Food and Agriculture Organization of the United Nations

Part 3: Farmer Field School one-curriculum

Climate-smart Farmer Field School curriculum

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Contents

Tables

Figures

Boxes

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This training material Part-3: Farmer Field School one-curriculum involves guiding supervisors, master trainers, and facilitators to enhance the effectiveness of Farmer Field School implementation, fostering continuous improvement and adaptation to evolving agricultural challenges.

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Abbreviations

AESA	agroecosystem analysis
AWM	advanced workshop method
CCA	climate change adaptations
CSA	climate-smart agriculture
CS-FFS	climate-smart Farmer Field School
ESS	environmental and social safeguards
FAO	Food and Agriculture Organization of the United Nations
FFS	Farmer Field School
FGD	focus group discussion
IPM	integrated pest management
MEAL	monitoring, evaluation, assessment and accountability
MOA	Ministry of Agriculture (Jordan)
MoEnv	Ministry of Environment (Jordan)
NARC	National Agricultural Research Centre
NFE	non-formal education
NGOs	non-government organizations
ODK	open data kit
OSHH	occupational safety, health and hygiene
SDI	sub-surface drip irrigation
SOP	standard operating procedures
SWOT	strength, weakness, opportunity and threat analysis
UNDP	United Nations Development Programme

Background

Jordan faces a multitude of challenges, including climate change, regional conflicts, and the recent COVID-19 pandemic, all of which have significant economic and societal implications. The CS-FFS initiative aims to address vulnerabilities in the country's economic, physical, and social infrastructure.

This initiative is spearheaded by the "Building resilience to cope with climate change in Jordan through improving water use efficiency in the agriculture sector (BRCCJ) " project, a collaborative effort between FAO, Ministry of Agriculture (MoA), Ministry of Environment (MoEnv), and United Nations Development Programme (UNDP). The project specifically targets Karak, Madaba, Tafileh, and Maan, Governorates situated in the Dead Sea basin. These regions are particularly susceptible to climate change due to their dependence on rainfed agriculture and high poverty rates within their rural populations. The seven-year project strives to achieve climate-resilient sustainable development by tackling water management issues, improving livelihoods, and scaling up climate adaptation strategies.

A pivotal component of the CS-FFS initiative is the meticulously crafted Farmer Field School one-curriculum, designed to equip farmers with the knowledge and skills necessary to thrive in a changing climate. This curriculum emphasizes the development of learning modules that are firmly rooted in climate-smart practices. Local and international experts from FAO, MoA, NGOs and private firms have collaborated to develop these modules, ensuring a well-rounded approach that blends practical hands-on skills with a deep conceptual understanding of climate adaptation strategies. The curriculum itself comprises six modules, each designed to empower farmers with the essential knowledge and skills to navigate the challenges of a changing climate and promote agricultural resilience and sustainability.

The project places high importance on ensuring consistent and efficient implementation across all participating regions. This is achieved through the meticulous formulation of the CS-FFS one-curriculum, which serves as a blueprint for successful field school operation. This standardized approach fosters uniformity and quality in knowledge delivery. Importantly, the curriculum embraces innovative techniques and a gender-sensitive perspective, underscoring the project's commitment to empowering all members of Jordanian communities. This holistic approach positions the CS-FFS curriculum as a cornerstone for achieving the project's overarching goal: fostering climate-resilient sustainable development within Jordan's agricultural sector.

Objectives

The document CS-FFS one-curriculum will help in achieving the following objectives in successful implementation of the CS-FFS programme including the training of facilitators/trainers (TOFs/TOTs) course for facilitators as well as CS-FFS for farmers.

- Enhance the effectiveness of Farmer Field School implementation, fostering continuous improvement and adaptation to evolving agricultural challenges.

- Improve the CS-FFS methodology, aligning it with climate-smart technologies and practices.
- Standardize CS-FFS implementation to ensure uniformity and quality across diverse regions and production systems.

Climate-smart Farmer Field School curriculum outlines

Characteristics

- Season long participatory training programme
- Module based facilitator-led sessions
- Farmer-led agroecosystem analysis (AESA) practice sessions
- Farmers skills-based training delivery
- Farmer-led climate-smart agriculture (CSA) practices extension and scale-up
- Water efficient irrigation technologies-based training programme

Core principles

- Discovery based learning-by-doing as a core participatory learning model.
- Hands on skill centred training modules and sessions – adults learn better through experience rather than passive listening at lectures.
- Science-by-farmers principles as a participatory technology development tool for analytical learning and adoptive research.
- Farmer-led innovation, research, and extension concepts as lead for field exercises of each module.
- Every CS-FFS is unique, so, the module outlines will be considered as guiding tools while detail contents of the modules will be needs based, open, and customizable.
- Result based simple and user-friendly modules and session activities.
- Customizable modules design for different CSA practices and technologies of selected farming systems.
- Farmer-lead learning cycle facilitated by facilitators and extension workers.
- Interactive learning tools on CSA technologies, learning exercises and data management including farmers diary.
- Learning programme is fully equipped with cross cuttings including environmental and social safeguards (ESS), gender mainstreaming, occupational safety, health, and hygiene (OSHH) etc.

Climate-smart Farmer Field School one-curriculum leaning lessons distribution

Table 1. Climate-smart Farmer Field School one-curriculum learning lessons distribution

#.	Thematic area	Learnings topics and lessons (general)

1	Climate-smart agriculture	• Introduction to CSA practices
		• Water status in the CS-FFS area
		• Agroecosystem analysis (AESA)
		• Crop water use efficiency
		• Primary CSA practices (relevant to selected module)
		  ○ sub-surface irrigation
		  ○ wicking beds
		  ○ cocoons
		  ○ azolla hydroponic
		  ○ hydroponic leafy crops
		  ○ adaptive varieties
		  ○ treated greywater
		  ○ grow bags technology
		  ○ strip planting
		  ○ smart irrigation
		• Cross cutting CSA practices (relevant to selected module)
		  ○ greenhouses
		  ○ composting
		  ○ intercropping
		  ○ integrated pest management
		  ○ mulching
		• Supplementary (sprinkler) irrigation
		• Household food and nutrition budgeting

2	Agribusiness and livelihood	• Understanding agribusiness and enterprise • Improving the livelihood of Jordanian farmers
3	Safe living and decent farming	• Gender mainstreaming

#.	Thematic area	Learnings topics and lessons (general)
		• Environmental social safeguards • Occupational health, safety, hygiene
4	Community development and farmer-led extension services	• Farmers organization & community development • Organizing field days • Community-based adaptation plans development for community adapting together • Organizing-graduation ceremony

Source: Authors' own elaboration.

Typical Farmer Field School time sheet

A typical FFS Timesheet provides a structured framework for planning and implementing a CS-FFS programme. It outlines key activities, their frequency, the focus areas, and the level of priority throughout different phases of the cropping season. This timesheet serves as a customizable guide to ensure FFS programmes effectively address the interconnected aspects of CSA, empowering farmers with the knowledge and skills for long-term resilience.

Box 1. Typical Farmer Field School time sheet outlines

Subject	Start CS-FFS Season	Mid CS-FFS Season	End CS-FFS Season	Post CS-FFS	Frequency	Note
Special topic - technical	High	Medium	Low	Follow-up	Weekly/bi-weekly	Focus on specific crop/farming CSA techniques.
Special topic - general	Medium	High	Medium	Follow-up	Weekly/bi-weekly	Market access, policies, broader context.
Establishment of learning plots	High	Medium	Low	Low	Seasonally	Depends on selection of experiments for learning.
AESA	Medium	High	Medium	Follow-up	Ongoing	Ongoing observation & understanding.
Science by farmers – experimentation	Medium	High	Medium	Follow-up	Bi-weekly	Designing and conducting trials.
Non-formal education (NFE)	Medium	Medium	Medium	-	Weekly	Capacity building, participatory learning.
Organization development	High	Medium	High	Ongoing	Monthly	Group strengthening, leadership.
Resource management	Low	Medium	High	Ongoing	Bi-weekly	Sustainable practices, input management.
Networking and linkages development	Low	Medium	High	Ongoing	Monthly	With agriculture service providers (public and private sector), big farmers, stakeholders and stakeholders from the agriculture sector, research centres.

Note:

Intensity

High – Intensive sessions, hands-on activities, significant time commitment

Medium – Moderately paced, mix of theory and practice.

Low – Introductory, concept-focused, less frequent

Follow-up – Monitoring, reviewing previous or new work.

Frequency

- Weekly
- Bi-weekly (once every two weeks)
- Monthly

Source: Authors' own elaboration.

- Ongoing (throughout the CS-FFS period)

Climate-smart Farmer Field School implementation calendar (general)

The CS-FFS implementation calendar acts as a valuable tool for setting priorities when launching a programme. It outlines crucial steps and their corresponding timelines, enabling effective workplace organization, timely procurement, and strategic team building. By understanding when specific resources and space will be needed, facilitators can make informed budgeting and scheduling decisions where they can prepare better for the upcoming CS-FFS sessions. The emphasis on farmer input fosters a collaborative spirit from the project's outset. The calendar also pinpoints which skills will be essential at different phases, aiding in both recruitment and recognizing the contributions of existing team members. This structured approach, adaptable to both autumn and spring seasons, sets the stage for efficient resource management and a strong sense of teamwork, maximizing the chances of a successful CS-FFS programme.

Table 2. Climate-smart Farmer Field School implementation calendar

CS-FFS starts in autumn			Autumn			Winter			Spring			Summer		
Months*			S	O	N	D	J	F	M	A	M	J	J	A
CS-FFS starts in spring			Spring			Summer			Autumn			Winter		
Months			M	A	M	J	J	A	S	O	N	D	J	F
Steps		Output												
1	Ground working (preparations) and promotion	• Preparation of curricula meetings with community. • Procurement of CS-FFS inputs & material.												
2	Identification of participants	Need assessment												
3	Group formation and organization	• Farmers registration completed. • Farmers organization formed.												

CS-FFS starts in autumn Months*			Autumn			Winter			Spring			Summer		
			S	O	N	D	J	F	M	A	M	J	J	A
CS-FFS starts in spring Months			Spring			Summer			Autumn			Winter		
			M	A	M	J	J	A	S	O	N	D	J	F
4	Identify participatory learning site	• Host farmers identified. • Resolution form signed by host farmer.												
5	Planning of CS-FFS learning CSA technologies	• CSA technology/practice identified and agreed with farmers. • Cropping system identified.												
6	Establishment of participatory learning sites	• Selected CSA technology implemented. • Selected crop(s) are sown/planted.												
7	Regular CS-FFS meetings	Training sessions on Critical stages of selected crop(s) or technology/practice (agreed with farmers)												
8	Agro-ecosystem analysis (AESA) of learning plots	• Farmers are trained on agroecosystem parameters. • Farmers are able to observe crop ecosystem.												
9	Farm agribusiness and enterprises	• Farmers are trained on business and enterprise. • Farmers are record keeping regularly.												

CS-FFS starts in autumn Months*			Autumn			Winter			Spring			Summer		
			S	O	N	D	J	F	M	A	M	J	J	A
CS-FFS starts in spring Months			Spring			Summer			Autumn			Winter		
			M	A	M	J	J	A	S	O	N	D	J	F
		• Farmers to do economic analysis.												
10	Harvest of learning plots	• Sessions on harvest and post-harvest conducted. • Farmers conducted cost benefit analysis.												
11	Post-harvest learning for CS-FFS produce	• Post-harvest CSA practices on value chains are considered.												
12	Planning and preparation for value-addition (optional)	• Farmers are trained on post-harvest CSA practices.												
13	Field day celebrations	• Neighbour Farmers visited CS-FFS learning sites.												
14	Participatory evaluation	• CS-FFS data record maintained in data books. • Monitoring, evaluation, accountability and learning (MEAL) team conducted pre-post evaluation and learning assessments.												
15	FFS alumni network	CS-FFS organization is networked with CS-FFS Clusters, networks locally, regionally,												

CS-FFS starts in autumn Months*			Autumn			Winter			Spring			Summer		
			S	O	N	D	J	F	M	A	M	J	J	A
CS-FFS starts in spring Months			Spring			Summer			Autumn			Winter		
			M	A	M	J	J	A	S	O	N	D	J	F
		nationally and globally (where possible)												
16	Graduation	• CS-FFS graduation criteria assessed. • Successful farmers awarded certificates												
17	Post CS-FFS	• Post CS-FFS planning conducted. • Action plan implemented.												

Note:

Months = J – January; F – February; M – March; A – April; M – May; J – June; J – July; A – August; S – September; O – October; N – November; and D – December.

Source: Authors' own elaboration.

Climate-smart Farmer Field School meetings design

The one-curriculum will employ two types of meetings for successful climate-smart Farmer Field School implementation.

Table 3. Climate-smart Farmer Field School meetings design

Meeting /session/ support	Purpose	Scope	Frequency
Preparation and support	Facilitate initial community engagement, farmer motivation, and continuous support for CS-FFS members and groups.	• Groundwork (preparations) and field school initiation. • Ongoing assistance with farmer-led science demonstrations, AESA practices, participatory decision-making, and record-keeping. • Online social networking and support.	Determined by facilitator availability, access to field schools, and farmer networking needs and crop type/season.
Scheduled meetings/ sessions	Deliver module-based training to enhance CS-FFS farmers capacity.	Pre-designed training sessions aligned with the one-curriculum.	Dependent on the selected module, the one-curriculum structure and crop (s).

Source: Authors' own elaboration.

Typical Climate-smart Farmer Field School session design

Farmer Field Schools (FFS) are built upon the foundation of participatory, season-long learning in the context of farmers' own fields. A typical FFS session follows a structured yet flexible format that promotes discovery-based learning and farmer-centred decision-making. Table below shows the outline for the CS-FFS session.

Table 4. Typical Climate-smart Farmer Field School session design

Assigned time	Activity	Description	Key FFS principles
30 minutes	Welcome & review	• Facilitator welcomes participants. • Review objectives and key takeaways from the previous session. • Brief icebreaker/energizer activity.	Experiential learning Group dynamics
60–90 minutes	AESA	• Farmers conduct regular field observations, gathering data on CSA technology and practices, water use, crop growth, pests, diseases, beneficial organisms, soil conditions, etc. • Data may be presented through drawings, charts, or simple measurements.	Discovery-based learning Holistic understanding Critical thinking
30–45 minutes	Group discussion & analysis	• Facilitator leads the group in analysing the AESA data. • Farmers discuss possible causes, implications, and potential solutions. • Open-ended questions to promote farmer-led discovery and decision-making	Participant-centred learning Problem solving
30 minutes	Special topic	• Short presentation, demonstration, or hands-on activity related to a specific need or interest of the group/ CSA practices	Integrated knowledge Addressing specific needs

Assigned time	Activity	Description	Key FFS principles
		• Link the topic to the AESA findings, making it relevant to the farmers' current situation.	
30 minutes	Planning & wrap-up	• Farmers work together to create a plan for the coming weeks, based on their analysis of the day's activities. • Summarize key learning points. • Brief evaluation or feedback exercise on the session.	Decision-making Action planning Reflection

Source: Authors' own elaboration.

