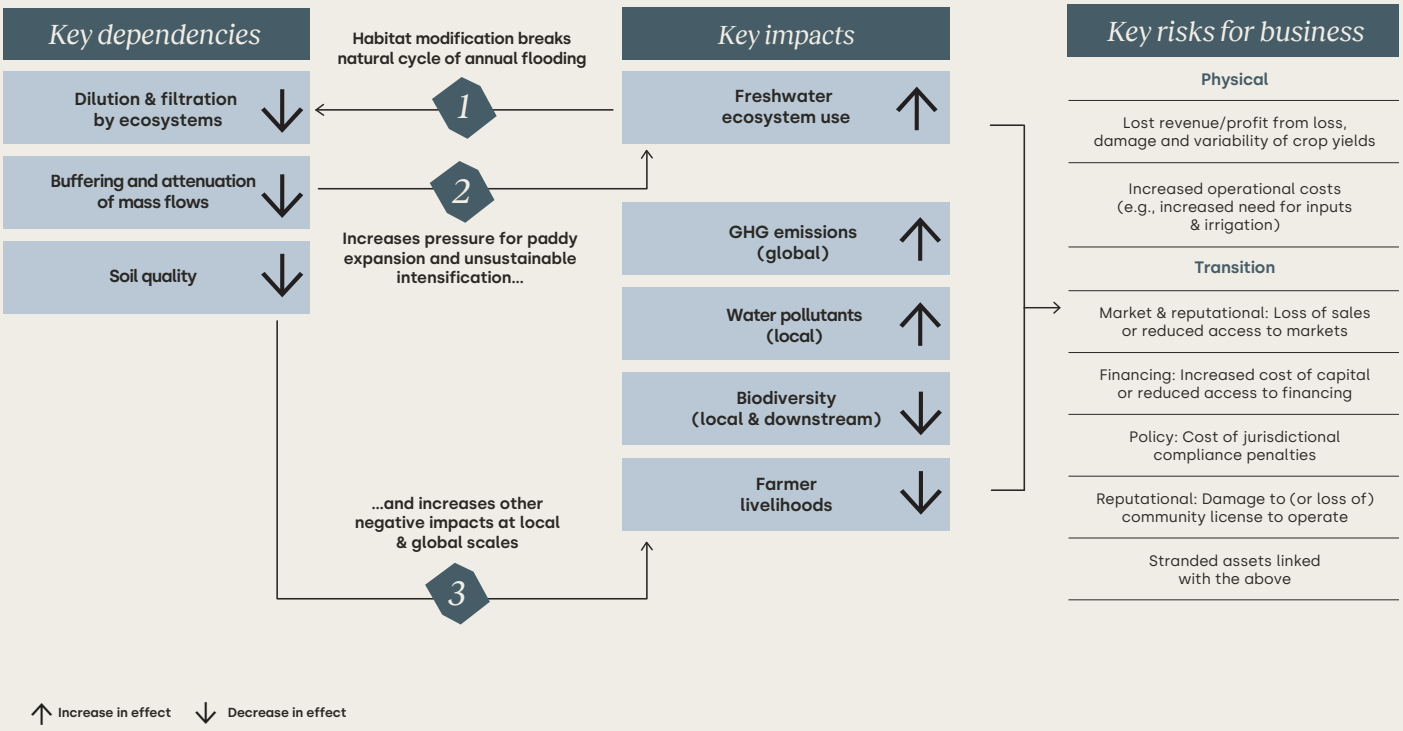
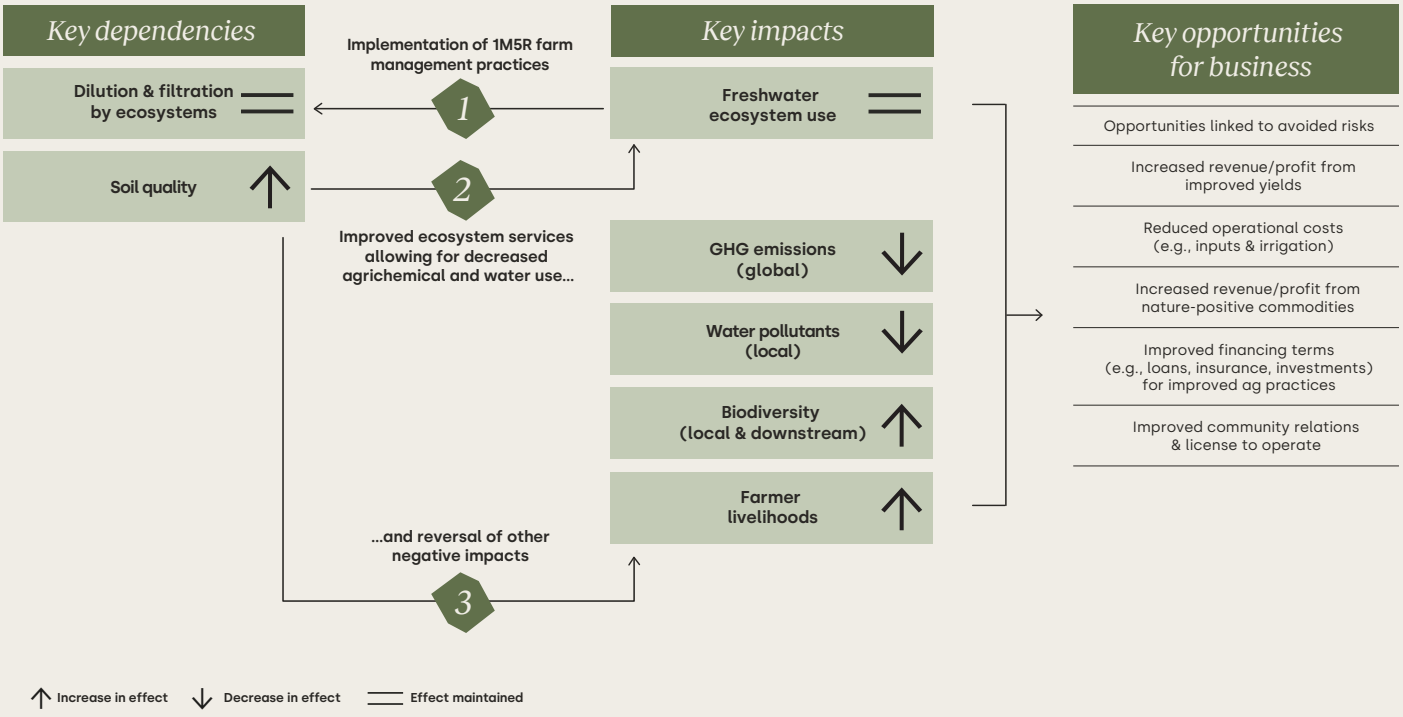


