



Group photo with the attendees of the second validation workshop

## A Decision Support Tool for integrating stakeholder perspectives through WEFE Nexus (Uzbekistan)

### DESCRIPTION

The Decision Support Tool helps decision-makers prioritize sustainable land management practices using the Water-Energy-Food-Ecosystem Nexus, fostering collaboration, facilitating social learning, and balancing diverse stakeholder interests.

Land management and agricultural production often face diverse and conflicting interests from various stakeholders. The Water-Energy-Food-Ecosystem (WEFE) Nexus offers a framework for addressing these challenges. Under the CGIAR Nexus Gains Initiative, the International Center for Agricultural Research in the Dry Areas (ICARDA) developed a Decision Support Tool (DST) designed to help decision-makers balance stakeholder interests within the WEFE Nexus. The DST's main objective is to enable comparison and thus prioritization of sustainable land management (SLM) technologies based on specific criteria and stakeholder-assigned weights.

The DST applies a multi-criteria analysis (MCA) framework combined with the Best-Worst Method (BWM) to capture stakeholder preferences and assign weights to different criteria. The MCA follows a hierarchical structure: the overarching goal of SLM is divided into sector-specific objectives for water, energy, food, and ecosystem health. Each is assessed through specific indicators, with stakeholder interviews used to derive weights and calculate a "Nexus Score"—a weighted average reflecting preferences for different SLM practices.

The tool's development involved two field campaigns:

- \* The 2023 campaign gathered indicator values for SLM practices through field visits and interviews with farmers, ensuring data reflected field-level conditions. It concluded with a validation workshop leading to adjustments in the ranking system.
- \* The 2024 campaign focused on collecting stakeholder weights for indicators within the WEFE Nexus through key informant interviews. A workshop gathered stakeholders from ministries and research institutions, and updated participants on the DST's development and preliminary findings, while collecting feedback.

Using the DST involves the following steps:

**Identify Area:** Define geographic boundaries, consult local SLM experts for technical validation, and engage stakeholders at local and regional levels.

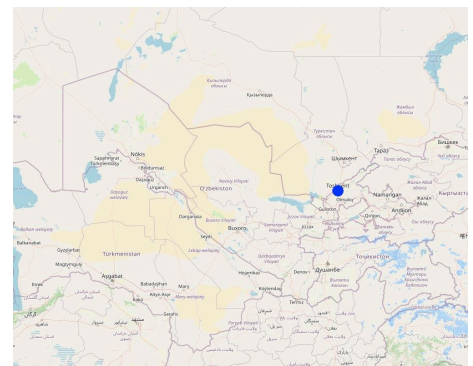
**Use the Tool:** Download the DST, compile an inventory of local SLM practices, gather stakeholder weights, review and complete indicator values, generate results, and refine inputs.

**Social Learning:** Hold validation workshops with stakeholders to review DST outputs, foster knowledge sharing, and address concerns to build consensus.

**Implementation:** Based on validated DST outcomes and stakeholder input, implement agreed SLM practices.

Overall, the DST aims to unite stakeholders in a shared understanding of land management decisions while addressing conflicting interests and policies. Findings reveal that departments often weigh indicators differently. Cross-departmental weight comparisons indicate shared

### LOCATION



**Location:** Tashkent (Uzbekistan), Uzbekistan

#### Geo-reference of selected sites

- 69.26662, 41.29762

**Initiation date:** 2022

**Year of termination:** n.a.

#### Type of Approach

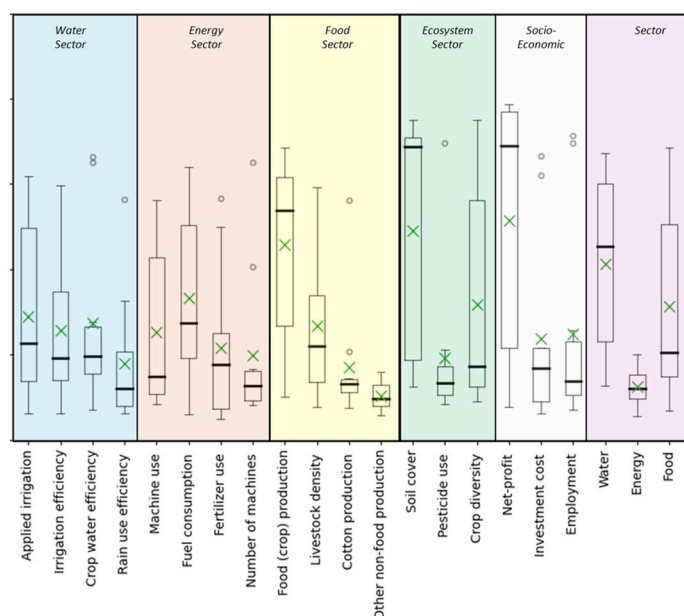
- ☐ traditional/ indigenous
- ☐ recent local initiative/ innovative
- ☒ project/ programme based