Key elements

- **Special topics** – short presentations, demonstrations, or activities cater to specific knowledge gaps or emerging needs within the group. These topics are linked to the selected CSA technology, practices, skills, experimentation, and AESA findings, crops, ensuring relevance to the farmers' current situation. It also covers general topics including OSHH, ESS, gender mainstreaming, organization, and networking.
- **Agroecosystem analysis** – a core pillar of the FFS experience. Farmers make regular, detailed observations of their fields, analysing the health of the crop, soil conditions, weather patterns, beneficial insects, pests, and diseases. This fosters a holistic understanding of the farming system.
- **Group discussion and analysis –** findings from the AESA are brought back to the group, where farmers collaboratively analyse the data, discuss challenges, and brainstorm solutions. This process builds problem-solving skills and empowers farmers to make informed decisions based on their own insights.
- **Planning & wrap-up –** sessions conclude with farmers developing action plans for the coming weeks. This reinforces the link between learning and practical application. Wrap-up also includes reflection and evaluation to improve future sessions.

Key principles underlying FFS session design

- **Experiential learning –** farmers learn by doing – through hands-on observation, experimentation, and problem-solving.
- **Participant-centred –** sessions prioritize farmer-led discussions and discovery, with the facilitator providing guidance rather than top-down instruction.
- **Holistic approach –** the FFS encourages farmers to see their fields/ production sites as interconnected systems, fostering an understanding of the broader agroecological context.
- **Critical thinking –** sessions promote analysis and reasoned decision-making, empowering farmers to move beyond simply following prescribed recommendations based on the needs of their own crops/farms.

Proposed session plan for Climate-smart Farmer Field School (general)

Table 5. Proposed session plan for climate-smart Farmer Field School

Session no.	Session title	Special topics (general)	Special topic (technical)	Activities
Session 1	Introduction & group formation	Farmer organization & community development	Introduction to relevant module and CSA technologies - CSA catalogues (selected practices)	Group formation & introductions Project introduction Brainstorming: Challenges & opportunities Introduction to water-smart irrigation concepts (field visit optional) Discovery learning Group work norms setting
Session 2	CSA principles	CSA practices	Brainstorming climate change impact on crop production & water management	Interactive discussion on CSA approach, principles, practices Group dynamic – Nine dots Team-building exercise – Water flow negotiation Planning learning plots establishment Site assessment for CSA practice/technology feasibility Planning household food budgets (optional)
Session 3	CSA learning plots & water efficiency	Crop water use efficiency Occupational health, safety & chemical handling	Soil moisture monitoring & irrigation scheduling System selection & design basics	Establishing demonstration plots – Installation of CSA technology /practices Occupational safety, health, and hygiene Introduction to soil moisture monitoring tools Mapping calendar
Session 4	Agro-ecosystem	AESA	Cross cutting CSA practices	Installation of CSA technology /practices

Session no.	Session title	Special topics (general)	Special topic (technical)	Activities
	analysis & planning			Field exercise: Analysing the crop/farm ecosystem Group dynamic: Critical thinking Group discussion: Identifying water management needs
Session 5	Crop /farm production cycle & gender integration	Household food & nutrition budgeting Gender mainstreaming in agriculture	Understanding crop production stages & water requirements	AESA of selected crop or farm Innovating CSA practices/ modifying and designing innovative solutions to challenges Integrating CSA practices into the production cycle
Session 6	Agribusiness & enterprise development	Agribusiness & enterprise development	Exploring market opportunities for crop/farm products Value addition	AESA of selected crop or farm Understanding agribusiness and enterprise Cost-benefit analysis Food processing of extra produce
Session 7	Technical deep dive: CSA practices and technologies	Review – environmental & social safeguards (ESS), gender mainstreaming & occupational safety	Advanced workshop method for CSA practices and technologies – Thinking out of the box	AWM session on CSA practices Sharing learnings on AESA of selected crop or farm Group discussion: ESS, gender roles in farm management
Session 8	Monitoring, evaluation, accountability & learning	CSA with focus on water-smart practices	Data collection and record keeping for irrigation management	AESA of selected crop or farm Activity - Farmers skills assessment Evaluating the effectiveness of CSA practices /technologies Prepare plan for post CS-FFS evaluation of CSA practices /technologies effectiveness
Session 9	Scaling up & community adaptation	Understanding & experimenting with sub-surface	Sharing experiences & best practices	Group presentations on learnings from demonstration plots

Session no.	Session title	Special topics (general)	Special topic (technical)	Activities
		irrigation techniques	from demonstration plots Collaborative planning for wider adoption	Discussion – challenges and opportunities for scaling up Introduction to community-based adaptation plans
Session 10	Graduation ceremony	Community-based adaptation plans: Adapting together	Graduation ceremony & recognition of achievements	Group activity – developing a community adaptation plan for water management Graduation ceremony event as per set agenda

Source: Authors' own elaboration.

Climate-smart Farmer Field School training material

The most important training materials in an CS-FFS are the field, the plants, crops, plant, the soil, insects, weeds, animals etc. along with the set of tools, and items related to selected CSA learning technology. These are readily available at the FFS location. Some other materials need to be supplied to facilitate preparation of an AESA (with drawings) and to set up small field trials. Here is a list of materials that are often needed in an FFS:

Tentative list of stationery items

Following list of stationery items are identified for smooth learning process.[1]

- Flip chart roll paper
- Permanent markers (5 colours)
- Pencils and pens
- Notebook/ farmer
- Colour stickies note cards (large 6 inches) and (small 3 inches)
- Masking tape
- Transparent tape
- Scissor
- File cover
- Farmer diary

[1] List of items with quantity and specifications is provided in the Workplan document under procurement of learning packages and toolkit.

Occupational safety, health, and hygiene

Occupational safety, health, and hygiene (OSHH) within Farmer Field Schools focuses on proactively identifying, evaluating, and minimizing potential risks that could harm participants' well-being. This includes protecting farmers from physical harm during field activities, safeguarding their health against illness from agricultural practices, and promoting good hygiene to prevent disease spread. Additionally, OSHH may consider mental well-being related to the challenges of farming. The primary goals of OSHH in FFS are to create a safe environment conducive to learning, prevent accidents and illnesses, teach beneficial safety and hygiene practices for their own farms, and build a strong bond of trust between facilitators and participants.

CS-FFS Facilitator's role:

- Assess potential hazards before starting FFS activities.
- Provide clear instructions on using tools and handling chemicals safely.
- Lead by example, wearing appropriate safety gear and practicing good hygiene.
- Ensure participants adhere to OSHH guidelines for everyone's safety.

Essential items	**First-aid kit** A well-stocked kit should include bandages, antiseptic wipes, pain relievers, gauze, medical tape, burn ointment, eye wash, insect sting treatment, and a manual. Ensure facilitators know how to use the kit's contents. **Drinking water supply –** clean, safe drinking water to prevent dehydration and heat-related illness. **Protective gear** • Gardening gloves are optional • Wide-brimmed hats (for sun protection) • Face mask (appropriate for dusty weather, people with allergies). **Proper tools –** ensure tools are in good condition and participants receive training on safe handling. **Rest area –** a designated shaded area for resting when needed, especially in hot weather. **Emergency communication –** a plan for contacting emergency services, including relevant phone numbers.
Hygiene considerations	**Handwashing facilities**

Access to soap and water for handwashing, especially before food preparation or eating.

Sanitary toilets

The host farmers should facilitate and ensure clean toilets are available for CS-FFS members during training sessions.

Climate-smart Farmer Field School learning modules and climate-smart agriculture practices

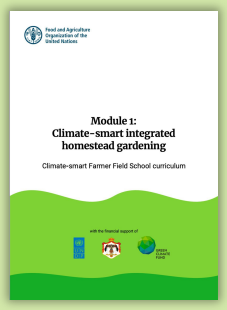
Climate-smart Farmer Field School modules and climate-smart agriculture practices catalogues

The successful implementation of CS-FFS requires a meticulously crafted one-curriculum capable of effectively addressing the diverse needs and challenges encountered by agricultural communities of Jordan. This endeavour is spearheaded by a collaborative effort between FAO represented by the national and international experts, working in tandem with officials from the MOA, during field missions. These missions introduce the core learning modules recommended for inclusion in the CS-FFS curriculum, with a specific focus on cropping systems tailored to the unique context of each participating region.

The modules, outlined below, cover a broad spectrum of topics aimed at equipping farmers with the knowledge and skills necessary to adapt to climate change focusing on water efficient technologies and practices while optimizing productivity and sustainability in their agricultural practices. The selection and customization of modules for individual field schools are influenced by various factors, including geographical location, prevalent cropping systems, available resources, and the collective expertise of participating members.

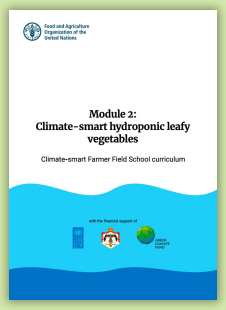
Furthermore, facilitators will undergo comprehensive training in the methodologies, technologies, and skills associated with each module and catalogue ensuring their capability to provide high-quality learning facilities and support to farmer participants. The following modules and catalogues, incorporating recommended CSA practices, have been chosen for the FFS programme targeting Jordanian farmers across four governorates, namely Ma'an, Madaba, Tafileh, and Karak, encompassing the southern valley of Jordan.

Box 2. Climate-smart Farmer Field School modules



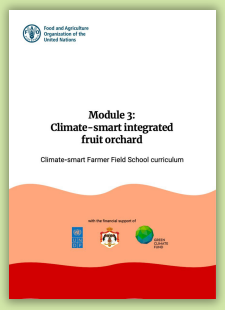
Module 1: Climate-smart integrated homestead gardening

Source: Khalid, J.M., Ibrahim, R.W., Molyneux, N. and Alamoush, R. 2024. *Module 1: Climate-smart integrated homestead gardening – Climate-smart Farmer Field School curriculum.* Amman, FAO. *https://doi.org/10.4060/cd2407en*



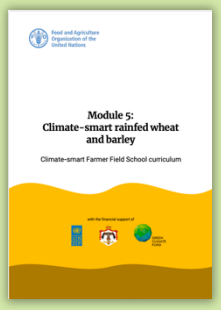
Module 2: Climate-smart hydroponic leafy vegetables

Source: Khalid, J.M., Ibrahim, R.W., Molyneux, N. and Alamoush, R. 2024. *Module 2: Climate-smart hydroponic leafy vegetables – Climate-smart Farmer Field School curriculum.* Amman, FAO. *DOI: https://doi.org/10.4060/cd2585en*



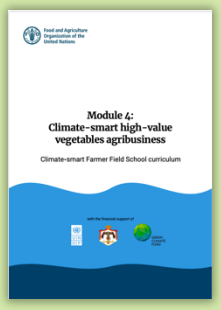
Module 3: Climate-smart integrated fruit orchards

Source: Khalid, J.M., Ibrahim, R.W., Molyneux, N. and Alamoush, R. 2024. *Module 3: Climate-smart integrated fruit orchard – Climate-smart Farmer Field School curriculum.* Amman, FAO. *https://doi.org/10.4060/cd2587en*



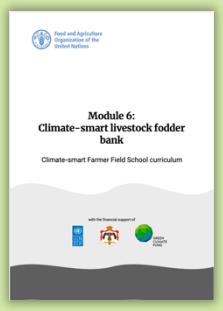
Module 4: Climate-smart high-value vegetables agribusiness

Source: Khalid, J.M., Ibrahim, R.W., Molyneux, N. and Alamoush, R. 2024. *Module 4: Climate-smart high-value vegetables agribusiness – Climate-smart Farmer Field School curriculum.* Amman, FAO. *https://doi.org/10.4060/cd2749en*



Module 5: Climate-smart rainfed wheat and barley

Source: Khalid, J.M., Ibrahim, R.W., Molyneux, N. and Alamoush, R. 2024. *Module 5: Climate-smart rainfed wheat and barley – Climate-smart Farmer Field School curriculum.* Amman, FAO. *https://doi.org/10.4060/cd2751en*

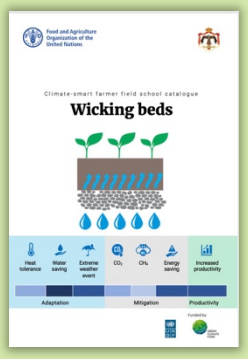


Module 6: Climate-smart livestock fodder bank

Source: Khalid, J.M., Ibrahim, R.W., Molyneux, N. and Alamoush, R. 2024. *Module 6: Climate-smart livestock fodder bank – Climate-smart Farmer Field School curriculum.* Amman, FAO. *https://doi.org/10.4060/cd2755en*

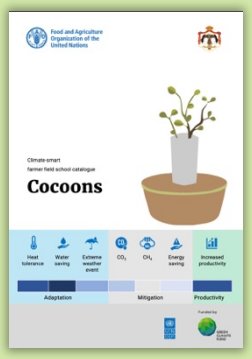
Source: Authors' own elaboration.

Box 3. Climate-smart Farmer Field School climate-smart agriculture technology catalogues



CSA Catalogue: Wicking beds

FAO. 2024. *Climate smart farmer field school catalogue: wicking beds.* Amman, FAO. *https://openknowledge.fao.org/handle/20.500.14283/cd2461en*

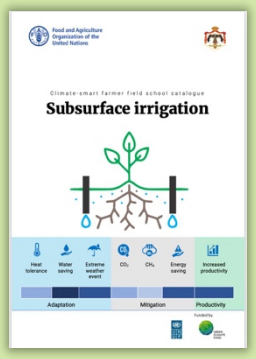


CSA Catalogue: Cocoons

FAO. 2024. *Climate smart farmer field school catalogue: Cocoons.* Amman, FAO. *https://openknowledge.fao.org/handle/20.500.14283/cd2461en*

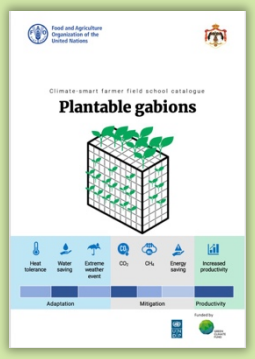
CSA Catalogue: Azolla hydroponic

FAO. 2024. *Climate smart farmer field school catalogue: Azolla hydroponic.* Amman, FAO. *https://openknowledge.fao.org/handle/20.500.14283/cd2664en*



CSA Catalogue: Sub-surface irrigation

FAO. 2024. *Climate smart farmer field school catalogue: Sub-surface irrigation.* Amman, FAO. *https://openknowledge.fao.org/handle/20.500.14283/cd2426en*

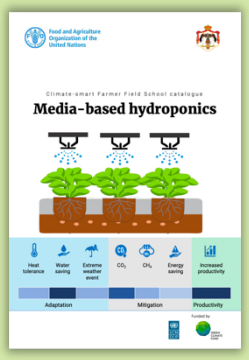


CSA Catalogue: Plantable gabions

FAO. 2024. *Climate smart farmer field school catalogue: Plantable gabions.* Amman, FAO. *https://openknowledge.fao.org/handle/20.500.14283/cd2460en*

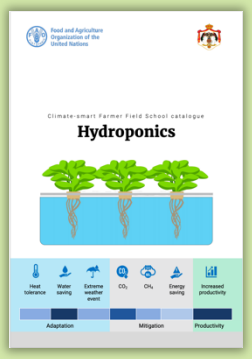
CSA Catalogue: Grow bags

FAO. 2024. *Climate smart farmer field school catalogue: Grow bags.* Amman, FAO. *https://openknowledge.fao.org/handle/20.500.14283/cd2666en*



CSA Catalogue: Media-based hydroponics

FAO. 2024. *Climate smart farmer field school catalogue: Media-based hydroponics.* Amman, FAO. *https://openknowledge.fao.org/handle/20.500.14283/cd2663en*

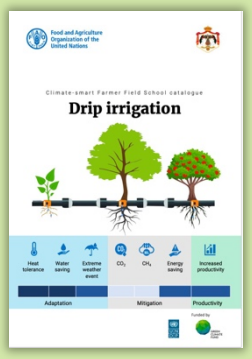


CSA Catalogue: Hydroponics

FAO. 2024. *Climate smart farmer field school catalogue: Hydroponics.* Amman, FAO. *https://openknowledge.fao.org/handle/20.500.14283/cd2899en*

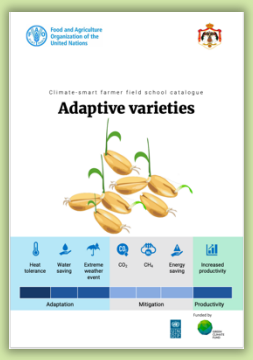
CSA Catalogue: Greywater recycling

FAO. 2024. *Climate smart farmer field school catalogue: Greywater recycling.* Amman, FAO. *https://openknowledge.fao.org/handle/20.500.14283/cd2665en*



CSA Catalogue: Drip irrigation

FAO. 2024. *Climate smart farmer field school catalogue: Drip irrigation.* Amman, FAO. *https://openknowledge.fao.org/handle/20.500.14283/cd2606en*



CSA Catalogue: Adaptive varieties

FAO. 2024. *Climate smart farmer field school catalogue: Adaptive varieties.* Amman, FAO. *https://openknowledge.fao.org/handle/20.500.14283/cd2970en*

Source: Authors' own elaboration.