Figure 7: Interconnections between key dependencies and impacts in a more nature-positive rice production system founded on 1M5R practices and the resulting opportunities for farmers and agri-food companies



Stage 2: *Commit and transform (targets for priority actions)*

02.

Stage 2:
Commit and transform (targets for priority actions)

Stages 2.1 & 2.2 - Set science-informed targets and take priority actions

Based on the materiality screening, agri-food companies should identify the existing and additional priority actions needed to avoid and reduce negative impacts and promote opportunities to restore and regenerate nature. Companies should set time-bound, specific, science-informed corporate-level targets and linked indicators to track progress on reducing priority impact drivers on nature.

There are key structural, technical and financial challenges to overcome in the transition to nature-positive rice production in the MKD. Introducing and scaling improved farming practices can significantly improve nature-related impacts and protect the critical ecosystem services that enable production and livelihoods. Further, some level of farm consolidation could unlock opportunities for improvement if executed carefully. As in all landscapes, system change requires alignment and partnership among all stakeholders, both public and private.

Improve agricultural practices

Based on conservative estimates for the MKD, improving water management and optimizing the application of inputs such as seeds, fertilizers and pesticides can help farmers increase yields by 5-10% and reduce input costs by 20-30%, thereby boosting incomes while improving environmental outcomes – including reducing pressure to expand paddy land.[43] The World Bank's Vietnam Sustainable Agriculture Transformation (VnSAT) project has successfully demonstrated such approaches on nearly 200,000 hectares of rice paddy.[44] More specifically, the **Sustainable Rice Platform (SRP)** has shown that sustainable rice cultivation according to its standard can lead to up to 20% reduction in water use, a nearly 50% cut in methane emissions from flooded rice fields and a 10-20% boost in farmers' net income.[45]

