

NaRIA

Natural Resource Integrity Assessment

SCORE-CARD

v.0

Gender

☐ Male

☐ Female

Farmer's name: _____

Georeference: _____

Field Site: _____

Action Site: _____

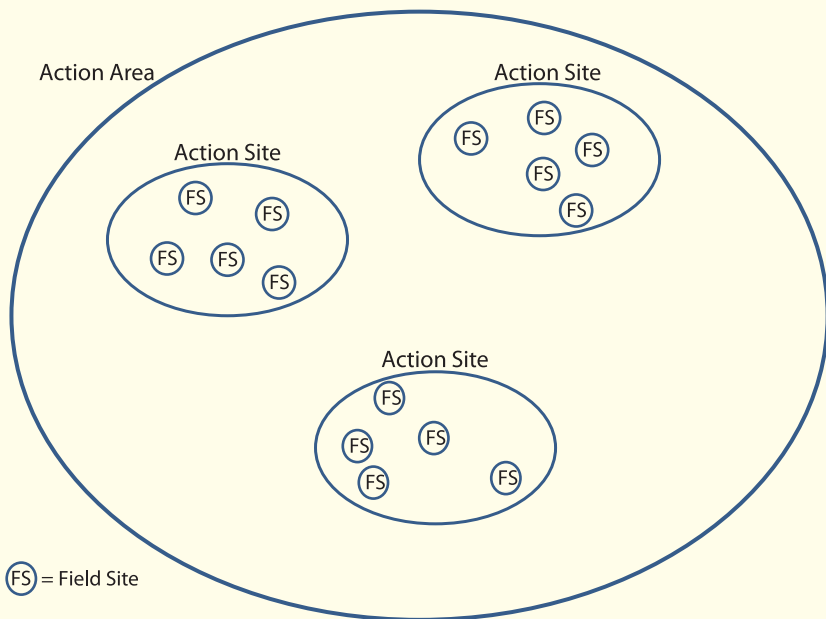
Action Area: _____

User name: _____

Date: _____ Number: _____

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Relationship between Action Area, Action Sites and Field Sites

Barrios E., Mortimer P.E. (2014). Natural Resource Integrity Assessment (NaRIA) Score Card. Integrated Systems Improvement (SRT 2.3). CGIAR Research program on Integrated Systems for the Humid Tropics (CRP 1.2).

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Introduction

- The purpose of the NaRIA Score Card is to provide a rapid assessment of the Natural Resource Integrity (NRI) status of farms to be involved in experimental work in Action Sites within Action Areas of the Humidtropics CGIAR Research Program. This would allow stratification of study farms according to initial NRI status when analyzing results of large numbers of participatory on-farm trials to be conducted at each Action Area.
- The NaRIA Score Cards are designed to be used by SRT2 Action Site teams for NRI assessments of study farms at Field Sites within Action Sites. This would involve farm-walks and conversations with farmers in-situ while marking a square using a pencil around the colored circles (🟡) that characterize the status of indicators for different sections of the NaRIA Score Cards. Once assessments are completed by SRT2 Action Site teams, all used NaRIA Score Cards will be stored safely at a central location and collection will be organized by the SRT2.3 focal person in each Action Area for further analysis.
- The utilization of the NaRIA score card is simple and allows having a rapid and quantitative visual estimation of NRI status for each study farm. After combining results for the five indicators in each of six NRI status assessment dimensions (i.e. landscape context, soil erosion, soil organic matter content, soil nutrient availability, soil biological activity, incidence of pest, weeds and diseases) an overall farm assessment can be generated.

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Landscape context

- Starting with a broad examination of the landscape context aims at getting a general picture of challenges and opportunities present in the larger area surrounding the study farms.
- The relative level of connectivity between natural vegetation patches, and of conservation of the riparian forest, are important indicators of land use intensification which ultimately affects the status and potential for management of natural resources.
- The turbidity of surface water can provide a rapid indication of the relative amount of sediment being transported as a result of upstream soil erosion processes in action (e.g. transparent = no erosion vs. murky color = erosion).
- Visual presence of gullies highlights that long term soil erosion processes have been in place requiring urgent attention.
- The color of surface water can indicate excessive richness of nutrients (e.g. greenish color due to profuse algal growth resulting from eutrophication). Knowledge of the amounts of inputs generally being used by farmers can also give a sense of potential pollution problems before they become visible.

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NaRIA Score Card				
Landscape context				
Abundant (81-100%)	Moderate (61-80%)	Occasional (41-60%)	Rare 21-40%	Absent (0-20%)
				
Connectivity between natural vegetation patches				
				
Conservation of riparian forests				
				
Amount of sediment in surface water				
				
Visual presence of gully erosion				
				
Threat of pollution or color of surface water				
				
				

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Soil erosion

- Farmland slope is a critical factor directly influencing soil erosion and loss from the farm. The greater the slope the greater the potential for soil erosion.
- The amount of soil that remains bare and exposed to direct rainfall impact also influences the severity of soil erosion processes.
- Earliest signs of erosion are seen when raindrops hit bare soil thus breaking up soil aggregates into individual soil particles. These soil particles block spaces between aggregates, so that crusts are formed that reduce infiltration and increase runoff. Therefore, water puddling as soon as rainfall falls is also an indicator here.
- Evidence of subsoil results from sheet erosion through removal of soil in thin layers by raindrop impact and shallow surface flow. This can also lead to visible grass roots and exposed tree roots.
- The presence of perennial cover on-farm (e.g. trees, pastures, agroforestry) has been shown to reduce the proportion of exposed soil, reduce the erosive power of raindrops, stabilize soil structure and enhance infiltration which all together results in lower runoff and soil erosion.