Table 6. Climate-smart Farmer Field School learning modules matrix

No.	Climate-smart technologies/ practices	Module 1	Module 2	Module 3	Module 4	Module 5	Module 6
		Climate-smart integrated homestead gardening	*Climate-smart hydroponic leafy vegetables*	*Climate-smart integrated fruit orchards*	*Climate-smart high-value vegetables agribusiness*	*Climate-smart rainfed wheat and barley*	*Climate-smart livestock fodder bank*
1	Sub-surface irrigation						
2	Smart irrigation technology						
3	Wicking beds						
4	Cocoons						
5	Plantable gabions						
6	Azolla hydroponic						
7	Hydroponics						
8	Adaptive varieties						
9	Treated greywater						
10	Grow bags (hydroponics)						
11	Strip tillage						
12	Intercropping						
13	Drip irrigation						
14	Greenhouse						
15	Composting						
16	Integrated pest management						
17	Mulching						
18	Livestock -small animals						

No.	Climate-smart technologies/ practices	Module 1	Module 2	Module 3	Module 4	Module 5	Module 6
		Climate-smart integrated homestead gardening	*Climate-smart hydroponic leafy vegetables*	*Climate-smart integrated fruit orchards*	*Climate-smart high-value vegetables agribusiness*	*Climate-smart rainfed wheat and barley*	*Climate-smart livestock fodder bank*
20	Livestock - poultry birds						

Note:

Primary CSA practice selected for core learning activity under the CS-FFS training programme: The practice forms the central focus of the programme.

Cross-cutting CSA practice selected as a supplementary learning activity in the CS-FFS program: This practice complements the primary focus, providing additional knowledge and skills.

Source: Authors' own elaboration.

Climate-smart Farmer Field School farmer skills matrix

Moving beyond passive knowledge transfer, CS-FFS programmes emphasize experiential learning and the development of a comprehensive skillset. This empowers farmers to become self-reliant agricultural decision-makers, equipped to navigate the complexities of modern agriculture and ensure long-term sustainability.

Table 7. Climate-smart Farmer Field School farmer skills matrix

Farmer skill	**Module 1**	**Module 2**	**Module 3**	**Module 4**	**Module 5**	**Module 6**
	Climate-smart integrated homestead gardening	*Climate-smart hydroponic leafy vegetables*	*Climate-smart integrated fruit orchards*	*Climate-smart high-value vegetables agribusiness*	*Climate-smart rainfed wheat and barley*	*Climate-smart livestock fodder bank*
Agroecosystem analysis	Y	Y	Y	Y	Y	Y
Budding and grafting	Y	-	Y	-	-	Y
Clean harvest and grading	Y	Y	Y	Y	Y	-
Disease scouting	Y	Y	Y	Y	Y	Y
Experimentation	Y	Y	Y	Y	Y	Y
Farm/garden layout	Y	Y	Y	Y	Y	Y
Germination test	Y	Y	-	Y	Y	-
Insect scouting	Y	Y	Y	Y	Y	Y
Nutrients scouting	Y	Y	Y	Y	Y	Y
Plant population calculation	Y	Y	Y	Y	Y	Y
Pruning	Y		Y			Y
Record keeping	Y	Y	Y	Y	Y	Y
Soil scouting	Y	-	Y	Y	Y	Y
Trellising of plants	Y			Y		
Water scouting	Y	Y	Y	Y	Y	Y

Farmer skill	**Module 1**	**Module 2**	**Module 3**	**Module 4**	**Module 5**	**Module 6**
	Climate-smart integrated homestead gardening	*Climate-smart hydroponic leafy vegetables*	*Climate-smart integrated fruit orchards*	*Climate-smart high-value vegetables agribusiness*	*Climate-smart rainfed wheat and barley*	*Climate-smart livestock fodder bank*
Weather monitoring	Y	Y	Y	Y	Y	Y
Weed scouting	Y	Y	Y	Y	Y	Y
Optional skills						
Animals' vaccination	Y	-	-	-	-	Y
Bio-pesticides making	Y	-	Y	-	-	-
Business plan development	Y	Y	Y	Y	Y	Y
Insects' traps making	Y	-	Y	Y	-	-

Source: Authors' own elaboration.

Science by farmers – experimentation

In the face of complex agricultural challenges, exacerbated by factors such as climate change and resource scarcity, the traditional model of top-down knowledge transfer in agriculture has proven inadequate. A more participatory and inclusive approach is needed – one that recognizes farmers not as passive recipients of information, but as active agents capable of scientific inquiry and innovation. This is where the CS-FFS approach comes in, offering a powerful model for empowering Jordanian farmers to become experts in their own fields.

The Farmer Field School approach rests on the principles of experiential learning, discovery-based education, and peer-to-peer knowledge exchange. At its core, CS-FFS involves establishing groups of farmers who meet regularly throughout a growing season to conduct field experiments, analyse results, and develop locally adapted solutions. Unlike conventional extension programmes, CS-FFS does not seek to deliver pre-packaged technologies or practices. Instead, it provides a framework for farmers to identify their own problems, design experiments to test potential solutions, and rigorously observe and interpret the outcomes.

The "learning by doing" philosophy of CS-FFS underpins the concept of "Science by Farmers." Farmers are not merely implementing prescribed techniques; they are engaging in a scientific process themselves. They formulate hypotheses, collect and analyse data, and draw conclusions based on evidence. This process not only leads to improved practices but also fosters a deeper understanding of the agroecological principles that govern their farming systems. By becoming scientists in their fields, farmers gain a sense of ownership over their knowledge and a renewed confidence in their decision-making abilities.

The science by farmers model, facilitated through Farmer Field Schools, holds tremendous promise for transforming agriculture. By empowering farmers with the tools and confidence to conduct their own research, farmer can build a more sustainable, resilient, and productive agricultural system – one driven by the knowledge and ingenuity of its most important asset: the farmers themselves.

Key concepts of science by farmers in CS-FFS

- **Agroecosystem analysis:** Remember the AESA? It's the foundation for good experiments. By carefully observing your farm as a whole system, you'll identify problems to solve or opportunities to explore.
- **Hypothesis:** A hypothesis is an educated guess on what might happen if you change something. It guides your experiment! For example: "If I add compost to my soil, my bean plants will produce more beans."
- **Variables:** These are the factors you change or keep the same during an experiment. You should only change one variable at a time to know what's working.
- **Control:** A control plot or treatment is a baseline for comparison, where you don't make any changes. This helps you see if your experiment made a difference.

A. Agroecosystem analysis

Definition

An agroecosystem is a cultivated area viewed as an ecological system. It comprises various components, including crops, livestock, soil, pests, beneficial insects, weeds, weather, and the socio-economic factors influencing farmers' decision-making processes.

Dynamic nature

Agroecosystems are not static. They are constantly evolving in response to natural processes, climate patterns, and farmers' interventions. Recognizing this dynamic nature is essential for effective management.

Agro-ecosystem Analysis (AESA) serves as a foundational component within CS-FFS, offering a participatory learning framework that empowers farmers to become proficient in managing their agricultural systems as an expert farmer. AESA makes farmers experts and enables them to systematically observe and analyse the intricate relationships within their crop or farm ecosystem, facilitating informed decision-making to enhance productivity and sustainability.

At the core of the CS-FFS approach, AESA is rooted in the ecosystem concept, recognizing the unique role of each element within the farm or field. In CS-FFS, AESA entails observing crop fields, farm system, animals, collecting and analysing data, and providing recommendations. Through regular observation of crop or livestock systems, AESA exercises elucidate the interactions between crops, animals and other biotic and abiotic factors. Data collected from these observations are utilized to inform decision-making processes, establishing a systematic approach to management.

AESA exercises are conducted within sub-groups consisting of four to five members, fostering participatory learning and collaboration. Each sub-group presents their observations and recommendations during plenary sessions, facilitating collective decision-making on management actions.

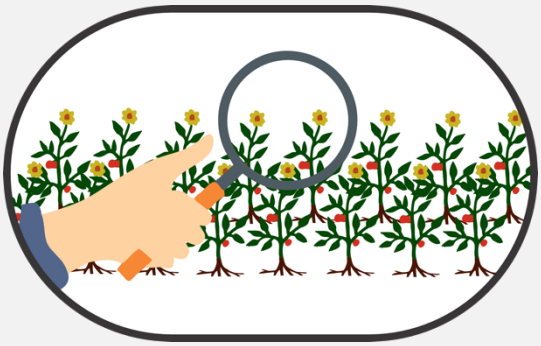
An agroecosystem encompasses a cultivated area viewed through an ecological lens, integrating various components such as crops, livestock, soil, pests, beneficial insects, weeds, weather patterns, and socio-economic factors. Recognizing the interconnectedness of these elements is essential for understanding the dynamics of agricultural systems and guiding farmers' decision-making processes towards sustainable practices.

AESA exercises improve decision-making skills by:

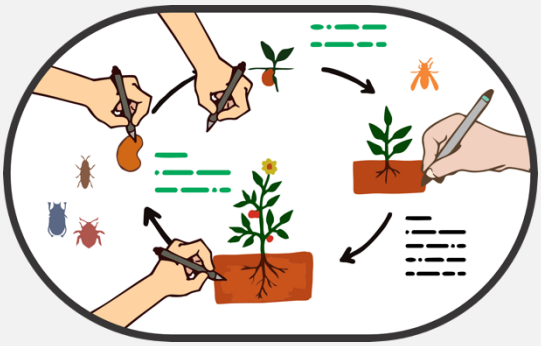
- enhancing observational skills,
- developing record keeping skills by drawing simple forms,
- generating discussions and sharing of farmer-to-farmer experience and
- developing presentation skills to promote communal decisions.

Figure 1. The agroecosystem analysis

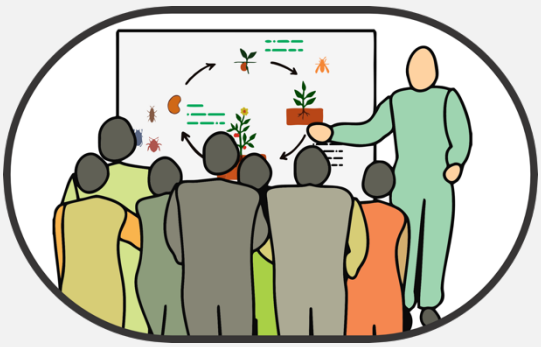
Agroecosystem analysis process



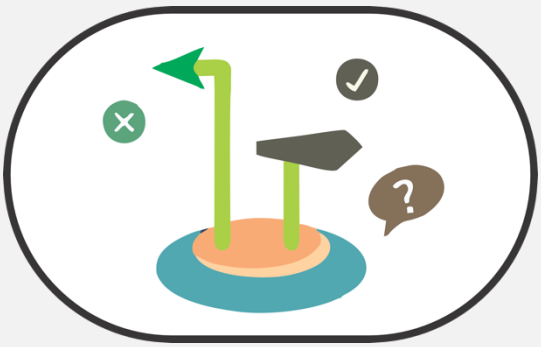
Step-1 Field-based observation: Farmers are divided into sub-groups and tasked with observing field conditions based on a set of predefined indicators. The focus of this stage is to understand the interrelationships between different components within the agroecosystem.



Step-2 Data analysis and documentation: Each sub-group examines, documents, and analyses their field observations. This includes drawings of the field conditions and formulating detailed recommendations and decisions based on their findings.



Step-3 Feedback presentation and discussion: All sub-groups reconvene to share their findings and conclusions with the larger group. The presentation of results is followed by a question-and-answer session where the presenting group must justify their analysis and recommendations.



Step-4 Collective action planning: The full group synthesizes the information and insights gained from each sub-group's presentation. Through collective discussion, the participants agree on a set of actions to be implemented based on the shared understanding and decisions reached.

Source: Authors' own elaboration.

Benefits of agroecosystem analysis

- AESA shifts the focus from external experts to farmers. Farmers develop confidence in their ability to understand and manage their agroecosystems.
- Decisions are grounded in farmers' own observations and analysis, leading to more contextually appropriate and effective solutions.
- AESA encourages focus on the interconnectedness within the system, fostering long-term sustainability in crop production.
- The group setting of FFS promotes knowledge exchange and the development of a supportive community of practice.

The agroecosystem analysis process

AESA in Farmer Field Schools follows a structured yet adaptable process:

Step 1. Field-based observation

AESA starts with careful observation. Farmers regularly walk their fields/ observe their production system, paying close attention to their crops, soil health, water availability, weather, and the presence of pests, diseases, and helpful insects.

Step 2. Data analysis, and documentation

Farmers collect their observations systematically, often using charts or diagrams to make it easier to understand, especially for those with varying literacy levels. Recording these details over time helps farmers spot patterns and track how their farm environment changes. This enables them to analyse their agroecosystem and make informed decisions for better farming practices.

Step 3. Feedback presentation and discussion

In their CS-FFS groups, farmers present and discuss the data they've collected. They look for patterns, connections between different parts of their farm (like weather and pest problems), and the root causes of any challenges they face. This group discussion turns simple observations into valuable knowledge, as farmers learn from each other and gain different perspectives.

Step 4. Collective action planning

With the insights gained from the analysis, farmers develop practical strategies to improve their farms. These strategies are tailored specifically to their farm's conditions and the challenges they have identified. Decisions might involve changing irrigation practices based on soil and weather data, using specific techniques to control weeds, enhancing beneficial insect populations, choosing disease-resistant crops, or adopting integrated pest management approaches. AESA empowers farmers to make informed, targeted decisions that improve their crop production and promote sustainable practices.

Step 5. Experimentation and adaptation (optional)

After discussing potential solutions, it's time to test them out. This is where the learning in AESA really gets exciting. Farmers can set up small experiments to try different methods and compare results. For example, you might test if a new irrigation technique saves water, or whether a certain plant mixture helps keep pests away. Careful observation and tracking of the experiment's results will help farmers see what works best for their specific farm. The FFS group supports this by sharing ideas and encouraging each other to keep trying new things to improve their farming practices. Small experimentation is always encouraged to be implemented on the non-host farmers plots, to further improve participation and learning equally.