Some specific examples of improved practices promoted and used in the MKD include:

- **1M5R (1 must and 5 reductions)** is a well-established set of practices to improve the quality and environmental footprint of rice production that calls for the use of certified seed (the "must") while reducing the amount of seed applied, the amount of agrichemicals and water used and postharvest losses. 1M5R has the backing of Vietnam's Ministry of Agriculture and Rural Development (MARD) as well as leading agronomic research groups like the **International Rice Research Institute (IRRI)**, and aligns with globally recognized efforts including **integrated pest management (IPM)** and **Target 7 of the Global Biodiversity Framework (GBF)** on reducing pollution risk from agriculture.
- **Alternate wetting-drying (AWD)** is a technique that reduces water consumption in rice fields without affecting yield by allowing intermittent drying during certain stages of the growing cycle. AWD helps farmers adapt to climate change and reduce GHG emissions (by up to 50%) through better-regulated irrigation.[46] However, farmer adoption to date is low due to barriers including initial investment costs and lack of irrigation infrastructure in the region.
- **Climate-smart rice planting (CSRP)**[47] is an integrated rice cropping system that uses climate-resilient crop cultivars and new tillage practices to relieve waterlogging; it increases oxygen in the topsoil and promotes energy-saving tillage-sowing-fertilizing machinery and rotation with a cover crop. CSRP links closely with breeding efforts underway to produce new rice varieties that can reduce emissions.

"Farmers participating in the SRP model are regularly supported with training in farming techniques and participating cooperatives are supported in seeds, fertilizers, and pesticides. Viet Nam's SRP model is a key model of a green agriculture that produces high quality rice, increases farmers' income, protects the environment and both producers and consumers' health."

Nguyen Thi Xuan Huong, Agriculture Extension Center of Kien Giang province, as quoted by MARD in 2021

→ **Rice-shrimp rotation**[48] is an extensive system appropriate for certain areas in which shrimp are grown in the dry season. In the rainy season, rainwater flushes out residual salinity and land is suitable for rice farming. The nutrients that accumulate in sediments during the shrimp culture period are beneficial for rice growing; in turn, rice plants help clear pond mud, which supports shrimp health. According to one expert, when implemented correctly this practice is "one of the obvious adaptations that can directly improve farmer livelihoods" in the MKD. This system is promoted as a form of adaptation to climate change and sea-level rise, but only if considered as a rotation practice (not as intensive aquaculture) with a careful balance between the two systems and their impacts on nature (see **Materiality section**).

→ ***See the*** **illustrative maturity progression** on nature-positive, farmer-centric rice production for more detail. See the **row crops summary** for further guidance on priority actions relevant across row crop commodities.

Landscapes & restoration

Taking a landscape approach reflects an understanding of farms as an active part of local ecosystems, communities and cultures, recognizing that they both rely on critical ecosystem services and create impacts beyond the farm boundary. Agri-food companies should embed landscape approaches as a guiding theme in their nature-positive strategies – including investing in landscape conservation and restoration programs in and beyond their value chains, with a particular focus on areas of high conservation value (HCV).

The sustainability of rice-based production systems depends to a large extent on the health of the landscapes they are part of. In particular, watershed wetlands and forests are vital for ensuring the stability of water supply needed by rice paddy systems. Landscape-scale collective action for sustainable water management and agrichemical pollution reduction, along with conservation and restoration of natural ecosystems, can have significant positive impacts for long-term rice production, biodiversity, ecosystem services, soil health, and climate mitigation and adaptation, while improving farmer livelihoods and food security.

Initiatives may include native species reforestation (including mangroves that provide critical coastline protection benefits),[49] natural wetland restoration and watershed conservation programs, and more. For examples see **WWF's projects** across the South-East Asia macro-region.

Stage 2.3 - Transform the system

Agri-food companies should identify additional actions needed to transform business models and business activities. These actions should address barriers and improve the enabling environment (policy, financing, technology, infrastructure). Companies should consider both direct operations and their wider sphere of influence (such as priority upstream and downstream value chains and landscape-specific stakeholders and customers).

Business strategy and market development

Smallholder rice production in fragmented land holdings and value chains generally has received less attention from the global sustainability community than other commodities such as soy and palm oil, nor has it attracted significant financial investment despite growing global demand. Investment risks mean off-takers in the rice value chain can be hesitant to lock in long-term agreements, disincentivizing farmers with the lack of contractual security.