priorities for certain criteria and highlight gaps in others, paving the way for interdepartmental collaboration.

The results of the weight survey provided notable insights. Within departments, responses exhibit a wide spread, indicating no collective priority. Across departments, certain criteria—such as reducing fuel consumption, food production, and net profit—are prioritized by all. Conversely, criteria like rain use efficiency, non-food production, and employment opportunities are collectively deprioritized.

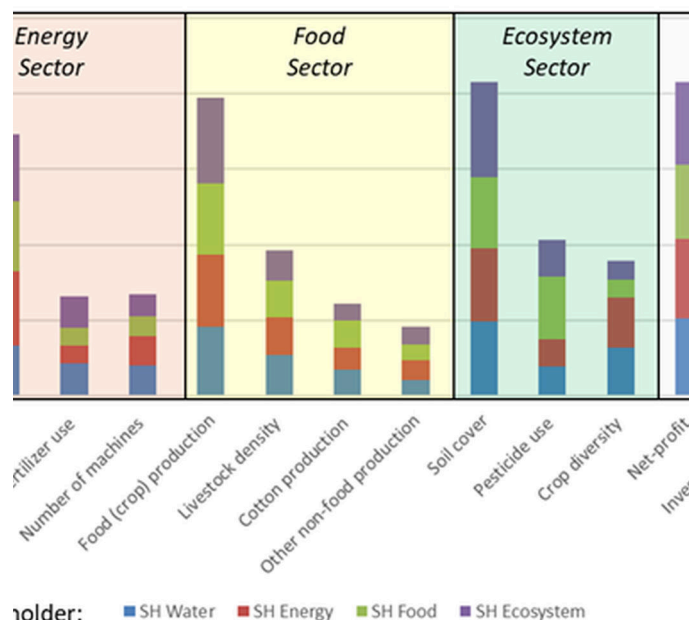
This work was conducted under the CGIAR Initiative on Nexus Gains, with gratitude to the CGIAR Trust Fund contributors ([www.cgiar.org/funders](http://www.cgiar.org/funders)). The DST and approach are inspired by the thesis of J. Verbist, titled “Perspectives on the Economic Feasibility of Increasing Soil-Based Ecosystem Services on Arable Farms in The Netherlands” (2022), conducted at the Business Economics (BEC) Group of Wageningen University under the supervision of Professors H. Saatkamp and M. Kik.

SH Water (BWM)



Boxplot showing the results of the weights given by the respondents of the Water department. The vertical axis present the weight (1=most important; 0=least important) The weights were calculated based on the BWM.

Cumulated Weight Division of Average Stakeholder



holder: SH Water SH Energy SH Food SH Ecosystem

Bar chart showing the arithmetic average weights of each department

## APPROACH AIMS AND ENABLING ENVIRONMENT

### Main aims / objectives of the approach

The objective of the DST is scale Sustainable Land Management through improved stakeholder engagement and integrated Water-Energy-Food-Ecosystem Nexus management.

### Conditions enabling the implementation of the Technology/ ies applied under the Approach

- **Collaboration/ coordination of actors:** All of the interviewed and collaborated department and ministries were willing to support and attend the workshop, closely following the developments of the DST.

### Conditions hindering the implementation of the Technology/ ies applied under the Approach

- **Institutional setting:** Institutional setting is relatively set in silos so departments and ministries generally do not mix and exchange ideas optimally.
- **Policies:** Policy in general often reflect the objective of a specific ministry, which can create conflicting policies.
- **Land governance (decision-making, implementation and enforcement):** Land governance is characterized by a strong push for productivity and land tenure over ownership.