Tools and techniques in AESA

- **Water and soil analysis kits:** allow farmers to examine moisture condition, nutrient levels and other soil parameters. Some basic sensors for water and soil can help more scientifically the farmers in analysing their field for water and soil quality during the field school learning programme.
- **EC meter**
    - NPK sensor
    - Moisture sensor
    - pH sensor
- **Insect traps and sampling methods:** used to monitor pest populations and assess beneficial insect activity. For example,
    - Sticky traps – brightly coloured, sticky surfaces attracting flying insects for identification and population counts e.g. yellow sticky cards for whitefly.
    - Pheromone traps – used to attract and capture specific pests for monitoring e.g. Methyl eugenol for fruit fly.
    - Sweep nets – used to sample insects in tall vegetation.
- **AESA chart or board:** A visual representation used to organize observations and facilitate analysis. It provides a visual platform for organizing and comparing observations and analyses from the farmer's field. AESA charts can be simple including:
    - Crop growth stages and corresponding weather data.
    - Plant health observations.
    - Soil/water analytical results (visual observation or using kit if available).
    - Insect populations over time.
    - Interpretation and recommendations
    - Final decision and action plan
- **Diagrams and pictorial representations:** simplified representations for farmers with limited literacy. The following could be useful while making AESA chart for presentation.

- Simplified plant life cycles.
- Drawings or photographs of insects (beneficial insects vs. pests).
- Symptoms of plant diseases or nutrient deficiencies.
- Basic flowcharts for decision-making.

B. Designing experiment

The science by farmers' model, used at the field school level, follows the minimum standards for experimental design. Here's a breakdown of the essential components of a well-designed experiment:

1. **Problem or opportunity:** What specifically does a farmer want to improve or understand better? Start with an idea that excites them and relates to their AESA observations.

2. **Hypothesis:** State the idea as a testable prediction. Example – planting a drought tolerant variety of wheat will increase the chance of crop success in low rainfall.

3. **Experimental plots:** Set up at least two plots - one for change (the 'treatment') and one as control (no change). Keep plots as similar as possible (soil type, sunlight, etc.).

4. **Data collection:** Decide what will be measured (input amount, water quantity, yield, plant health, pest numbers, etc.) and how often. Keep careful records!

5. **Timeline:** The experiment should follow the entire crop cycle or last long enough to see a difference. However, some experiments may be about the off-production cycle and follow the proposed design of the experiment accordingly.

Box 4. Sample experiment

Sample experiment	Compost boost
Problem	Low yields and poor soil health
Hypothesis	Adding compost to my soil will improve plant growth and yield.
Materials	Beans seed or any available seeds, compost, notebook, pencil, tagging cards, small experimental area etc.
Procedure	**Plots** Plot A – Receives compost treatment Plot B – Receives no compost (control) **Data** • Plant height and health observations weekly • Final bean yield (weight)
Timeline	Whole bean/crop growing season

Discussion	• Compare data: did your treatment plot outperform the control? Look closely at your records. • Group discussion: what did other CS-FFS participants observe in similar experiments? • Don't be afraid of 'failure': experiments sometimes don't turn out as expected. That's valuable information too! Identify what you might change for next season.
Conclusion	• Adapting solutions: tailor the successful practices to your whole farm, keeping local conditions in mind. • Knowledge sharing: share your findings with other farmers, your CS-FFS group, and your community to spread successful ideas.

Source: Authors' own elaboration.

Examples of experiments on water and soil dynamics

Objectives

- Provide farmers with a practical understanding of soil texture, water infiltration, water holding capacity, and their implications for irrigation management.
- Enhance farmers' observational skills regarding soil moisture dynamics in the field.
- Promote decision-making informed by soil and water characteristics for improved crop production and resource efficiency.

Experiment 1	**Investigating the impact of soil type on water infiltration rates**
Problem	Understanding how water moves through different soil types is crucial for optimizing irrigation practices and minimizing water loss in agriculture, especially in water-scarce regions like Jordan.
Hypothesis	Soil texture (sand, loam, clay) significantly influences water infiltration rates, with coarser soils demonstrating faster infiltration and finer soils showing slower infiltration.
Time	30 minutes
Timeline	1–2 hours (depending on soil collection and processing)
Materials	Transparent columns, diverse soil types (sand, loam, clay, potentially structured and compacted soil samples), rulers, water, timer.

Procedure	1. Soil preparation:
	  ○ If possible, collect soil samples from different areas of the field or region to represent potential variability.
	  ○ Dry and sieve the soils to remove large debris (optional but helps standardize texture).
	2. Column setup:
	  ○ Fill each transparent column with a different soil type, creating distinct layers. Ensure consistent packing of soil within each column.
	  ○ Mark the columns with height increments for easy measurement.
	3. Water application:

- Measure and record a standardized amount of water (enough to create observable infiltration).
- Carefully pour the water onto the surface of each soil column, trying to distribute it evenly.
- Start the timer immediately.

4. Data collection:
   - At regular time intervals (e.g. every 1 minute, 5 minutes, 10 minutes), record the depth of the wetting front (the visible boundary of where water has penetrated) in each column.

Discussion

- Graphically visualize the infiltration rate for each soil type (depth of wetting front vs. time).
- Which soil type showed the fastest infiltration? Which was the slowest?
- Discuss how the particle size, porosity, and structure of each soil type influenced its infiltration rate.
- Did the infiltration rate differ in the compacted soil sample?
- Explain how these observations would impact.
- Would sandy soils need more frequent watering compared to clay soils?
- How can these findings help avoid waterlogging or runoff?

Conclusion

- Summarize the key findings on how soil type affects water infiltration.
- Emphasize the importance of understanding soil properties for efficient water management in agriculture.

Note

- If possible, run multiple trials with each soil type to ensure accuracy.
- If feasible, include a simple soil texture analysis (using sieves or a sedimentation test) to further reinforce the link between particle size and infiltration.

Experiment 2	**Determining water holding capacity of different soil types**
Problem	Understanding a soil's water holding capacity is essential for effective irrigation management in water-scarce regions like Jordan. This experiment will help farmers determine how much water their specific soil types can hold.
Hypothesis	Different soil types will have varying water holding capacities, with sandier soils holding less water than those with higher clay or organic matter content.
Time	30 minutes
Timeline	Organize soil samples during the training session and leave them for drying in open air. Do an experiment in the next session.
Materials	Several representative soil types: collect samples from different areas of the farm or region (e.g. sandy soil, clay-rich soil, loam)., Funnels, filter paper, graduated cylinders (sized to collect sufficient drainage), water, lab scales (accurate to at least 0.1 gram).
Procedure	• Determine dry weight of soil samples. • Saturate soil and allow excess water to drain. • Re-weigh saturated soil samples. • Calculate water holding capacity as a percentage of soil dry weight.
Discussion	• Compare water holding capacities across soil types and discuss the concept of plant available water. • Address practical irrigation scheduling based on how much water different soils can hold before the next irrigation event.
Conclusion	• Summarize the main findings of the experiment, emphasizing how farmers can use this knowledge to optimize their irrigation practices in Jordan's water-scarce conditions.

Experiment 3	**Investigating root zone characteristics to optimize irrigation practices**
Problem	Understanding root zone characteristics is crucial for efficient water use in agriculture. This experiment aims to directly visualize root systems of diverse crops to support better irrigation decisions.
Hypothesis	Different crop varieties will exhibit distinct differences in root depth and spread, influencing their optimal irrigation requirements.
Time	45 minutes
Timeline	• The experiment itself can be completed within a day depending on the number of plant samples. • Follow-up discussions and analysis can take place over subsequent Farmer Field School sessions.
Materials	Shovels, measuring tapes, diverse crop or plant specimens (choose a variety of crops, including local, economically relevant ones), root-washing station (if available – this could include buckets, hoses, and sieves), notebook and pens for data recording.
Procedure	• Choose a variety of crops relevant to your area, including both shallow-rooted and deep-rooted plants, if possible. • Carefully dig around selected plants to expose their root systems, minimizing damage. ○ Measure the maximum depth of root penetration. ○ Measure the lateral spread of the roots (the extent from the plant's base) • If available, carefully wash the roots over a sieve to observe finer root structures. • Record the plant species, root depth, lateral spread, and any notable observations about root structure. Take photos if possible.
Discussion	• Which crops had deeper roots vs. shallower roots? • What differences were observed in root structure between crops (e.g. fibrous vs. taproot)? • How might the observed root characteristics influence water uptake by different plants?

- How can this knowledge be used to tailor irrigation schedules (e.g. shallower watering more frequently for shallow-rooted crops)?
- Are there local practices that seem particularly well-suited or ill-suited due to the root observations?

Conclusion

- Summarize the range of root systems observed.
- Emphasize the importance of considering crop-specific root architecture when designing irrigation systems.
- Discuss how this knowledge can promote water conservation and enhance crop productivity.

Experiment 4 **Mulching for evaporation reduction**

Problem High temperatures and arid conditions in Jordan lead to rapid water evaporation from the soil. Can mulching help conserve soil moisture?

Hypothesis Mulching will reduce evaporation, helping soil retain water longer and improve crop health.

Time 45 minutes

Timeline The length of the experiment will depend on the crop's growing season.

Materials

- Two similar plots of land or no. of plants already cultivated one with organic mulch material (black mulch, straw, leaves, wood chips, etc.) and the other without mulching.
- Soil moisture meter (optional)

Procedure

- Comparing the crops cultivated under mulching vs the crop cultivated without mulching, assuming providing the same inputs.
- Water both plots at the same time and in equal amounts.
- Monitor soil moisture regularly in both plots (either visually or with a moisture meter).
- Observe plant health, growth rate, and signs of water stress.
- Harvest both plots at maturity. Weigh and record yield from each plot.

Discussion

- Did the mulched plot retain moisture for longer periods than the un-mulched plot?
- Were there differences in plant health between the two plots?
- Was there a difference in crop yield?
- What are the costs/availability of different mulch materials?

Conclusion

- Summarize findings and discuss the effectiveness of mulching for the farmers.

Experiment 5 **Spread the use and optimizing sub-surface irrigation depth for orchards**

Problem Subsurface irrigation can save water, but optimal placement depth for orchard trees in Jordanian conditions is unknown, while sub-surface irrigation is newly introduced to many farmers within the Jordanian conditions.

Hypothesis There is a specific subsurface drip irrigation depth that maximizes water efficiency and tree health in orchard settings.

Time 120 minutes (perform this experiment during establishment of CS-FFS learning plot)

Timeline One full growing season

Materials

- Subsurface irrigation lines
- Tools for installing lines at different depths (drippers, drills, etc.)
- At least 3 fruit orchard plots (or at least one dunum)
- Water source
- Soil moisture meters

Procedure

1. Divide a section of the orchard into three plots (and consider having a control).
2. Install subsurface lines at different depths:
    - plot 1: shallow (e.g. 15 cm),
    - plot 2: medium (e.g. 30 cm),
    - plot 3: deeper (e.g. 45 cm).
3. Irrigate all plots with the same water volumes throughout the season.
4. Monitor soil moisture meters at root level and below irrigation lines.
5. Observe tree health throughout the growing season in all plots.
6. Compare fruit yield between plots.

Discussion

- Which depth led to the best moisture retention at root level?
- Which depth showed the least moisture loss below the root zone?
- Were there differences in observed tree health across plots?

- Did fruit yield differ between the depths?

Conclusion

- Determine an ideal depth for subsurface drip irrigation lines for this orchard, balancing water efficiency and tree productivity.

Important considerations

- Farmer field schools emphasize farmer-led learning. Ensure farmers are involved in designing the study, monitoring results, and discussing implications.
- Soil type will influence water movement, tailor experiments to the specific soil conditions.
- Adapt experiments to the type of orchard trees (e.g. citrus, olive, etc.).
- Help farmers explore the cost-benefit analysis of these systems compared to traditional methods.

Non-formal education participatory learning exercises

Climate-smart Farmer Field Schools stand out from traditional agricultural training programmes by embracing non-formal education (NFE) exercises. These interactive activities go beyond rote memorization and lectures, fostering a dynamic learning environment that empowers farmers. NFE exercises are not just about making learning fun. They are the cornerstone of the CS-FFS approach, fostering a sense of ownership and transforming farmers from passive learners into active participants in their own agricultural development. By building critical thinking, communication, and collaboration skills, NFE exercises empower farmers to become successful agricultural entrepreneurs and drive innovation within their communities.

The CS-FFS programme leverages NFE methods to cultivate a new generation of empowered and knowledgeable agricultural practitioners. This approach departs from traditional classroom settings, fostering a dynamic learning environment specifically tailored to the needs of rural farming communities. The following are the core NFE methodologies.

Participatory methods and tools

The CS-FFS approach is a participatory process focusing on farmers' needs, knowledge, and capacity for learning. Because the approach is based on the principles of participatory learning and action, this guide provides an overview of the principles of participation and the types of participatory methods and tools. It also provides guidelines on how the methods and tools can be used.

Principles of participation

Participatory methods and approaches are becoming increasingly important in the context of sustainable development, while participation, action research and adult education are all helping to empower the poor. Participation also helps to develop people as it enhances communication and understanding between different groups. In addition, interaction between people from different institutional contexts tends to promote innovation.

There are many variations in the way participatory methods are used, not only because each site is unique, but also because the methods can be employed to serve many different objectives. This guide focuses mainly on the use of participatory methods for participatory planning, learning, and for MEAL. When using participatory methods, CS-FFS facilitators should take account of the following principles (adapted from Pretty *et al.*, 1995):

- Everyone is different and makes different evaluations of situations; therefore, everyone's opinion is important. Seek diversity not simplicity.
- Ensure that groups interact and that diverse views are incorporated in the learning process. Unity is strength.
- The approach should be adapted to suit each different condition, objective, and community.
- External experts should help people carry out their own studies, thereby learning and achieving their own objectives.

- Leading to change: The process of joint analysis and dialogue helps people implement the defined changes.

Guiding principles of NFE participatory learning in Climate-smart Farmer Field School

- **Farmer-centric -**The programme prioritizes the existing knowledge and lived experiences of farmers. Facilitators act as guides rather than instructors, fostering a collaborative learning environment.
- **Context-specific -** Learning is directly tied to the specific agricultural cycle, local environment, and the unique challenges faced by the participating farming community.
- **Collaborative -** Active participation, group work, and mutual support are fundamental aspects of the CS-FFS approach.
- **Discovery-based learning -** CS-FFS encourages exploration and experimentation. Rather than providing pre-determined solutions, the programme equips farmers with the tools and knowledge to conduct trials and discover optimal practices for their specific contexts.
- **Gender and social inclusion -** CS-FFS programmes should strive for inclusivity, ensuring NFE methods are accessible and encourage participation from underrepresented groups within the farming community.