Yet the private sector has much to offer in the MKD. As one expert notes, "The private sector has a halo effect" on policy and other drivers for systems transformation in the region. Business and finance leadership can build markets and catalyze collaborative, multi-stakeholder efforts to deliver technical and financial support to farmers for sustainable farming practices, cooperative structures, pricing and market training. Programs should be developed with farmers at the center, with strengthened local enablers that allow for aggregation and value-adding activities, such as cooperatives and shared processing facilities.

→ ***The*** **row crops summary** outlines generalized nature-positive priority actions for agri-food companies engaged with row crop commodities

Upstream

Agrichemical companies have opportunities to develop capacity for last-mile delivery of input supply and service provision, including producing or importing high-quality inputs and equipment, and the provision of flexible machinery-ownership models. Research suggests that the development and use of improved and climate-resilient rice varieties can have great benefit for yields and farmer incomes[50] - in turn these benefits can facilitate nature-positive farming investment and adaptation.

Downstream

System transformation can only happen with development, scaling and farmer access to new markets and revenue streams, such as for high-quality rice, premiums for environmental performance (including low-carbon and SRP-certified rice), value-added products (such as from production by-products) and crop diversification. Agri-food companies and banks should establish long-term procurement and lending agreements (respectively) with farmers, for example with clusters of producers in HCV landscapes. As in other agricultural commodities, downstream players including traders and distributors should continue reducing supply chain GHG emissions and improving other nature impacts of their processes.

Spotlight on Olam: The **Market Oriented Smallholder Value Chain**, *a multi-stakeholder initiative between Olam Agri, German development cooperation (GIZ), and Vietnam's MARD, has supported 10,000 smallholder farmers to significantly improve farming practices. The program has enabled up to 150,000 tons of rice to meet the SRP standard, with most smallholder farmers demonstrating a greater than 50% increase in scores verified by SRP. Farmers adopting modern AWD and drip irrigation techniques have reduced their water use by up to 40% and fertilizer use by up to 15%. Olam Agri has provided incentives to farmers and created market linkages between cooperatives and millers to purchase directly from MKD farmers. The initiative has also created new growth opportunities for Vietnam's rice exports in markets such as the EU and US.*

"The large scale of rice production, consumption, and export in Vietnam, an export gateway with high participation by rice sector companies, suggests strong investment potential. Low sustainability in production systems and high vulnerability to climate change point toward a strong need for sustainability-oriented investment. Opportunities include mechanization, irrigation, improved varieties, land rehabilitation, and road networks. Cooperatives may be suitable local counterparties."

Sustainable Rice Landscapes Initiative[53]

Finance

Private capital flow to the rice sector, including in Vietnam, has been constrained due to low margins, high complexity and uncertain returns – particularly for primary production and first-stage processing.[51] Yet in the **words** of Global Environment Facility (GEF)'s CEO, "It's time to invest in sustainable rice."

As a leading example, the multi-stakeholder Sustainable Rice Landscapes Initiative (SRLI) works to scale capacity for landscape-based food system transformation projects; harness public-private partnerships; and integrate next-generation knowledge management. The SRLI finds that finance models that can successfully scale up investment in sustainable rice will require strong partnerships involving a range of public and private actors with different appetites for risk and return.[52]

Ensuring that farmers are not left behind in the shift to regenerative food systems needs a mix of funding sources and instruments, the most catalytic being long-term patient capital and de-risking using concessionary finance and technical assistance. Blended finance models, finance from carbon markets, for value chain investments and for landscape and jurisdictional approaches are some of the key mechanisms through which private sector investments can be scaled up. This applies to on-farm practices as well as supply chain investments. In the MKD, there is a particular need for greater investment in processing and downstream infrastructure.

Public policy

Domestic policy plays a critical role in transforming the rice production system in Vietnam, especially given the smallholder-dominated landscape where ecological sustainability is closely intertwined with human wellbeing and livelihoods. Agri-food companies and trade groups should support policies that advance a nature-positive production system and safeguard farmer livelihoods, and take the lead in creating public-private partnerships to scale-up beneficial practices at the farm level.