## PARTICIPATION AND ROLES OF STAKEHOLDERS INVOLVED

### Stakeholders involved in the Approach and their roles

What stakeholders / implementing bodies were involved in the Approach?	Specify stakeholders	Describe roles of stakeholders
local land users/ local communities		Farmers were interviewed to understand their preference and to quantify indicator values (e.g., how much fuel does their current practice consume)
SLM specialists/ agricultural advisers	Experts from the four WEFE departments	They were interviewed to get weights for indicators.
researchers	ICARDA	ICARDA developed the DST based on Multi-Criteria-Decision-Making (MCDM) literature.
national government (planners, decision-makers)	Four WEFE departments	These stakeholders implement and formulate policies for land management.

**Lead agency**  
ICARDA developed the DST and organized the field campaigns and workshops.

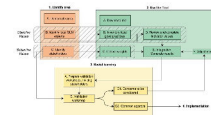
**Involvement of local land users/ local communities in the different phases of the Approach**

	none	passive	external support	interactive	self-mobilization	
initiation/ motivation	✓					SLM specialist, as user of the DST, should identify a working area and identify relevant stakeholders and locally available good practices. When indicator data is retrieved and study area is known, weights for the different WEFE indicators should be given by the stakeholders. Based on that a workshop should be organized where stakeholders can discuss the outcome of the DST and move towards implementation. Once stakeholder agree on the outcome of the DST, the resulting SLM Technologies can be implemented
planning				✓		The DST can be used for MEL as well. Stakeholders can interviewed to see if preferences have changed over time and to validate indicator values when data becomes available.
implementation				✓		
monitoring/ evaluation				✓		



## Flow chart

The Decision Support Tool (DST) facilitates the planning and implementation of Sustainable Land Management (SLM) practices through a structured process. The flow chart illustrates the four main phases of using the DST: identifying the area, utilizing the tool, promoting social learning, and implementing the plan. Each phase involves specific steps to ensure the tool's effective use and stakeholder collaboration. The following guidelines provide a detailed explanation of these steps, guiding users from initial planning to final execution.



**Objective Values:** The first distinct process within the framework of the DST is the incorporation of objective values. These values are derived from measurable and verifiable data such as yield, fertilizer use, irrigation efficiency, and net-income. The DST leverages this quantitative information to assess how well different interventions perform across a range of technical criteria.

**Subjective Values:** The second process addresses the integration of subjective values, which stem from the perceptions, priorities, and preferences of stakeholders. These values are gathered through weighing, such as Direct Ranking or the Best-Worst Method (BWM), to reflect stakeholders' interests, but also reflecting social and cultural dimensions. Incorporating subjective values ensures that the tool aligns with the needs and interests of the communities and stakeholders involved, fostering greater acceptance and ownership of the chosen SLM practices. This process emphasizes the importance of balancing technical efficiency with social relevance, resulting in a more holistic and inclusive decision-making process.

### 1. Identify Area

**A.Demarcate Area:** Define the geographical boundaries at the farm and watershed levels. These scales are suitable for applying the DST because the DST focusses on land management rather than more abstract national and policy levels.

**B.Identify Local SLM Experts:** Engage local experts in SLM early in the process to leverage their knowledge about the area's specific practices and challenges. They are the right people to validate technical aspects of land management, which is invaluable regarding the indicator values.

**C.Identify Stakeholders:** Identify relevant stakeholders across different levels, including local authorities, farmers, and regional organizations. Even if broader-scale stakeholders (e.g., national ministries) are involved, focus on local or regional branches that directly influence the area.

### 2. Use the Tool

**A.Download the Tool:** Access the DST from ICARDA's Monitoring, Evaluation, and Learning (MEL) platform after defining the area and identifying stakeholders.

**B.Inventory Local Good Practices:** Review existing SLM practices and identify those most relevant for the area. The DST comes with predefined options, but additional practices can be added to reflect the local context.

**C.Collect Weights:** Gather weights for different indicators from stakeholders using methods like the Best-Worst-Method (BWM) or direct ranking. These weights will be used to reflect stakeholder preferences in the evaluation.

**D.Review and Complete Indicator Values:** Assess and adjust the default indicator values within the DST to better reflect local conditions, considering factors like soil properties, rainfall, and market conditions. In addition, when local SLM practices are added, these indicators values should also be given.

**E.Generate Results:** Use the weighted indicators to run the DST and produce visualizations and evaluations of various SLM options.

**F.Adjust Inputs:** If necessary, refine the input data based on insights gained during the tool's use, allowing for recalibration of indicator values, weights, or additional local practices.