Non-formal education participatory learning methods glossary

Table 8. Non-formal education participatory learning methods glossary

Method	Tools /technique	Definition
Informal interviewing	Semi-structured interviews	A semi-structured interview is a qualitative research method that combines a pre-determined set of open questions with the opportunity for the interviewer to explore themes or responses further. Unlike in a structured interview, the phrasing and order of the questions are not set, allowing for flexibility. This method is often used in social sciences and other research fields.
	Focused group discussion (FGD)	A qualitative research method focused on obtaining in-depth insights through a carefully structured discussion among a small, purposefully selected group.
Illustrative approach – Visual methods	Participatory mapping	Participatory mapping is a method that allows individuals, including both literate and non-literate participants, to contribute to the creation of maps that display biophysical, economic, and social indicators. These maps can include a variety of features, such as livestock mobility routes, grazing areas, natural resources, and social structures. The process of creating these maps is interactive and inclusive, enabling many people to be involved and share their ideas.
	Seasonal calendars	Seasonal calendars are a useful method for understanding seasonal variations in disease occurrence, weather, labour needs, cash, fodder availability, etc. They help participants to visualize, understand and discuss when and why problems occur.
Advanced workshop method (AWM)	Colour cards	The advance workshop methods comprise uses of brainstorming through colour cards with the following four steps i- Brainstorming ii- Categorization /clustering

Method	Tools /technique	Definition
		iii- Prioritization /voting iv- Action plan
	Sprint drawing	Sprint drawing is an advanced technique of brainstorming activity with visuals where participants draw their thoughts in a sprint way. For example: drawing on cards rather than writing the words
Group work	Big group	Group work is defined as work done by a group of people in collaboration. Group work with the engagement of the whole group of field school i.e. 20–30 persons.
	Sub-group	The group works with the engagement of sub-groups of field school i.e. 4–6 persons per group working together.
Facilitation /brainstorming session	Participatory brainstorming session	A pull–push technique is used by the facilitator to engage participants through questioning to ensure their participation and learning purposes rather than lecturing them.
Lecture presentation	Straight forward presentation by facilitator or guest speaker in the field school	
Discovery learning	Transit walk	Participants organize a walk to discover the field under the supervision of facilitators
	Field observation	Critical observation of field crops, farm setting, orchard, garden, backyard, home, and surroundings For example: doing AESA
Beginning exercises	Starting/beginning exercises are good examples to show the increase in brotherhoodness. In starting/ beginning exercises includes exercises like “Training participant’s introduction, expectations and concerns from training exercises and strength, weakness, opportunities and threats (SWOT) analysis are worth mentioning.	
	Team building is a collective term for various types of activities used to enhance social relations and define roles within teams, often involving collaborative tasks. The purpose of team-building activities is to motivate your people to work together,	

Method	Tools /technique	Definition
Team /group building exercises	develop their strengths, and address any weaknesses. So, any team-building exercise should encourage collaboration rather than competition. For example: Building the tower	
Trust/ confidence building exercises	Trust-building activities are games or exercises that are used to help their participants create trust and powerful working relationships with one another. The trust-building exercises develop trust between participants so that they can work more effectively. For example: Trust fall	
Ice-breaker and energizer	Breaking the ice in the process of learning and creating interest among training participants during training is called an icebreaker. This ice breaker is not necessary for those environments where training participants know each other very well, but it is very successful in those places where participants are strangers to each other. Icebreaker are varied and can be implemented in any activity in which all training participants are included physically and mentally. For example: Hugging the balloon	
Groups dynamic	The group dynamic is a joint effort of a group in which different forces or elements of the environment correlate at any time and by which there is a change in the individual, group, environment, or circumstances. Group dynamic exercises are meant to eliminate negative behaviour, increase relations and harmony among training participants and accelerate the learning process. Group dynamic exercises may be game exercises; trust-building exercises and starting exercises are being used very regularly in the Farmer Field School and for training assistants and advisor partners. Group dynamic exercises are used to achieve the following objectives. For example: Nine dots	
Role play	Role-playing takes place between two or more people, who act out roles to explore a particular scenario. It's most useful to help you or your team prepare for unfamiliar or difficult situations. For example, you can use it to practice sales meetings, and interviews.	

Source: Authors' own elaboration.

a. Semi-structured interviews

Informal dialogue and interviewing are commonly one of the first steps in participatory planning activities. Taking time to talk to people will set the right atmosphere. Interviewing is a specialized skill that improves with practice. Guidelines on how to use interview methods and techniques are presented below.

Objectives	• To set a conducive atmosphere for CS-FFS development • To gather general and specific information on water usage in Jordanian farming
Time	Approximately 1 hour per interview
Materials	Customized checklist of discussion points and exercises, questions on the water usage in the Jordanian agriculture sector, note-taking materials (pen/paper, or recording device with permissions).
Facilitation technique	Semi-structured interview
Procedure	• Introductions – self-introduction, clear purpose, manage expectations. • Questioning – open-ended, avoid closed/leading, start general then specific. • Observation – non-verbal cues, participation patterns, sensitive topics. • Probing – detailed follow-up on farmer-raised themes, check consistency.
Conclusion	• Summarize main points, possibly with participants for validation. • Share the gathered knowledge on the topic with colleagues, farmers and relative agriculture members. • Express gratitude.

b. Focus-group discussion

A focus-group discussion aims to collect general information, clarify details, or gather opinions from a small group of selected people who represent different viewpoints. A group of 4–8 people is ideal. The group is presented with a broad question, for example: “What impact do you think the AESA has on farmer practices?” Let the group discuss this question for the time agreed upon. The facilitator observes and helps the group to maintain the focus of the discussion. After the discussion has ended, the facilitator notes down the results.

Objectives	• Gather a wide range of opinions, beliefs, and experiences on a specific topic. • Explore the 'why' behind perspectives, uncovering motivations and reasoning. • Identify areas of consensus or disagreement, highlighting potential conflicts or shared understandings
Time	Allocate a pre-determined time frame for the discussion (typically 60 – 90 minutes), allowing for both introduction and thorough exploration.
Materials	A well-defined central question or a set of guiding discussion topics, note-taking materials (pen/paper, digital recording devices if permissions granted). Optional: Visual aids or stimuli relevant to the topic (images, prototypes, etc.).
Facilitation technique	Group discussion
Procedure	1. Introductions – welcome participants, outline the purpose, create a safe space for open sharing. 2. Present the broad question/topics – clearly introduce the topic(s) of interest. 3. Facilitate discussion – encourage balanced participation, probe for deeper insights, manage conversational flow, and ensure focus on the topic(s) at hand. 4. Observation – actively observe group dynamics, non-verbal cues, patterns in responses, and potential areas of tension or strong agreement. 5. Record – thoroughly document key points, themes, notable quotes, and any recurring patterns or contradictions that emerge.
Conclusion	• Summarize main findings with the group (optional – can improve clarity and validate interpretations).

- Thank participants for their contributions and reiterate the value of their insights.

Additional notes

- Careful participant selection is key. Aim for diversity while ensuring some common ground to foster meaningful exchange.
- The facilitator's role is to create a conducive environment for open sharing and to guide the exploration of the topic without imposing their own views.
- Successful focus groups allow for a natural flow of ideas where participants build on each other's contributions and reveal unexpected insights.

c. Participatory mapping

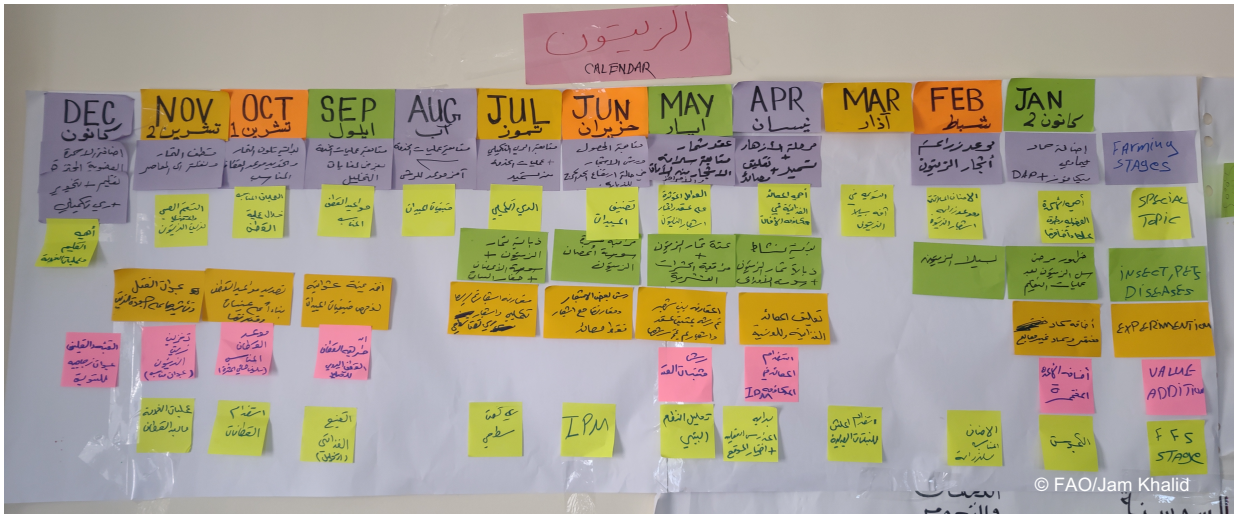
A collaborative process where communities create visual representations of their spatial knowledge and perceptions about a specific topic or area.

Objectives	• Provide a tangible, shared understanding of how water scarcity affects different agricultural elements (gardens, orchards, crops, livestock) within the village community. • Facilitate easy recording, analysis, and feedback within the group.
Time	45 minutes
Materials	Locally available items: sticks, stones, leaves, etc. Flip charts, markers, notebooks for additional notes or copies of the map
Procedure	1. Find a suitable open space, clearly explain the mapping goals, emphasizing the focus on water scarcity's effects. Outline key features to be included (from the original exercise). 2. Encourage the group to collaborate freely, using natural materials to construct their map. The facilitator provides support but avoids interfering with the process. 3. Discreetly monitor progress, offering time extensions if needed. Pay attention to potential areas of focus the farmers seem to highlight. 4. Upon completion, facilitate a discussion where the group explains their map. Probe for deeper insights about areas with severe water-related challenges or innovative local practices. 5. Assist the group in adding a sense of scale (e.g. walking time between points) and a north-south orientation for context. 6. Create two large, clear copies of the map, giving one to the community. This enables further analysis and continued discussion and action planning.
Conclusion	• Guide a reflective discussion focusing on the map's insights. • Explore potential solutions, areas for further investigation, or immediate steps the community might take to address water scarcity challenges.
Additional notes	• Encourage representation from diverse agricultural practices within the group for a holistic view of water scarcity's consequences. • The facilitator's role is primarily to set the stage, observe, and guide the discussion. The community's knowledge and solutions should be central.

- Consider using the completed map as a springboard for further participatory exercises focused on water conservation and resource management.

d. Seasonal calendar

A visual tool to represent and analyse cyclical patterns in agriculture, such as disease, weather, resource availability, labour demands, etc. This exercise focuses on water stress and cropping cycles.



Objectives	• Map out periods of water stress and their impact on different crops throughout the year. • Identify critical points in the growing season where water scarcity is most detrimental. • Utilize the calendar as a decision-making tool for water management, crop selection, and scheduling practices.
Time	Approximately 1 hour, with potential for follow-up activities based on the calendar's insights.
Materials	• Locally available materials (sticks, stones, etc.) to create the calendar on the ground or • Markers, flip charts, pens, notebooks, and colour stickers. • Optional – prepared pictorial representations of crops and water-stress indicators to use with the calendar.
Facilitation technique	• Participatory seasonal calendar

Procedure

1. Timeline setup – construct a horizontal timeline representing a year. Divide it into relevant Jordanian seasons or months, clearly labelling each section.

2. Rainfall mapping – using stickers, have farmers indicate typical rainfall patterns by season (more stickers = heavier rainfall). Record this for reference.

3. Adding crops – introduce each crop type (written name, picture, or specimen). Ask farmers to map on the timeline when each is typically grown/harvested.

4. Water stress – with stickers, have farmers indicate the severity of water stress experienced by each crop during different points in their growth cycle.

5. Discussion – facilitate a discussion, probing with "why" questions to understand the reasoning behind water-stress indicators. Identify crucial periods and explore solutions to mitigate water scarcity during those times.

6. Documentation – thoroughly record the discussion, calendar layout, and farmers' insights. Create clear copies, one for the community, to facilitate further analysis and action.

Conclusion

Summarize key insights from the calendar. Discuss potential changes in practices (e.g. crop selection, planting times, water-conservation techniques) using this new visual understanding of water-crop interactions.

Additional notes

- Encourage diversity in the group, ensuring different crops are represented.
- The facilitator primarily guides setup, discussion, and documentation. The farmers should be the driving force in mapping crop cycles and water-stress challenges.
- For farmers with low literacy, focus heavily on pictorial representations during mapping.
- Consider using the calendar as a foundation for further exercises on drought-resilient crops or water harvesting techniques targeted to the specific needs identified.

e. Advanced Workshop Method

Advanced workshop method (AWM) offers a structured approach to brainstorming and prioritizing ideas. It utilizes colour cards to categorize large volumes of ideas during brainstorming sessions. Participants sort ideas based on factors like potential benefits (green) or limitations (red), then vote on the most promising ones. This method, along with visual techniques like sprint drawing, fosters creative thinking and helps groups effectively choose the most relevant solutions to explore further.

Exercise	**Climate-smart agriculture practices session with AWM**
Objectives	• Brainstorm a wide range of CSA practices using visuals. • Categorize and prioritize the most promising practices for local adoption. • Develop an action plan for further exploration of chosen practices.
Audience	Farmers in FFS, agricultural extension workers in training of facilitators /trainers (TOF/TOT), or anyone interested in learning about CSA practices.
Time	60 minutes
Materials	Large sheets of paper (flipcharts or butcher paper), markers, coloured cards (4 different colours), sticky notes
Facilitation Technique	AWM with colour cards and sprint drawing
Procedure	1. **Introduction (5 minutes)** • Briefly introduce the concept of climate change and its impact on agriculture. • Explain the purpose of the session to explore and prioritize CSA practices using the AWM method. 2. **Brainstorming** A. Brainstorming with colour card (10 minutes) o Think about the challenges you face due to climate change in your agriculture. Imagine solutions! Spend 2 minutes writing on the cards about what a CSA practice(s) is suitable to address these challenges. Encourage creativity and ideas.

B. Brainstorming with sprint drawing as second option (15 minutes)

- Think about the challenges you face due to climate change in your agriculture. Imagine solutions! spend 3 minutes drawing on a sheet of paper what a CSA practice might look like to address these challenges. Encourage creativity and visual representation of their ideas.

3. **Categorization & clustering (10 minutes)**
   - Provide each participant with 4 coloured cards.
   - Instruct participants to review the cards or drawings on the sheets and use their coloured cards to categorize practices:
     - **Green:** Practices that seem very beneficial and relevant.
     - **Yellow:** Practices with potential but needing further discussion.
     - **Red:** Practices with significant limitations or not relevant to the context.
     - **Blue:** Questions or points for clarification.
   - Facilitate participants to cluster similar drawings based on their color-coded categories.

4. **Prioritization & voting (15 minutes)**
   - Discuss each cluster, focusing on the green and yellow categories.
   - Facilitate a brief discussion to clarify any blue-coded questions.
   - Provide each participant with 3 sticky notes.
   - Facilitation prompt: "vote for the 2 most promising CSA practices you'd like to explore further. Use the sticky notes to vote (1 vote per note)."
   - Collect the sticky notes and tally the votes for each practice within the green and yellow clusters.

5. **Action plan (15 minutes)**
   - Identify the top 2–3 practices based on the vote tally.
   - Use a large sheet of paper to create an action plan for each chosen practice.
   - Action plan sections:

- **Practice:** Briefly describe the chosen CSA practice.
- **Who:** Identify who will take the lead in exploring this practice further (individual, group, etc.)
- **What:** List specific steps to learn more about the practice (research, demonstration plots, etc.)
- **When:** Set a timeframe for each action step.
- **Resources:** Identify any needed resources (funding, materials, etc.)

6. **Wrap-up and reflection (5 minutes):**
    - Briefly summarize the key CSA practices discussed and chosen for further exploration.
    - Encourage participants to reflect on their learning and next steps outlined in the action plan.

Benefits of AWM with colour cards and sprint drawing

- Encourages active participation and visual thinking.
- Provides a quick and efficient way to categorize many ideas.
- Helps prioritize practices based on perceived benefits and limitations.