The public sector can play a key role in addressing the challenge of production scale, which is ever-present in a system reliant upon smallholders. Without converting to large-scale monoculture that could further damage ecosystems and accelerate the rural exodus, some level of farm aggregation (such as into plots of 10-20 hectares, according to some experts) could provide better investment capacity and negotiation powers, and more processing capacity for small farmers – all of which are key to shifting practices and improving outcomes.

To tackle agrichemical-driven pollution and human health concerns, stronger public policies must regulate the commercialization and use of fertilizers and pesticides in the MKD, to bring them in line with international standards and to ensure effective enforcement. Another key focus area is strengthening copyright protections to encourage companies up and down the value chain to develop and deploy technologies supporting nature-positive objectives – including new seed varieties, measurement, reporting and verification (MRV) technologies and more.

Vietnam's Resolution 120, also known as "Thuan Thien" (Adapting to Nature), is a potentially transformative public-sector initiative towards an integrated and adaptive approach to sustainable land management and rice cultivation in the MKD.[54] In February 2022, the first regional master plan was approved for the MKD, building the way toward investment planning and implementation.

Resolution 120 and other proposed plans for the region acknowledge the importance of landscape-based approaches in identifying the best opportunities and also risks of certain regions and adapting accordingly.[56] Integrated landscape management approaches, including partnerships with neighboring regions and countries, must underpin coordinated action across multiple land-uses and is essential for long-term conservation and sustainable outcomes.

Under Resolution 120, the national government has developed a "one million hectares" plan for low-carbon, high-quality rice production in the MKD. Twelve of the region's 13 provinces have signed on, with a commitment to reach over half a million hectares by 2025 and over 1 million hectares by 2030.[55] The plan includes action areas such as reorganizing rice production to promote cooperation and association among farming households, promoting sustainable farming practices and certified rice varieties, incentivizing mechanization and digital technology to advance innovative farming practices, investing in processing facilities and infrastructure and establishing a rice-carbon credit market.

Maturity progression: Supporting farmer livelihoods

WBCSD's **foundations guidance** includes the core concept of a corporate nature maturity progression, from starting to developing, advancing and ultimately leading. The general progression, aligned with the **SBTN Action Framework**, is from "do no harm" to "do more good" to "transform the system." A set of criteria aligned with the **High-level Business Actions on Nature** defines each stage. The intent is to meet companies where they are today and support their advancement toward leading practices.

The following progression illustrates the highest priority issue for catalyzing nature-positive system transformation in this landscape: **supporting farmer livelihoods for sustainable rice production**.

"Encouraging farmers to switch means offering incentives, training and also a market."

New York Times, 2023

Table 5: Illustrative corporate maturity progression for nature-positive, farmer-centric rice production in the MKD