### 3. Social Learning

**A.Prepare Validation Workshops, Inviting Stakeholders:** Organize workshops with identified stakeholders to validate the DST's outputs. Ensure that all relevant voices are heard, and prepare to address any concerns raised.

**B.Validation Workshop:** Facilitate a structured workshop where stakeholders can review and discuss the tool's results. The workshop should encourage knowledge sharing and foster social learning. The DST is a mean to create common understanding and appreciation among WEFE stakeholders for sustainable land management.

**C.Iterate:**

**C1. Concerns to be Considered:** Document and address any issues or concerns raised by stakeholders during the workshop, potentially revising the DST inputs or methodology.

**C2. Common Approval:** Aim for a shared understanding and acceptance of the results, incorporating feedback from the validation process.

### 4. Implementation

Once the results are validated and any necessary adjustments have been made, proceed to implement the agreed-upon SLM practices. The plan should reflect the insights gained through the DST analysis and stakeholder feedback, ensuring that the execution phase aligns with the validated recommendations.

## Decision-making on the selection of SLM Technology

Decisions were taken by

- ☐ land users alone (self-initiative)
- ☐ mainly land users, supported by SLM specialists
- ☒ all relevant actors, as part of a participatory approach
- ☐ mainly SLM specialists, following consultation with land users
- ☐ SLM specialists alone
- ☐ politicians/ leaders

Decisions were made based on

- ☒ evaluation of well-documented SLM knowledge (evidence-based decision-making)
- ☒ research findings
- ☒ personal experience and opinions (undocumented)

## TECHNICAL SUPPORT, CAPACITY BUILDING, AND KNOWLEDGE MANAGEMENT

The following activities or services have been part of the approach

- ☒ Capacity building/ training
- ☒ Advisory service
- ☐ Institution strengthening (organizational development)
- ☐ Monitoring and evaluation
- ☒ Research

## Capacity building/ training

### Training was provided to the following stakeholders

- ☐ land users
- ☐ field staff/ advisers
- ☒ WEFE Departments

### Form of training

- ☐ on-the-job
- ☐ farmer-to-farmer
- ☐ demonstration areas
- ☐ public meetings
- ☒ courses

### Subjects covered

A short course on the WEFE concept and its relation to land management was conducted, to build a common understanding.

## Advisory service

### Advisory service was provided

- ☒ on land users' fields
- ☒ at permanent centres

## Research

### Research treated the following topics

- ☐ sociology
- ☐ economics / marketing
- ☐ ecology
- ☐ technology

A publication in Operations and Research was done. This paper elaborated on the need, concept, and use of the DST.

## FINANCING AND EXTERNAL MATERIAL SUPPORT

### Annual budget in USD for the SLM component

- ☐ < 2,000
- ☐ 2,000-10,000
- ☐ 10,000-100,000
- ☐ 100,000-1,000,000
- ☐ > 1,000,000

Precise annual budget: n.a.

The main objective was to make a DST so not to implement SLM Technologies. DST is programmed in excel exactly for the reason to have no ongoing finance for IT. The Tool is downloadable through the institutional knowledge management of ICARDA (repo MEL). Costs are expected for implementing/constructing the SLMs or for holding the workshops.

### The following services or incentives have been provided to land users

- ☐ Financial/ material support provided to land users
- ☐ Subsidies for specific inputs
- ☐ Credit
- ☐ Other incentives or instruments

## IMPACT ANALYSIS AND CONCLUDING STATEMENTS

### Impacts of the Approach

Did the Approach enable evidence-based decision-making?

The DST requires input data such as indicators value and weight of these indicators. Therefore, the DST is also framework to elaborate decision and priorities in SLM/WEFE, increase evidence-based DM.

No  
Yes, little  
Yes, moderately  
Yes, greatly

☐ ☐ ☐ ☒

Did the Approach improve coordination and cost-effective implementation of SLM?

The DST shows where stakeholders can work together and where their action contradict, knowing this can lead to more cost-effective policies and improve coordination.

☐ ☐ ☒ ☐

Did the Approach improve knowledge and capacities of other stakeholders?

The DST revolves around WEFE Nexus, hence when presenting the DST, WEFE is also automatically considered as well, which enhanced the knowledge of the stakeholders.

☐ ☐ ☒ ☐

Did the Approach build/ strengthen institutions, collaboration between stakeholders?