Additional notes

- Consider adapting the color-coding system based on specific needs (e.g. feasibility, cost, etc.).
- The facilitator can adjust the time allocated for each stage depending on the group size and complexity of discussion.

Facilitation /brainstorming session (pull–push technique)

In a participatory brainstorming session, facilitators utilize a pull–push technique to actively engage participants in collaborative problem-solving. Instead of adopting a traditional lecture-based approach, facilitators employ strategic questioning to draw out ideas and insights from participants, fostering a dynamic exchange of perspectives. This method ensures active participation and enhances learning outcomes by encouraging critical thinking and knowledge sharing within the group.

Exercise	**Brainstorming session on CSA practices**
Objectives	• Identify current challenges faced by farmers due to climate change. • Explore potential CSA practices to address these challenges. • Discuss the benefits and limitations of different CSA practices.
Time	45 minutes
Materials	Whiteboard or flipchart, markers, sticky notes (different colours)
Facilitation technique	pull–push brainstorming

Procedure

1. **Introduction (5 minutes):**
    - Briefly introduce the concept of climate change and its impact on agriculture.
    - Explain the purpose of the session: brainstorm and discuss CSA practices.
2. **Pull-phase – identifying challenges (15 minutes):**
    - Facilitation prompt – what are the main challenges you face due to climate change in your agricultural practices? (e.g. erratic rainfall, extreme weather events, rising temperatures).
    - Use brainstorming techniques to encourage participation:
        - Allow participants to call out ideas freely.
        - Write down all ideas on the board/flipchart without judgment.
        - Encourage elaboration and build upon existing ideas.
3. **Push-phase – introducing CSA practices (10 minutes):**
    - **Facilitation prompt:** Now that we have identified challenges, let's explore potential solutions. What are

some CSA practices you've heard of or might be interested in learning more about? (e.g. water-saving irrigation, cover cropping, drought-resistant varieties).

- Introduce a few key CSA practices relevant to the local context. Briefly explain each practice and its potential benefits for addressing the listed challenges.

4. **Group activity – exploring specific practices (15 minutes):**
    - Divide participants into small groups (3–4 people).
    - Assign each group a specific CSA practice.
    - Instructions for groups:
        - Discuss the benefits and limitations of the assigned CSA practice.
        - Consider factors such as cost, labour requirements, and potential yield improvement.
        - Use sticky notes (different colours) to categorize ideas: "benefits" (green) and "limitations" (red).
    - Facilitation tip – rotate throughout the groups, ensuring all participants contribute and answer any questions.
5. **Group presentations and discussion (10 minutes):**
    - Each group presents their assigned CSA practice, sharing their identified benefits and limitations.
    - Encourage discussion and exchange of ideas between groups.
6. **Wrap-up and action planning (5 minutes):**
    - Briefly summarize the key CSA practices discussed.
    - Ask participants to reflect on their learning and identify next steps.
    - Encourage participants to explore resources or seek further information on specific CSA practices.

Additional notes

- This activity can be adapted to different time constraints.
- The facilitator can adjust the specific CSA practices introduced based on the audience's location and agricultural practices.
- Consider incorporating visuals or case studies of successful CSA implementation in the region.

Lecture with interactive discussion

A lecture presentation within a field school setting typically involves a straightforward delivery of information by a facilitator or guest speaker who is an expert in their field. This traditional format aims to provide farmers with a structured learning experience, focusing on conveying knowledge, theories, and practical insights relevant to the subject matter. Through verbal explanations, visual aids, and possibly interactive elements, such as Q&A sessions, this approach aims to deepen farmers' understanding and proficiency in the topic being discussed, enriching their educational journey within the field school context.

Exercise 1	**Lecture on CSA practices for efficient farming**
Objectives	• Enhance farmers' understanding of key CSA practices. • Encourage discussion and application of CSA practices to their local context. • Identify challenges and opportunities related to CSA adoption.
Time	45 minutes
Materials	Whiteboard or flipchart, markers, handouts (optional)
Facilitation technique	• Lecture presentation with interactive discussion
Procedure	**Introduction (5 minutes)** • Briefly introduce the concept of climate change and its impact on agriculture. • Explain the session's purpose: to learn about CSA practices and their potential benefits. **Lecture presentation (20 minutes)** • Deliver a clear and concise presentation on key CSA practices relevant to the local context (e.g. water-saving irrigation, soil conservation techniques, drought-resistant varieties). • Use simple language and avoid technical jargon. • Emphasize the benefits of each practice for improving efficiency, reducing climate risks, and potentially increasing yields. **Interactive discussion (15 minutes)** • Divide participants into small groups (3–4 people).

Facilitation prompts

- What are some challenges you currently face in your farming practices?
- How do you think the CSA practices discussed might address these challenges?
- Are there any specific practices you'd like to learn more about?
- Facilitate group discussions, ensuring everyone participates.
- Encourage participants to share their experiences and ask questions.

Wrap-up and action planning (5 minutes)

- Briefly summarize the key CSA practices discussed.
- Encourage participants to consider potential ways they can adapt these practices to their own farms.
- Offer additional resources or suggest follow-up activities for further learning (optional handouts or field demonstrations).

Additional notes

- Consider incorporating real-life examples or case studies of successful CSA implementation in the region (if possible, without needing visuals).
- Adapt the specific CSA practices discussed based on the farmers' existing agricultural practices and local challenges.
- Encourage a participatory atmosphere where farmers feel comfortable sharing their experiences and concerns.
- This exercise can be easily adapted to include a short quiz or activity to assess learning after the lecture portion.

Discovery learning exercise – transit walk

Discovery learning in CS-FFS represents an interactive and participatory approach to agricultural education and extension. In CS-FFS, farmers engage in hands-on activities and field observations to acquire practical knowledge and skills. Through this process, farmers learn via discovery, experimentation, and reflection rather than passively receiving information.

The discovery learning exercise through a transit walk offers participants a unique opportunity to explore and learn hands-on under facilitator guidance. Participants embark on a journey to observe and critically analyse various elements in the field, including crops, farm settings, orchards, gardens, backyards, homes, and surrounding environments. Like conducting AESA, this immersive approach encourages active engagement and deep understanding as participants discover and reflect on the intricacies of their surroundings, fostering a holistic learning experience.

Exercise 1	**Discovery learning through transit walk**
Objectives	• Enhance farmers' observational skills and critical thinking regarding their agroecosystem. • Encourage exploration of the relationships between different components of the field ecosystem. • Promote identification of potential climate-smart practices based on field observations.
Location	Farmer's field (ideally one representing typical local conditions)
Time	90 minutes
Materials	Clipboards, pencils, observation sheets (with guiding questions – see below), optional: magnifying glasses, hand lenses
Facilitation technique	Discovery learning through transit walk
Procedure	1. **Introduction (10 minutes):** ○ Briefly explain the concept of an agroecosystem and its importance for sustainable farming. ○ Introduce the purpose of the exercise: to explore the field and discover the various elements that make up the local agroecosystem.

2. **Preparation (5 minutes):**
    - Distribute clipboards, pencils, and observation sheets to each participant.
    - Briefly review the guiding questions on the observation sheets (see below). These questions should prompt observations about different aspects of the field, like soil health, biodiversity, and pest presence.
    - Distribute magnifying glasses or hand lenses to enhance close observation (optional).
3. **Transit walk (30 minutes):**
    - Lead the participants on a slow and focused walk through the field.
    - Encourage them to observe the surroundings carefully, using all their senses (sight, touch, smell, hearing).
    - Prompt them to record their observations and answer the guiding questions on the sheets.
    - Stop at various points of interest within the field (e.g. healthy vs. stressed crops, areas with different soil types, presence of beneficial insects).
    - Encourage discussion and sharing of observations throughout the walk.
4. **Field observation (30 minutes):**
    - Divide participants into small groups and assign them specific areas within the field for closer observation.
    - Encourage participants to use a hand lens (optional) for closer examination of soil, insects, or plant features.
    - Groups continue to record detailed observations and discuss potential connections between different components of the ecosystem.
5. **Group discussion & synthesis (15 minutes):**
    - Gather participants back to a central location within the field.
    - Facilitate a group discussion about the observations made during the walk.

- Encourage farmers to share what they found interesting, surprising, or concerning.
- Guide the discussion to connect observations to the concept of agroecosystem (e.g. how soil health affects plant growth, how diverse insect populations can benefit agriculture).

6. **Application & action planning (10 minutes):**
    - Based on the observations and discussion, ask participants to consider:
        - "How do the different elements of the field ecosystem interact with each other?"
        - "How might climate change affect this ecosystem?"
        - "Can you identify any potential CSA practices based on your observations?" (e.g. using cover crops to improve soil health, encouraging beneficial insects for pest control)

Observation sheet guiding questions (examples):

- Describe the soil in different areas of the field (colour, texture, presence of cracks or erosion).
- Are there any signs of water stress on the crops?
- Observe different plant species growing in the field (crops, weeds, beneficial plants).
- Are there any insects present, and can you identify them as beneficial or harmful?
- Look for signs of animal activity (burrows, droppings).
- Are there any areas of the field that seem healthier or less healthy than others and, why do you think that is?

Additional notes

- The facilitator can adapt the guiding questions on the observation sheets based on the specific characteristics of the field and the local context.
- Encourage a curious and open-minded approach during the walk.

- This exercise can be followed by further activities or discussions on specific CSA practices relevant to the identified needs of the agroecosystem.

Exercise 2 **Critical thinking**

As part of the discovery learning, incorporating the exercise, critical thinking into Farmer Field School programme, we can effectively equip participants with the foundation for critical thinking as they face challenges and make decisions based on ecosystem analysis related to their agricultural crop(s) and practices.

Objectives Enhance critical thinking skills by improving observation and memory.

Time 25 minutes

Materials A variety of small, medium, and large objects (30–50) with diverse textures, colours, and functions (e.g. pen, eraser, feather, rock, key, leaf, etc.), Notebook and pen for each participant

Facilitation technique Observation skills

Procedure

1. **Preparation (5 minutes):**
    - Arrange the objects in a central location within a circle formed by the participants.
    - Briefly explain the purpose of the exercise: to sharpen observation skills and memory, which are crucial for critical thinking in farming.
2. **Observation phase (2 minutes):**
    - Instruct participants to observe the objects silently for exactly 2 minutes.
    - Encourage them to pay close attention to details like size, colour, texture, material, and function of each object.
3. **Memory recall (5 minutes):**
    - Ask participants to sit down and individually write down as many objects as they can remember from the observation phase within 5 minutes.
4. **Verification and discussion (10 minutes):**
    - Together, reveal the objects again and have participants check their lists.
    - Count the number of correctly recalled objects for each participant.
    - **Discussion points:**

        - What were the biggest challenges in remembering the objects?
        - What strategies did participants use to remember the objects?
        - How does this exercise relate to critical thinking in farming?

5. **Conclusion and feedback (5 minutes):**
    - Briefly explain that critical thinking in farming relies on careful observation of details like crop health, insect presence, and weather patterns.
    - Improved observation skills lead to better decision-making for farm management.
    - Ask participants:
        - How can you apply this skill of close observation to your daily farming practices?
        - Did this exercise change your perspective on the importance of observation?

Expected outcome:

Participants will recognize the importance of observation and memory for critical thinking in agriculture. They will also gain a better understanding of their own strengths and weaknesses in these areas.

Additional notes

- Consider offering a small reward (e.g. a seed packet) to the participant who recalls the most objects to create a fun and competitive element (optional).
- Adapt the types of objects used based on what's readily available in your Farmer Field School setting.
- This exercise can be easily modified to include additional elements, such as asking participants to categorize the objects by function or material after the recall phase.

Beginning exercises

Exercise **Paired interviews**

Objectives

- To introduce the participants to each other.
- To practice active listening and observation skills.
- To foster a sense of connection within the group by highlighting unique traits.

Time 20 Minutes

Materials Optional: Paper and pens for taking notes during the interview

Procedure

1. Divide participants into pairs. If there's an odd number, you can have a group of three.
2. Instruct pairs to spend 5–7 minutes interviewing each other. Emphasize that instead of general questions ("where are you from?"), they should focus on discovering unique or unexpected things about their partner. Here are some prompts:
    - What's a surprising skill or talent you have?
    - What's one thing on your bucket list?
    - If you could have any superpower, what would it be and why?
    - Tell me about a time you overcame a significant challenge.
    - Share a childhood memory that always makes you smile.
3. Bring everyone back together. Have each person introduce their partner and share 2–3 of the most interesting or insightful things they learned. You can encourage the presenter to use a little storytelling style to keep others engaged.

Feedback Ask the group to lead the feedback, rather than the leader posing questions. For instance:

- What surprised you most about what you learned today?

- Did anyone make a connection with someone they didn't expect to?
- How can we use the information we learned about each other going forward within this group?

Exercise 2 **Mind mapping**

Objectives To gauge participants' understanding of CSA at the beginning of the training session and to compare it with their knowledge at the end of the programme.

Time 60 minutes

This exercise is best conducted at the beginning of the programme, following the session on hopes, ambitions, and dangers. It's essential to emphasize that there are no right or wrong answers; the aim is to understand participants' current knowledge levels. This information will inform the facilitator in tailoring the programme content effectively. Additionally, conducting a similar exercise at the end of the programme allows for a comparison, enabling participants to assess their learning progress.

Materials Large sheets of paper (for example. manila sheet or paired white flip charts), coloured markers, scotch tape etc.

Procedure

1. Divide the training participants into small groups of four or five members each.
2. Provide each group with sheets of paper and coloured markers.
3. Instruct the groups to brainstorm and discuss what they know about CSA for ten minutes.
4. After the brainstorming session, ask each group to visually represent their understanding of CSA on the provided sheets. They can use drawings, diagrams, keywords, or any other visual representation method.
5. Allocate at least 30 minutes for the groups to complete their visual representations.
6. Once the charts are ready, affix them to the board or wall for easy viewing.
7. Facilitate a discussion around the concepts presented on the charts. Encourage participants to explain their visuals and share their perspectives on CSA.
8. Conclude the activity by reviewing the key points discussed and reinforcing the importance of CSA in addressing current agricultural challenges.

Note It's beneficial to display the charts created at the beginning of the exercise alongside those produced at the end of the programme. This visual comparison allows participants to observe their knowledge progression and reinforces the value of the training programme.

Team-building exercises

Activities like "building the tower" encourage collaboration and communication. Farmers learn to work together effectively, a crucial skill for sharing best practices and tackling agricultural challenges as a community.

Exercise 1 **Constructing a tower**

Objectives

- To highlight the essential components of effective teamwork, including communication, collaboration, and resourcefulness.
- To encourage participants to reflect on their personal contributions, both positive and areas for improvement, within a team dynamic.

Time

30 minutes

- When seeking open discussion about group dynamics and individual behaviour in a team setting.
- When the potential exists for healthy confrontation and a desire to improve collaboration.

Materials

- 150 plastic straws (per group)
- Scotch tape (limited rolls)
- Scissors (limited pairs)
- Paper and pens for reflection

Procedure

1. **Group formation:** divide participants into groups of 5.
2. **Set the stage:** gather materials in the centre of the room. Explain the goals of the exercise.
3. **Instructions:**
    - Your team has 20 minutes to build the tallest freestanding tower using only the provided materials.
    - Communication is encouraged, but there will be limited tape and scissors available.
4. **Reflective observation:** Observe the groups without interference. Note patterns of interaction, decision-making, and resource use.