		Corporate nature maturity levels		
		Starting ***"Do no harm"***	***Developing/advancing*** ***"Do more good"***	***Leading*** ***"Transform the system"***
Key levers for transformation	Policy & stakeholder engagement	Comply with all jurisdictional regulations on fertilizers & pesticides, land-use & farming practices and human rights; support public-private coordination to improve regulatory strength & technical support, especially regarding pesticides labeling, marketing and application	Support public programs for landscape environmental-agricultural integrated planning & improving food security; follow & promote leading international standards on human rights & farmer livelihoods	Lead pre-competitive coordination, partnerships development, trade associations & policy advocacy for system transformation with farmers at the center; support government programs on holistic landscape planning, promote agri-SME development and farm consolidation/scaling; advance policies aligned with leading international standards on farmer livelihoods; enable multistakeholder partnerships to build farming community resilience
	Business strategy	General commitment to improving farmer livelihoods, especially smallholders, via: → Technical support: High-quality agronomic information delivered in simple formats (e.g., product labeling & training); support for sustainable practices including 1M5R & IPM → Financial & market support: Adoption of ethical pricing and marketing strategies	Adopt science-driven, time-bound, quantitative commitments to improve farmer livelihoods, with regular progress reporting; develop capabilities, practices & monitoring at farm-level via: → Technical support: Scale up sustainable agriculture, including 1M5R, AWD & IPM; support development of high-quality, climate-resilient rice varieties → Financial & market support: Develop markets & align farmer contracts for high-quality, sustainable rice (e.g., SRP-certified); partner with lenders & insurers to maintain farmer cash flows throughout the year	Set science-based targets to deliver & scale programs for farm-level sustainable intensification & regenerative practices, with a landscape approach and farmer livelihoods focus; invest to improve MRV capabilities to unlock market access Develop public-private partnerships for blended financing; develop nature-positive ingredients and consumer products; accelerate & scale markets for nature-based solutions & insetting (e.g., for soil carbon storage)
	Illustrative commitments	Inputs: Implement 1M5R-aligned training for all sales agents and distributors and eliminate sales-driven commissions; phase out use of the most hazardous chemicals by 2025 Downstream: Introduce sustainability principles in rice sourcing process and supplier engagement; implement 1M5R field trial with 100 MKD farmers	Inputs: Increase sales of high-quality seed varieties by 50% by 2025; develop bio-based alternatives to conventional pesticides Downstream: Increase sourcing volume of high-quality, sustainably-produced rice from the MKD by 50% by 2025 Both: Partner with extension agencies to train at least 5,000 MKD farmers by 2025 on 1M5R & high-quality production; directly support at least 1,000 farmers with implementation & monitoring	Inputs: By 2028, fully align business model with 1M5R as reflected in inputs & services revenues; invest USD $100M in sustainable R&D Downstream: Ensure that 95% of MKD-sourced rice is sustainably-produced by 2030, as verified by a credible third party, with demonstrated improvement in MKD farmer incomes over the same period Both: Partner with provincial governments in program to reach 10,000 youth in highest-poverty areas of the MKD for innovation & sustainability in rice production
	Key references	IRRI – 1M5R; SRP Performance Indicators; FAO International Code of Conduct on Pesticide Management	SRP Standard for Sustainable Rice; OP2B Regenerative Agriculture Framework; Business Commission to Tackle Inequality	SBTN Land (beta) & Freshwater targets; SBTi-FLAG targets; OP2B Restoration Framework; Sustainable Rice Landscapes Initiative

Note: This step-wise approach outlines priority actions, illustrative commitments and key references for actors up and down the rice value chain, in line with biome-specific guidelines

Key trade-offs & remaining barriers

Nature-positive system transformation in the rice sector in the MKD involves several important and unresolved trade-offs and barriers. Agri-food companies up and down the value chain play a critical role in collaborating with the full range of stakeholders to address and resolve these challenges to drive change at the speed and scale needed for the region's nature, people and economy to thrive.

Practices, scale & farmer livelihoods

- → Tension exists between climate-driven impacts which are likely to decrease MKD rice yields, the resulting pressure on farmers to compensate by expanding paddylands (see Figure 4 above), and the global push to decrease agricultural land footprints for conservation outcomes (driven by **the GBF Target 3 on "30x30"** and **SBTN Land (beta) target 2**).
- → Changing farming practices can be complex – they are influenced by culture, perceived productivity and the financial risks of incorporating new production practices. Change requires up-front investment and never comes without risk.[57] Already-vulnerable farming communities should not bear any potential short-term negative impact to production or yields that could impact local food security and farmer incomes.
- → How to achieve optimal farm scale and manage the transition in a way that supports smallholder farmers is a key question currently without a clear solution. Any proposed farm consolidation must happen in an inclusive manner, requiring close alignment among public and private sector stakeholders and farmers.

Water use, GHGs & climate change

- → Despite the ecological damage and increased input needs caused, recent research shows farmers are largely resistant to the notion of removing or altering the existing dyke systems upon which they have become reliant.[58]
- → The imperative for water use reduction can further accelerate the effects of climate-driven salinity intrusion; approaches must be customized to the geography and ecology of each specific area.
- → Some GHG emissions are inherent in the rice production process; methane reduction potential (especially via AWD) will be context-specific and will require stakeholder alignment on technical details like baselines and timescales. MRV systems and capabilities are also critical to tracking and capturing the value from reductions.
- → The MKD is particularly vulnerable to climate change; which scenarios to consider and how to balance mitigation with adaptation investment (both public and private) are key questions for all stakeholders involved.