The DST should lead to cross-department collaborations.

☐ ☐ ☒ ☐

### Main motivation of land users to implement SLM

- ☒ n.a.

### Sustainability of Approach activities

Can the land users sustain what has been implemented through the Approach (without external support)?

- ☐ no
- ☐ yes
- ☐ uncertain

## CONCLUSIONS AND LESSONS LEARNT

## Strengths: land user's view

### Strengths: compiler's or other key resource person's view

- Integrated Analysis Across Multiple Sectors: The DST incorporates the Water-Energy-Food-Ecosystem (WEFE) Nexus, enabling a holistic evaluation of Sustainable Land Management (SLM) practices. This allows stakeholders to assess potential trade-offs and synergies across sectors, promoting balanced, multi-faceted decision-making.
- Stakeholder-Driven Approach: By gathering weights from stakeholders through methods like the Best-Worst Method, the DST reflects diverse priorities and values. This inclusivity fosters greater acceptance and ownership of SLM decisions, enhancing alignment with local needs and contexts.
- User-Friendly and Adaptable Design: The DST is designed to be intuitive and compatible with common spreadsheet software, reducing the need for specialized training. Users can also adapt the tool by adding local practices and adjusting parameters, ensuring it remains relevant across varying contexts.
- Support for Social Learning and Collaborative Decision-Making: The DST's framework encourages stakeholder validation workshops, which facilitate knowledge sharing and collaborative refinement of the tool. This social learning process enhances mutual understanding among stakeholders and builds consensus on SLM priorities.
- Visual and Quantitative Decision Support: By translating data into weighted scores and visual representations, the DST provides clear, actionable insights into SLM options. This visual aid helps decision-makers quickly identify win-win solutions or understand potential trade-offs, aiding more informed and efficient planning.

## Weaknesses/ disadvantages/ risks: land user's view how to overcome

### Weaknesses/ disadvantages/ risks: compiler's or other key resource person's view how to overcome

- Dependence on Stakeholder Involvement: The DST's effectiveness relies heavily on active engagement from a diverse set of stakeholders to provide accurate weighting and feedback. If stakeholders are unwilling to participate or lack interest, the tool's output may not fully reflect local priorities and needs. If stakeholder involvement is limited, their weights can be estimated based on previous studies or similar contexts to approximate their likely priorities. Alternatively, you can demonstrate the DST's relevance by showcasing how it supports their specific goals or decision-making processes, encouraging them to see the value of their input.
- Oversimplification of Indicator Values: The DST may reduce complex, multi-faceted indicators to single values, which can overlook important nuances, such as temporal variability or site-specific conditions, potentially leading to decisions that don't capture the full reality. This can be considered during the proposed workshop and may result in change of indicator values.

## REFERENCES

### Compiler

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### Editors

### Reviewer

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### Full description in the WOCAT database

[https://qcat.wocat.net/en/wocat/approaches/view/approaches\\_7356/](https://qcat.wocat.net/en/wocat/approaches/view/approaches_7356/)

### Linked SLM data

n.a.

### Documentation was facilitated by

#### Institution

- International Center for Agricultural Research in the Dry Areas (ICARDA) - Lebanon

#### Project

- ICARDA Institutional Knowledge Management Initiative

### Key references

- Verbist, J., & Akramkhanov, A. (2024). A decision support tool for stakeholder engagement in sustainable land management using the WEFE Nexus: A simulation for the Aral Sea Basin stakeholders. Lecture Notes in Operations Research.:

### Links to relevant information which is available online

- Joren Verbist, Ulugbek Sadullaev, Ruhangiz Nurbekova, Akmal Akramkhanov. (18/12/2023). DSS for WEFE Nexus: Balancing Stakeholder Priorities for Sustainable Land Management and survey results on SLM practices.: <https://hdl.handle.net/20.500.11766/69182>
- Akmal Akramkhanov, Joren Verbist, Shakhzoda Umarova. (18/12/2023). Report on the validation of "Sustainable land use practices: increasing soil fertility, effective use of water resources, and increasing the efficiency of agrotechnical activities" workshop.: <https://hdl.handle.net/20.500.11766/69038>
- Support Tool for Stakeholder Engagement in Sustainable Land Management using the WEFE Nexus: A simulation for the Aral Sea Basin stakeholders.: <https://hdl.handle.net/20.500.11766/69569>
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