Showcase and reflection

- Have teams present their towers. Facilitate a discussion centred on:
    - What factors contributed to the tower's success?
    - What challenges did your team face, and how were they overcome (or not)?

    - As an individual, what role did you play within the team?
- What would you do differently next time to enhance teamwork?

Exercise 2 **Team-building exercise – Water flow negotiation**

Objectives This team-building exercise, designed specifically for Jordanian CS-FFS farmers, focuses on collaboration, communication, and resource management – all crucial skills for successful agricultural practices.

Time 30–45 minutes

Materials Large open space, masking tape, markers, small objects (beans, coins, etc.) representing water units (1 unit = X litres) – enough for each team member to have 10–15 units.

Procedure

1. Divide the participants into teams of 3–4 farmers. Explain that water scarcity is a major challenge in Jordan and effective management is crucial.
2. Use masking tape to create a simple map of an irrigation canal feeding four separate fields (one for each team). Mark each field with a letter (A, B, C, D).
3. Distribute the water units (beans/coins) to each team member. Explain that they represent their individual water allocation for the upcoming planting season.
4. Inform the teams that due to unforeseen circumstances (drought, canal or water supply maintenance), the overall water allocation has been reduced. However, they can negotiate water sharing amongst themselves to optimize crop yields for the entire group.
5. Teams have 15 minutes to discuss and agree on how to distribute the water units amongst their members. Encourage them to consider factors like:
    - Different crop water needs
    - Land size and soil quality
    - Individual farmer experience
6. Each team presents their final water distribution plan to the larger group. Facilitate a discussion about the negotiation process, challenges faced, and the rationale behind their decisions.
7. Discuss the importance of collaboration and communication in managing shared resources like water. Highlight real-life situations where Jordanian farmers might need to work together (e.g. pest control, shared machinery).

Variations

- Introduce an element of competition – after the negotiation and sharing phase, announce that the team with the highest predicted combined crop yield (based on water allocation and crop selection) wins a prize (seeds, tools, etc.).
- Incorporate real-life data – if available, provide teams with data on typical water needs for common Jordanian crops. This adds a layer of realism and encourages research-based decision making.

Benefits

- Encourages farmers to work together towards a common goal.
- Promotes active listening, negotiation skills, and clear communication of needs.
- Simulates real-world water scarcity challenges and fosters strategic decision making.
- Provides a platform for farmers to develop creative solutions to shared problems.

This team-building exercise can be easily adapted to different CS-FFS training modules, making it a valuable tool for empowering Jordanian farmers to work together and thrive in a challenging agricultural environment.

Trust building

Exercises like the "trust fall" create a safe space for open communication and shared decision-making. Trust is essential for farmers to feel comfortable sharing experiences, failures, and successes, leading to richer learning experiences for all.

Objectives

- Create a comfortable learning environment where farmers feel safe expressing ideas and challenges.
- Highlight the importance of reliance and cooperation for success, particularly in agricultural contexts.

Audience

A group of farmers participating in a Farmer Field School.

Time

10–15 minutes

Materials

A blindfold (scarf, or piece of cloth etc.)

Procedure

1. Find an open, safe area (outdoors, if possible, weather permitting). Clear any potential obstacles.

2. Briefly explain the importance of trust in successful teamwork, particularly when facing shared agricultural challenges.

3. Divide farmers into pairs. Have one person in each pair be the "guide", the other the "guided".

4. The "guided" partner wears the blindfold. The "guide" will verbally instruct their partner to navigate a simple obstacle course you outline (e.g. walking around a few trees, stepping over a small object).

5. After a few minutes, have partners switch roles, so everyone experiences both guiding and being guided.

6. Facilitate a brief discussion on the experience, asking:

- How did it feel to be the 'guide'?
- How did it feel to be 'guided'?
- What made good communication and successful guidance?

Conclusion

Emphasize the importance of clear instructions, trusting your teammate, and relying on each other

Additional notes

- Adapt the obstacle course for terrain and participant capabilities.
- Be mindful of different comfort levels.
- Make participation optional, offering an alternative observation role.

Icebreakers & energizers

Activities like "the farming chain" to break the ice and foster a sense of collaboration and shared experience within the group. A more relaxed atmosphere encourages active participation and fosters a sense of camaraderie, leading to more engaged learning.

Title	The farming chain
Objective	• Break the ice and foster a sense of collaboration and shared experience within the group. • Energize farmers and create a positive, active atmosphere for learning.
Audience	Farmers participating in a CS-FFS programme.
Time	Approximately 5–10 minutes.
Materials	None required.
Procedure	1. Setup – Ask farmers to stand in a circle. Explain that you will start with a farming-related action and a sound. 2. Demonstration – The facilitator demonstrates first. For example: "Milling wheat!" (mimics turning a hand grinder and makes a grinding noise). 3. Chain begins – The person to the facilitator's left repeats the action/sound, then adds their own unique farming-related contribution (e.g. "Harvesting olives!" with a picking motion and plucking sound). 4. Continues around the circle – Each farmer in turn repeats the entire chain of actions/sounds, adding their own. Focus should be on speed and having fun!
Variations	• Speed challenge – gradually increase the pace, creating a more humorous and energetic atmosphere. • Elimination – if someone messes up the order or takes too long, they can playfully "sit out," increasing the challenge for those remaining.
Additional notes	• The facilitator can inject new actions or sounds if the chain seems to stagnate. • Keep the energy high and focus on participation over perfection.

Why it works for CS-FFS

- It draws on farmers' everyday experiences, creating an immediate sense of connection.
- Gets farmers moving and engaged, shaking off any initial hesitancy.
- Emphasizes building on each other's contributions, mirroring the CS-FFS learning process.

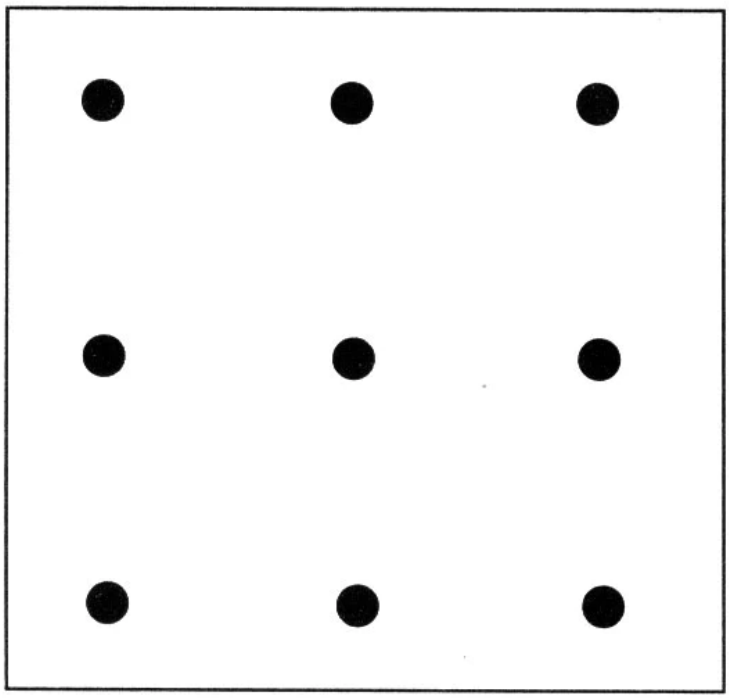
Group dynamics

Exercises like "nine dots" challenge participants to think creatively and identify common ground. By working together to solve problems in a non-competitive way, farmers develop critical thinking skills and learn to appreciate diverse perspectives. This fosters a cohesive learning group where everyone feels valued and contributes to the shared learning experience.

Title	**Nine dots**
Objective	• Promote "outside the box" thinking and problem-solving. • Highlight the value of collaboration and diverse perspectives. • Build trust and create a sense of shared problem-solving within the group
Time	10 minutes
Materials	• Paper or a surface where you can draw easily. • Pen or marker
Procedure	1. Draw a 3x3 grid of nine dots on the paper/surface. Explain the goal: connect all nine dots using only four straight lines, without lifting the pen from the paper. 2. Give farmers a few minutes to attempt the puzzle individually. 3. Encourage farmers to discuss their approaches and try it together as a group. Allow open sharing of ideas, even if they initially seem incorrect. 4. Whether they solve it or not, reveal the solution (check online for illustrations). Focus the discussion on: • What made this challenging? Did anyone have pre-conceived notions that hindered them? • Did group work spark new ways of thinking? How did different ideas contribute? 5. Linking it to CS-FFS Group Dynamics • Just like the puzzle has one solution, CS-FFS aims to solve farming challenges. Emphasize that everyone's input is needed for the most effective solutions. • CS-FFS involves tackling complex problems. This exercise highlights that multiple perspectives and experimentation are valuable in finding solutions.

	• CS-FFS isn't about who's right or wrong, but about discovering what works best. This exercise reinforces that everyone's ideas are welcome.
Variations	• Look up other "think outside the box" puzzles for farmer groups • Introduce practical problem scenarios for the group to solve together, building on this exercise's foundation.
Additional notes	• Have simpler puzzles ready if the group solves it quickly. This keeps the engagement going. • Encourage participation, be patient with incorrect attempts, and guide the discussion to emphasize positive group dynamics lessons.

Figure 2. Nine dots design exercise



Source: Authors' own elaboration

Role play

Simulating real-world scenarios allows farmers to practice essential skills in a safe environment. For example, farmers can role-play negotiating with vendors or identifying pests in their fields. This practical application of knowledge builds confidence and empowers farmers to tackle challenges they might face on their own farms.

Title	**Role play in the Farmer Field School**
Objective	• Practice real-world skills within a safe, supportive environment. • Promote active learning and knowledge application. • Build confidence and problem-solving abilities. • Encourage communication and collaborative decision-making.
Time	60 minutes
Materials	• Scenario descriptions (tailored to specific CS-FFS topics) • Props or visual aids (optional, depending on the scenario)
Procedure	1. Choose scenarios relevant to the farmers' current learning focus. Examples: • Pest Management – farmers play the roles of pests, predators, and the farmer, acting out an ecosystem interaction. • Negotiation – farmers role-play buyer and seller, practicing fair pricing and bargaining. • Community conflict – farmers act out a scenario where collective decision-making is needed (e.g. water resource sharing). 2. Divide farmers into sub-groups and assign roles. Ensure a mix of experienced and less-experienced farmers in each group. 3. Give groups time to briefly discuss their roles and plan their approach. 4. Have groups perform their role-plays. Encourage the rest of the farmers to be active observers.

5. After each scenario, facilitate a discussion:

- What worked well? What challenges did the actors face?
- How does this relate to real-life situations?
- What key lessons can be learned?

Variations

- Focus on the specific skill the scenario targets (identification, communication, conflict resolution).
- Emphasize that it's okay to make mistakes and that this is about learning together.
- Make the scenarios as realistic as possible to maximize impact on the farmers.

Additional notes

- Begin with short, straightforward scenarios and gradually increase complexity.
- Guide discussions to draw out practical learnings and link them to broader CS-FFS goals.
- Inject humour to ease nervousness and enhance engagement.

Climate-smart Farmer Field School organization and management

Organization and management skills are the backbone of a successful CS-FFS experience. From planning field days and graduation ceremonies to coordinating learning resources and field activities, these skills turn knowledge into action. A well-organized CS-FFS allows farmers to focus on learning, builds confidence in handling complex tasks, and ensures that knowledge gained translates into improved farming practices. Equipping with the tools to streamline processes, manage time effectively, and foster a collaborative learning environment. Understanding how to plan, delegate, and coordinate resources empowers both facilitators and farmers within the CS-FFS programme. These practical skills extend far beyond the classroom – strong organization and management lay the foundation for efficient farming practices, collective action within the community, and the long-term success of farmer-led initiatives. following key learning exercises are embedded in the learning process including:

- Farmers' organization development
- Field day organization
- Graduation ceremony organization

Farmers' organization development

CS-FFS transcend individual improvement, fostering the development of strong farmer organizations. This is crucial because organized farmers amplify their knowledge, bolster their bargaining power, and drive innovation within their community. United, they gain a stronger voice to advocate for their needs, secure resources, and tackle challenges related to markets and climate change. A farmer organization extends the CS-FFS legacy, ensuring the benefits are long-lasting and that farmers become catalysts for positive change in their communities. CS-FFS programmes inherently promote collaboration and empowerment, providing a solid foundation for robust organization building. By understanding the advantages and strategies for successful farmer organizations, CS-FFS participants become not just better farmers, but also leaders who shape the future of their communities.

Exercise title	**Building a democratic farmer organization**
Objective	• Introduce the concept of a democratic farmer organization within the CS-FFS group. • Simulate the process of electing key office bearers (president, general secretary, finance secretary). • Encourage collaboration and participation in decision-making.

Time 45 minutes

Materials

- Flipchart or whiteboard
- Markers
- Three pieces of paper with titles: president, general secretary, finance secretary
- Voting slips (optional, depending on group size)

Procedure

- Briefly discuss the importance of farmer organizations for collective action, knowledge sharing, and advocacy. Explain how a democratic structure empowers everyone to participate.

Office bearer roles

President – Leads meetings, represents the organization at events, and ensures smooth functioning (write key responsibilities on the flipchart/whiteboard).

General secretary – Maintains records of meetings, activities, and finances. Prepares agendas and communicates with members (add responsibilities).

Finance secretary – Manages any group funds, keeps financial records accurate, and reports on expenditures (add responsibilities).

- Open the floor for nominations for each position. Farmers can nominate themselves or others. Encourage diverse nominations.
- If the group is large, allow nominated candidates a short time to explain why they'd be suitable for the role (emphasize service to the group).
- Choose a voting method – open show of hands or secret ballots with voting slips (depending on comfort levels). Each member casts one vote for each position.
- Count the votes and announce the elected officials for each role.
- Applaud everyone who participated and congratulate the elected members.
- Briefly discuss the importance of everyone supporting the elected officials and participating in the organization's activities.

CS-FFS dynamics

- Simulating elections fosters a sense of ownership and encourages farmers to take initiative in their learning process.

- Introduces the concept of fair and inclusive decision-making, setting a model for future group functioning.
- Identifies potential leaders within the group and provides an opportunity for them to practice leadership skills.

Additional notes

- Adjust the level of formality depending on the group's size and comfort level.
- Even if nominees are chosen by consensus, ensure everyone feels their voice is heard.
- Explain that elected officials are accountable to the group and should act in their best interests.

Organizing field day

Field days are a cornerstone of the CS-FFS experience, transforming learning from theory into tangible action. They provide a platform for farmers to showcase the results of their experimentation, share newfound knowledge with their peers, and engage with a broader audience that may include policymakers, extension workers, and potential market partners. By observing practices in the field, farmers witness firsthand the potential benefits of new techniques, sparking interest and inspiring adoption. Field days also foster a sense of community and collective achievement, celebrating the efforts of CS-FFS participants. Furthermore, they open channels of communication and collaboration, building valuable networks that extend the benefits of the CS-FFS programme far beyond its conclusion.

Slogan Climate-smart solutions for a changing world

Date DD/MM/YY

Time 10.00–11.30

Location …….