MRV & carbon markets

- → New opportunities are available in the development of carbon markets based on **Article 6 of the Paris Agreement** and Vietnam's revised **Law on Environmental Protection**.[59] MRV systems mature enough to support carbon markets are needed but not yet fully developed for Vietnam. Furthermore, the voluntary space today grapples with credibility concerns around globally applicable rice-carbon methodologies due to permanence, additionality and related technical and integrity issues.[60] It is essential to resolve these to bring real nature-positive and farmer-centered benefits.

→ ***Note*** that the next phase of guidance under **WBCSD's Roadmaps to Nature Positive** will focus on corporate performance and accountability, including recommended indicators and metrics for priority action areas.

Stage 3: *Disclose (initial disclosures)*

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Stage 3:
Disclose (initial disclosures)

Initial disclosures can build on existing nature-related reporting practices and may include the methodologies and outputs of a company's materiality assessment, value chain mapping, interim target-setting and progress on actions. As a company's nature journey matures, disclosure ambitions and granularity should increase.

For companies linked to MKD rice production, nature-related disclosures may be necessary to meet legal standards (such as according to Vietnam's Law on Environmental Protection and international trade requirements), through annual corporate sustainability reporting, and as part of collaborations like the SRLI. The **TNFD's sector- and biome-specific guidance** provide a framework, process and recommended metrics for corporate disclosure that are relevant for this landscape and aligned with other leading voluntary frameworks, such as CDP, the EU Corporate Sustainability Reporting Directive (CSRD), the Global Reporting Initiative (GRI) and the International Sustainability Standards Board (ISSB). The **High Impact Commodity List From SBTN** is also instructive in this process.

In general, corporate reporting should include the value chain and landscape-specific assessments suggested in this deep dive, including acknowledgement of existing gaps and barriers as outlined in the previous section. The aim should not be perfection or full value chain data coverage but rather a materiality-led approach with transparency about the process, findings and progress. The key questions to consider may include:

- → What are stakeholders (financial and other) actually looking for?
- → What is in the company's control to manage and measure?
- → What falls in its broader spheres of influence?

Sticking closely to leading consensus-driven disclosure frameworks will help ensure a transparent and credible approach.

→ ***See*** the **Foundations guidance** and **row crops summary** for more detail on disclosure recommendations and linking to global frameworks, including GBF target 15.

Annexes

Annex 1: Landscape profile

Key considerations for the **Scoping** and **Locate** steps of corporate value chain nature assessment, as recommended in the LEAP approach from the Taskforce on Nature-related Financial Disclosures (TNFD) – including sector and subsector identification according to the Sustainability Accounting Standards Board (SASB) **Sustainable Industry Classification System (SICS)**, commodity presence on the Science Based Targets Network (SBTN) **High Impact Commodity List**, relevant biomes, the identification of biodiversity risks, water stress and other considerations. See the **Intergovernmental Platform for Biodiversity and Ecosystem Services (IPBES) glossary** for definitions of key terms.

LOCATION		***SOURCE***
MEKONG RIVER DELTA, VIETNAM		
Geolocation	~867,000 hectares spanning southwestern Vietnam	
Biomes	Coastal river deltas (MFT1.1) Seasonal floodplain marshes (TF1.4) Rice paddies (F3.3)	TNFD guidance
Biodiversity overall risk	High	WWF Risk Filter
Biodiversity hotspot?	Yes	Critical Ecosystem Partnership Fund (CEPF)
Includes key biodiversity areas (KBAs)?	Yes	WWF Risk Filter
High water stress?	Medium/high	World Resources Institute (WRI) Aqueduct

CROP CYCLE			***SOURCE***
	RICE	***AQUACULTURE***	
SICS sector	Food & Beverage		SASB
SICS industries – upstream	Chemicals *Industrial Machinery & Goods* *Insurance, Commercial Banks*		
SICS Industries – direct operations	Agricultural Products		
SICS industries – downstream	Processed Foods Transportation – Rail, Road, Marine Food Retailers & Distributors *Beverages – Alcoholic & Non-Alcoholic* *Biotechnology & Pharmaceuticals*		
High-impact commodity list?	Yes	No	SBTN

Note: Sectors in italics could be relevant but were not assessed as unique to this deep dive

Annex 2: Further reading

Agence Française de Développement (AFD): The Mekong Delta Emergency – Climate and Environmental Adaptation Strategies to 2050 report investigates the consistency between current adaptation plans and scientific knowledge on environmental changes, proposes different possible adaptation options to tackle the corresponding pressures and investigates how intermediary levels of governance could help drive the bio-physical dynamics of the MKD in a sustainable direction.