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NaRIA Score Card				
Soil Erosion				
Abundant (81-100%)	Moderate (61-80%)	Occasional (41-60%)	Rare (21-40%)	Absent (0-20%)
				
Proportion of area with slope greater than 15%				
				
Proportion of exposed soil				
				
Visual presence of erosion				
				
Visual evidence of sub-soil or exposed roots				
				
Presence of perennial plant cover on farm (trees, pastures)				
				
				

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Soil organic matter

- In general, darker soils are considered to have a greater soil organic matter content than those of lighter color considering they belong to the same soil type and have a similar humidity level.
- The increased burning frequency of organic residues on the soil will generally increase farm carbon losses.
- Tillage practices break up soil aggregates that physically protect soil organic matter and thus exposes it to microbial action. Increasing soil tillage intensity leads to greater soil organic matter losses.
- Presence of litter cover reflects to the use given to organic residues on-farm. Please record alternative uses in the notes section.
- Reduction of topsoil layer thickness as a result of soil erosion is a very important problem as most of the organic matter and nutrients in the soil are concentrated in the topsoil and thus lost this way.

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NaRIA Score Card				
Soil organic matter				
Abundant (81-100%)	Moderate (61-80%)	Occasional (41-60%)	Rare (21-40%)	Absent (0-20%)
				
Proportion of soil that is black or dark in color				
				
Frequency of burning				
				
Frequency of soil tillage				
				
Presence of soil litter cover				
				
Thickness of top soil				
				
				

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Soil nutrient availability

- Native plants have been traditionally used by farmers across the globe as indicators of soil fertility and nutrient availability. While some plants are indicative of fertile soils, others are indicative of poor soils. It is important to have an integrated assessment of both types of indicator plants to allow for consistency checks. Record the names of indicator plants in the notes section.
- The yellowing of leaves, often referred to as chlorosis, is associated with crop nitrogen (N) deficiency.
- The purpling of leaf underside along veins is associated with phosphorus (P) deficiency.
- Necrosis of leaf margins is associated with potassium (K) deficiency.

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NaRIA Score Card				
Soil nutrient availability				
Abundant (81-100%)	Moderate (61-80%)	Occasional (41-60%)	Rare 21-40%	Absent (0-20%)
				
Presence of native plants indicating poor soils				
				
Presence of native plants indicating fertile soils				
				
Yellowing of leaves (Chlorosis)				
				
Purpling of leaf underside along veins				
				
Margins of older leaves become necrotic				
				
				

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Soil biological activity

- This section concerns soil biological activity that generates benefits to farm productivity.
- Abundance of earthworms is usually considered a positive indicator of soil quality status as they influence both organic matter decomposition and soil structure.
- Presence of root nodules in planted or native legumes indicates that nitrogen fixing bacteria are present in the soil and there is potential for nitrogen inputs to the soil via biological nitrogen (N) fixation.
- The inside color of the nodules will confirm that in addition to being “infective” (e.g. induce root nodules in legumes), nitrogen fixing bacteria are also “effective” and actively fixing nitrogen from the atmosphere.
- Soil biological activity is significantly affected by soil pH and the blackening of root tips and their stunted growth highlight excess in soil aluminum (Al) and soil acidity.
- Soil aggregate formation and their stability to water contact result largely from the combined action of arbuscular mycorrhizal fungi (AMF), soil macrofauna, and plant roots.

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NaRIA Score Card				
Soil biological activity				
Abundant (81-100%)	Moderate (61-80%)	Occasional (41-60%)	Rare 21-40%	Absent (0-20%)
				
Presence of earthworms				
				
Presence of legume root nodulation				
				
Presence dark red nodule interior				
				
Root tips blacken, stunted and thickened roots				
				
Soil aggregation and aggregate stability				
				
				

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Natural Resource Integrity Assessment

Pests, diseases and weeds

- This section concerns soil biological activity that generates challenges to farm productivity.
- Insect consumption of plant tissues through herbivory is a natural process, but it can become a problem when insect numbers become too high and generate a negative effect on the plant and farm productivity losses.
- Root galls result from the action of plant-parasitic nematodes (e.g. root-knot nematodes from genus *Meloidogyne*) in high numbers that may be lethal in young plants, cause decreased yield in mature plants, and thus generate farm productivity losses.
- Root-rots are typically the result of activity of fungal pathogens (e.g. *Phytium*, *Fusarium*, *Rhizoctonia*, *Verticillium*, *Macrophomina*) that causes early crop death and thus generate farm productivity losses.
- The parasitic weed *Striga* has been a major problem cereal crop productivity in Africa. Impact of other weeds largely occurs through competition for resources.
- The presence of viral problems can sometimes be evidenced by the presence of concentric ring spots on leaves.

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NaRIA Score Card				
Pests, diseases and weeds				
Abundant (81-100%)	Moderate (61-80%)	Occasional (41-60%)	Rare (21-40%)	Absent (0-20%)
				
Plant damage by insects				
				
Presence of roots galls (parasitic nematodes)				
				
Presence of root-rots (fungal pathogens)				
				
<i>Presence of Striga or other weeds</i>				
				
Presence of plant viruses				
				
				

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Overall farm assessment

- The overall farm assessment will summarize the results obtained in each of the six NRI status dimensions evaluated, with five indicators each, that will give a final reading out of 30 indicators (e.g. 8 blues, 10 greens, 6 yellows, 2 oranges, 4 reds) which will be typical for each farm.

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NaRIA Score Card Overall Farm Assessment

Landscape context

Soil erosion

Soil organic matter content

Soil nutrient availability

Soil biological activity

Pests, diseases and weeds



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Natural Resource Integrity Assessment Notes

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