Agenda

- **10.00–110.00 am: welcome and registration**
    - Welcome remarks by CS-FFS facilitator and/or community leader
    - Participant sign-in, distribution of handouts
- **10.10–11.00 am: Demonstration stations**
    - Divide participants into smaller groups for rotations
    - Stations could include:
        - Sub-surface irrigation system
        - Vegetables on wicking beds
        - Fruit plants planted by cocoons
        - Integrated pest management approaches with reduced chemical use like fruit fly management through pheromones trapes in olive and apple plots
        - Composting unit
        - Use of treated grey water for tress
    - Ensure knowledgeable farmers or experts are present to explain each station
- **11.00 am–11.300 pm: Panel discussion/Q&A and closing remarks**
    - Invite experts or successful adopters of CSA practices to share experiences
    - Focus on benefits, overcoming challenges, adapting techniques

    - Encourage audience questions and dialogue

Logistics

- **Transport:** If needed, plan for group transport to the site.
- **Handouts:** Prepare short summaries of demonstrated practices for participants to take home.
- **Volunteers:** Recruit CS-FFS participants to help with setup, guiding groups, and cleanup.

Tips for success

- **Invite diverse participants:** Entice the broader farming community, extension workers, etc.
- **Keep it interactive:** Hands-on activities are crucial.
- **Follow-up:** Have a plan to provide ongoing support for CSA adoption after the field day.
- **Evaluation:** Gather participant feedback to improve future events.

Graduation ceremony organization

Graduation ceremonies can be held to award participants in the CS-FFS with a graduation certificate, acknowledging their participation in the CS-FFS. This may be done simultaneously with the field day or at the last meeting, with CS-FFS participants and possibly family members.

Farmer Field School graduation ceremony programme

Celebrating climate-smart integrated homestead gardens

Theme: Celebrating ten sessions of participatory learning: Climate-smart integrated homestead gardens

Date: [Insert date]

Time: [Start time] – [End time]

Location: [Name of venue]

Objectives

- Celebrate the completion of the CS-FFS programme.
- Recognize the achievements and dedication of graduates.
- Showcase the benefits of climate-smart technologies for sustainable agriculture.
- Foster a sense of community and inspire continued learning.

Programme

- **9.00–9.30 am: Welcome and registration**
    - Welcoming remarks by CS-FFS facilitator or programme coordinator.
    - Sign-in of graduates, guests, and dignitaries (if attending).
    - Display of participant projects or photos showcasing their homestead gardens.
- **9.30–10.00 am: Opening ceremony**
    - Traditional welcome (optional, depending on cultural context).
    - Introduction of programme partners and sponsors (if applicable).
    - Keynote address by a local leader or representative from an agricultural organization, emphasizing the importance of CSA.
- **10.00–10.30 am: Graduate recognition**
    - Presentation of certificates to graduates by facilitators and dignitaries.
    - Short speeches by one or two graduates, reflecting on their learning experiences and the impact of the CS-FFS programme.
- **10.30–11.30 am: Presentations and demonstrations**

    - Short presentation on key Climate-Smart technologies covered during the CS-FFS programme:
        - Sub-surface irrigation
        - Wicking beds
        - Cocoons for agroforestry and fruit orchards
        - Vertical farming
    - Interactive demonstrations led by graduates, showcasing their skills in implementing these technologies in their homestead gardens.
    - Encourage audience participation with questions and discussions.
- **11.30 am–12.30 pm: Refreshments and networking**
    - Opportunity for graduates, guests, and facilitators to interact and share experiences.
    - Light refreshments served.
- **12.30–1.00 pm: Closing remarks and next steps**
    - Brief speech by CS-FFS facilitator, summarizing key learnings and achievements of the programme.
    - Discussion of ongoing support and resources available to graduates.
    - Announcement of any follow-up activities or opportunities for continued learning and collaboration.
- **1.00 pm: Optional – group photo**
    - Gather all graduates, facilitators, partners, and guests for a commemorative photo.

Additional considerations, if applicable

- **Music and entertainment:** Lively music or cultural performances can add a festive touch to the ceremony.
- **Media coverage:** Invite local media to capture and share the event with the broader community.
- **Decorations:** Use plants, recycled materials, or other creative elements to create a visually appealing venue.
- **Local food:** Consider offering refreshments prepared using produce grown in the graduates' homestead gardens.

Remember

- Adapt the programme to your specific context and cultural traditions.
- Delegate tasks and involve CS-FFS graduates in the planning and execution of the ceremony.
- Ensure the ceremony is inclusive, respectful, and celebrates the achievements of all participants.

Special learning exercises

Food budgeting for a healthy harvest

Introduction

Welcome farmers! today, we'll explore food budgeting alongside homestead gardening, a key concept in CSA. By planning your food needs, you can maximize the harvest from your home garden and save money.

Learning objectives

- Understand the importance of food budgeting for homestead gardens.
- Identify factors influencing food costs.
- Develop a basic food budget plan for your household.

Materials

- Whiteboard/flipchart
- Markers
- Pens and paper for participants
- Sample food price list (can be created with participants based on local market prices)

Procedure

Benefits of food budgeting

- Brainstorm with participants: What are the benefits of planning your food needs (reduced waste, save money, eat healthier, etc.)?
- Briefly explain how budgeting helps utilize homegrown produce effectively throughout the year.

Factors affecting food costs

- Discuss factors influencing food costs: seasonal variations, buying in bulk, impulse purchases, etc.
- Ask participants to share their experiences with food price fluctuations.

Creating a food budget plan

- Divide participants into small groups and provide each group with paper and pens.
- Ask them to list their household's staple food items (grains, vegetables, fruits, etc.).
- Using the sample price list or local market knowledge, estimate the monthly cost of each item.
- Guide participants to consider how much they can realistically grow in their homestead garden to replace store-bought items.

Budgeting for seasonal variations

- Discuss how to plan for seasonal availability of homegrown produce.
- Introduce food processing concepts such as preservation techniques (drying, pickling, etc.) to extend the use of garden produce throughout the year especially in off-season periods.

Sharing and discussion

- Each group presents their food budget plan, highlighting the cost-saving potential of their homestead garden.
- Facilitate a discussion on challenges and solutions for sticking to the budget plan.

Conclusion

- Briefly summarize the importance of food budgeting for a healthy harvest and a sustainable homestead garden.
- Encourage participants to implement the food budgeting plan at home and adapt it based on their garden's yield.
- Provide resources or suggest further discussions on preservation techniques for seasonal produce.

Additional tips

- Consider incorporating a fun activity: play a budgeting game where participants need to create a healthy meal plan within a specific budget using a list of available ingredients (including potential homegrown produce).
- Encourage knowledge sharing among farmers. Let them discuss their experiences with different homegrown vegetables and fruits, their yields, and preservation methods.

Enhancing water use efficiency at your farm

Learning exercise Calculating water use efficiency at your farm

Objectives

- Farmers will grasp the concept of WUE and its importance in Jordan's water-scarce environment in terms of saving water and the costs of used water.
- Farmers will learn simple methods to calculate WUE for their crops.
- Farmers will explore practical water-smart techniques to improve WUE on their farms.

Materials

- Whiteboard or flipchart
- Markers
- Calculators (or smartphones with calculators)
- Handouts with key information (optional)

Methodology

1. Introduction to water use efficiency (15 minutes)

- Define WUE as the amount of crop yield (e.g. kilograms of produce) obtained per unit of water used (e.g. cubic metres). Emphasize that higher WUE means more "crop per drop".
- Highlight Jordan's water scarcity. Explain that improving WUE is essential to maximize agricultural production while conserving precious water resources.

2. Calculating water use efficiency (30 minutes)

- Simple formula – introduce the basic WUE calculation:
  WUE = crop yield (kg) / water applied (cubic metres)
- Example – provide a real-world example from Jordan (adapt to the crops grown in the CS-FFS): If a farmer produces 1000 kg of tomatoes using 500 cubic metres of water, WUE = 1000 kg / 500 m^3 = 2 kg/m^3
- Practice – give farmers hypothetical or real scenarios from their farms to calculate WUE.

3. Water-smart practices to boost WUE (60 minutes)

Categories

Divide water-smart practices into categories:

- Irrigation techniques – drip irrigation, deficit irrigation, scheduling based on soil moisture.

- Soil management – mulching, cover crops, crop rotation, polyculture that will result in improving soil structure
- Crop selection: drought-tolerant varieties, crops suitable for the local climate

Discussion

For each category, lead a discussion on:

  - How the practice improves WUE
  - Practical implementation for farmers in the FFS
  - Potential challenges and solutions

4. Field demonstration (optional, if feasible within FFS setting – 30 minutes)

- Choose one or two water-smart practices that are especially relevant to the farmers.
- Show how the practices are implemented in the field. This could be on a demonstration plot or at a farmers' field.
- Encourage farmers to try the techniques themselves for hands-on learning.

5. Evaluation and feedback (15 minutes)

- Feedback forms – distribute brief evaluation forms for farmers to provide feedback on what they learned and how useful the exercise was.
- Group discussion – facilitate a discussion to gather further insights and identify areas for continued learning.

Additional tips

- Adapt to local context – tailor examples and practices to the specific crops, soils, and climate of the region where the FFS takes place.
- Visual aids – use diagrams and photos to demonstrate concepts.
- Farmer-led – encourage farmers to share their existing knowledge and experiences with water-saving practices.

Understanding water footprint

Learning exercise	Calculating water footprint
Objective	• Farmers will understand the concept of water footprints. • Farmers will be able to calculate the water footprint of a specific crop. • Farmers will identify water-smart practices to reduce their water footprint.
Materials	• Whiteboard or flipchart • Markers • Calculators (or ability to do simple calculations) • Fact sheets on water footprints of common crops in Jordan (see resources below) • Images or videos demonstrating water-smart practices (optional)

Methodology	**1. Introduction to water footprints (15–20 minutes)**
	• Explain: A water footprint is the total amount of freshwater used to produce a product or service. Just like we leave a carbon footprint, we also leave a water footprint with everything we grow, buy, and use.
	• Divide into groups: break farmers into smaller groups of 4–5 members.
	• Discussion:
	  ○ Ask farmers what crops they grow on their farms.
	  ○ Ask them to think about all the water that goes into growing that crop. Brainstorm and write down their ideas (irrigation, rainfall, processing, etc.).
	2. Understanding water footprint components (15 minutes)
	• Explain the three types of water footprints:
	• Green water footprint: rainwater used by the plant.
	• Blue water footprint: irrigation water from surface or groundwater sources.
	• Grey water footprint: water used and potentially polluted in processing.
	• Focus: For this exercise with farmers, focus on green and blue water footprints as those are what they directly influence.

3. Calculating a water footprint (20–30 minutes)

- Choose a crop: select a common crop in Jordan (e.g. tomatoes, cucumbers, olives).
- Resource: provide the group with a fact sheet that includes:
    - Average green water footprint per kilogram of the crop
    - Average blue water footprint per kilogram of the crop

Guided calculation

- Ask each group to estimate how many kilograms of the chosen crop they produce on their farm in a season.
- Help them calculate their estimated water footprint:
- (Green footprint per kg (×) yield in kg) + (blue footprint per kg (×) yield in kg) = total water footprint

Note

Water footprint: the total amount of fresh water used to produce a good or service. This includes all the water involved in growing, processing, and transporting the item.

Green footprint: the volume of rainwater consumed during the production of a crop. This focuses on the water naturally absorbed from rainfall.

Blue footprint: The volume of freshwater extracted from surface or groundwater sources to produce a crop. This includes water used for irrigation purposes.

Yield: The total amount of a crop harvested from a specific area.

4. Identifying water-smart practices (20 minutes)

- Brainstorm: in their groups, ask farmers to think about ways to reduce their green and blue water footprints. Write them on the board.
- Examples:
- Green: mulching, cover crops to retain soil moisture
- Blue: drip irrigation, deficit irrigation (controlled water stress), rainwater harvesting
- Grey: (If relevant) water recycling or less polluting practices

- Localize: discuss which practices are most realistic and beneficial in the Jordanian context.

5. Reflection and action planning (15 minutes)

- Questions: ask farmers:
  - Were you surprised by the size of your crop's water footprint?
  - Which water-smart practice might be the most useful to implement on your farm?
- Individual plans – encourage farmers to set a small, achievable goal to reduce their water footprint in the next season.

Annexes

Annex 1: Climate-smart Farmer Field School activity quality check list

Agroecosystem analyses

- Before the activity begins are participants told the goal of the activity and the process to be followed? ☐
- During observation do participants get into the field, farm or greenhouse? ☐
- Do participants look at all parts of the animals/plant/tree as part of their observation activity? ☐
- Do participants perform water scouting as part of their observation activity? ☐
- Are participants able to use the water and soil sensors (if provided for learning in the CS-FFS)? ☐
- Do participants look at all pests and predators found on the sample plants or farm or animals? ☐
- Do participants note down what they find? ☐
- Do participants collect specimens (insects, parts of plants especially diseased or abnormal etc.)? ☐
- Are insect collections made? ☐
- Are observations summarized in the agroecosystem drawings or presentations? ☐
- Does the facilitator pose problems, ask questions relevant to the drawings, or use other methods to encourage participant analysis of the drawings? ☐
- Does discussion take place concerning field conditions? ☐
- Are "what if" scenarios posed by the facilitator and discussed by the participants? ☐
- Are previous agroecosystem findings used for comparisons to the situation this meeting? ☐
- Does all participants participated in the AESA chart or board preparation activity while analysing data? ☐

- Are field management decisions taken and critically examined before acceptance? ☐
- Are decisions based on levels of different ecosystem factors observation and analysis of their functional relationships in the field? ☐
- Do the participants appoint one or more members to be responsible for following-up management decisions? ☐
- Are participants active and working together in small groups? ☐
- Does the facilitator, by means of questions, help the participants to analyse the activity and what they have learned? ☐

Field studies

- Are participants able to explain the reason for doing this field study? ☐
- Are participants able to explain the different treatments of the study? ☐
- Are participants able to explain the different parameters to be observed? ☐

Special topics

- Before the activity, does the facilitator explain the goal and process of the activity? ☐
- During the activity are participants involved and active? ☐
- Are group activities dominated by one individual? ☐
- Can participants present results stating or summarizing what has happened and why? ☐
- Can participants state what they have learned from the activity? ☐
- Does the facilitator ask open ended questions to: help participants examine what happened during the activity; generalize from the activity; apply what they learned to "real life"? ☐

Group dynamics

- Are group dynamic activities done? ☐
- Before activity does the facilitator tell participants the goal and process of the activity? ☐

- Are all participants involved in the activity? ☐
- Does the facilitator ask open ended questions to: help participants examine what happened during the activity; generalize from the activity; apply what they learned to "real life"? ☐

General

- Is there a positive and enjoyable working atmosphere in the group? ☐
- Does the facilitator keep an attendance record per meeting? ☐
- Does the facilitator follow-up on participants do not present at a meeting? ☐
- Are participants invited/encouraged to do part of the facilitation, either of sub-groups or in the whole group, or do a group dynamic activity? ☐
- Is the facilitator able to establish constructive communication with local leaders and supporting agency staff? ☐

Annex 2: List of learning exercises

Beginning exercises

1. True or false
2. Take the pen & talk
3. Get to know each other

Team building exercises

1. What is a team?
2. Arranging the pictures
3. Family linkage
4. Let us take a picture
5. Filling water in bucket
6. Chain of hands
7. Drawing a picture without lifting the pen

Trust/ confidence building exercises

1. Fall in circle on Trust
2. Trusting each other

Groups dynamic exercises

1. Nine dots
2. The mirror game
3. The Watch Game
4. I think I know him
5. Profit or loss
6. Counting seeds of watermelon
7. The farmer's will
8. Great creation

Icebreaker and energizers

1. Name the person
2. Don't laugh
3. Counting the vowels'
4. Shopping list
5. I like you because….
6. Egg and spoon
7. Sit down if…
8. Rain

Source: Khalid, J.M. and Shazia, J. 2014. *Part II – Non-formal Education. Livestock Farmer Field School.* Islamabad, SOFT.

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