International Rice Research Institute (IRRI): This international agricultural research and training organization is dedicated to abolishing poverty and hunger among people and populations that depend on rice-based agri-food systems. It aims to improve the health and welfare of rice farmers and consumers, promote environmental sustainability in a world challenged by climate change and support the empowerment of women and youth in the rice industry.

Just Rural Transition (JRT) – Principles for Just Food System Transitions: JRT brings together food producers, governments, businesses, investors, civil society and rural and Indigenous peoples to champion equitable solutions to food systems challenges. This report lays out 10 guiding principles for achieving just food system transitions and explores their implications in terms of desired outcomes, planning and decision-making processes, systemic changes that may be needed and tensions that must be managed.

Partnership for Sustainable Agriculture in Vietnam (PSAV): This public-private partnership coordinated by the Vietnamese Ministry of Agriculture and Rural Development (MARD) plays an important role in bringing together the public sector (government, scientific and training institutions, etc.) and the private sector with domestic and overseas organizations and individuals. PSAV contributes to institutional and policy development and attracts resources to jointly implement Vietnam's rural and agricultural development goals to meet the industry's new challenges.

Sustainable Food Lab Living Income report: This guide for companies seeks to address poverty and economic viability with smallholder farmers in their supply chains. Using this guide, companies can integrate living incomes into their sourcing practices and sustainability programs.

Sustainable Rice Landscapes Initiative (SRLI): This multi-stakeholder program convened by WBCSD aims to increase resource-use efficiency, reduce the environmental and climate impacts of rice production, and maximize the role of rice-growing landscapes as carbon sinks, biodiversity habitats and sources of ecosystem services. A **blended finance facility** is currently being designed with funding from the United Nations Environment Programme (UNEP) Global Environment Facility, to be piloted in Bangladesh, Cambodia and Vietnam – including an accelerator for nature-based rice solutions to leverage the rapidly expanding carbon markets and increase private-sector funding for sustainable rice production.

Sustainable Rice Platform (SRP): This multi-stakeholder platform is co-convened by UNEP and IRRI to promote resource efficiency and sustainable trade flows, production and consumption operations, and supply chains in the global rice sector. In 2015, SRP introduced the world's first voluntary Standard and Performance Indicators for sustainable rice farming, dedicated to the needs of smallholders and based on proven science-based best-practices.

System of Rice Intensification (SRI) International Network and Resources Center: This climate-smart, agroecological methodology aims to increase the productivity of rice and other crops by changing the management of plants, soil, water and nutrients. SRI-Rice is housed in the Department of Global Development of Cornell's College of Agriculture and Life Sciences; its **Vietnam page** contains a summary of work and progress in the country since 2002.

Vietnam – Sustainable Agriculture Transformation (VnSAT): This World Bank-funded program supported the conversion of 148,000 hectares of rice cultivation to a low-emission system during 2015-2022; it was supported by IRRI and is considered a model of success to build upon going forward.

Acronyms and abbreviations

1M5R	1 must and 5 reductions
AWD	alternate wetting-drying
BAU	business as usual
CSRD	EU Corporate Sustainability Reporting Directive
CSRP	climate smart rice planting
DIRO	dependencies, impacts, risks and opportunities
GBF	Global Biodiversity Framework
GEF	Global Environment Facility
GHG	greenhouse gas
HCV	high conservation value
IPM	integrated pest management
IPSARD	Institute for Policy and Strategy for Agriculture and Rural Development
IRRI	International Rice Research Institute
ISSB	International Sustainability Standards Board
KBA	key biodiversity area
LCA	life cycle analysis
NPK	nitrogen, phosphorous and potassium
MARD	Ministry of Agriculture and Rural Development
MKD	Mekong Delta
MRV	measurement, reporting and verification
NDC	nationally determined contributions
PSAV	Partnership for Sustainable Agriculture in Vietnam
SBTN	Science Based Targets Network
SRLI	Sustainable Rice Landscapes Initiative
SRP	Sustainable Rice Platform
TNFD	Taskforce on Nature-related Financial Disclosures
UNEP	United Nations Environment Programme
VnSAT	Vietnam Sustainable Agriculture Transformation program

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