Brief of Monitoring, Evaluation and Learning Plan

Modernization of Crop Breeding Programs in Arab Countries

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About ICARDA

Is a treaty-based international organization, established in 1975, the International Center for Agricultural Research in the Dry Areas (ICARDA) is an autonomous non-profit, international institute governed by a Board of Trustees and, under the auspices of the CGIAR System in accordance with the provisions of the Charter, ICARDA focusses on delivering innovative solutions for sustainable agricultural development in the non-tropical dry areas of the developing world. ICARDA provide innovative, science-based solutions to improve the livelihoods and resilience of resource-poor smallholder farmers. ICARDA is developing that through strategic partnerships, linking research to development, and capacity development, and by taking into account gender equality and the role of youth in transforming the non-tropical dry areas.

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1. What is a Monitoring, Evaluation & Learning Plan

A Monitoring, Evaluation & Learning Plan defines the approach the project takes on conducting Monitoring, Evaluation and Learning (MEL) and the roles and responsibilities during the MEL process. Its role is to specify and provide guidance for the operationalization of the monitoring and evaluation system.

The MEL plan will bridge the logic model (e.g. logical framework, impact pathway, theory of change) that underpins the project with the implementation of the monitoring and evaluation system. Also, it helps in organizing the learning processes that occur during and at the end of every project. Additionally, it is a powerful time-saving tool that foresees and keeps track of all the connections between the assumptions, the activities and the expected outcomes of the project. This will contribute to intervene quickly and effectively when modifications to the project's activities are required to maintain the objectives identified by the action.

1.1. Why it is important

Efficiency – How are we implementing the project? Are the identified assumptions respected? The MEL plan identifies in advance problems and ways to solve the problems. It allows a rapid and efficient response to those.

Effectiveness – Are we reaching our outcomes? Are we achieving results? A MEL plan helps us to ask these questions both during the planning stages, throughout implementation, and after completion. It also encourages the culture of systematic learning for future projects.

Donor alignment – Are we matching the donor's framework? How can we better describe our work to the donor? The identification of the project's alignment with the donor framework helps the institutions implementing the activities to describe the intervention's level of fitness with the strategic view of the donor.

A MEL Plan can work like a machine. Its components are interconnected; they work jointly and help us in managing the flow of information that comes from the implementation of the project.

2. The structure of a Monitoring, Evaluation & Learning Plan

A MEL Plan is composed of three main parts: **Monitoring**, **Evaluation** and **Learning**.

The **Monitoring** component provides a clear picture of the relations between every activity undertaken by the project and its final goal. Those relations are identified in the Theory of Change, the Impact Pathway and the project's Logical Framework (Logframe) matrix. It includes the collection and the analysis of routinary data and information through to support the decision-making, communication, evaluation and learning processes for Project managers and stakeholders.

The **Evaluation** part contributes to verify the correct implementation, relevance, efficiency, effectiveness, impact and sustainability[2] of the project as a whole. The identification of evaluation questions is essential to assess whether the project has been implemented consistently with its purpose. Quantitative and/or qualitative indicators are established ex-ante as a mean of verification of the correct implementation of the project.

The **Learning** component is designed to systematize the learning-by-doing aspect that is present in every project through the identification of explicit learning questions, the collection and analysis of data and the sharing of lessons learned.

3. The Modernization of Crop Breeding Programs in Arab Countries MEL Plan

The MEL team of ICARDA develops plans for any new projects as part of its routine activities. This process usually involves young research fellows.

The MEL plan has been developed using the Modernization of Crop Breeding Programs in Arab Countries (BreedMod) Project Proposal and feedback from the project manager and staff. It is structured as below:

1. **Introduction**
2. **Project Results Framework** *(Logical framework, impact pathway, theory of change, and alignment to IFAD, ICARDA and CGIAR frameworks)*
3. **Performance Monitoring Systems** (*Indicators, Routine Monitoring vs Periodic Evaluation, Key Evaluation Questions)*
4. **Learning and Adaptive Management**
5. **MEL Support Supervision**
6. **Project Review and Planning**
7. **Reporting**

3.1 The BreedMod Project Logical Framework Matrix

Through the identification of the connection between **Goal, Objectives, Outcomes and Outputs**, it is possible to analyze how the activities implemented are related to the ultimate goal of the project. Those connections are expressed in the below Logframe matrix.

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[2] OECD (2011), "Section 10: Monitoring and Evaluation", in *The OECD DAC Handbook on Security System Reform: Supporting Security and Justice*, OECD Publishing.

Component	Outputs	Indicators
1. Speed Breeding	• 1.1 A new facility is established, providing capacity for new speed breeding activities • 1.2 Crop lines are developed • 1.3 NARS scientists trained	o Plant capacity at the new speed breeding facility (ICARDA-Rabat) (baseline = 2,000, target = 100,000) o Number of plant lines advanced from F1 stage to preliminary trial under speed breeding (baseline = 0, target = 35,000 (5,000 per crop)) o Number of people trained in the use of new breeding technologies and phenotyping pipeline (baseline = 0, target = 30)
2. High throughput precision data collection	• 2.1 Genotyping and phenotyping data collected with reduced experimental error • 2.2 Improved data for making better selection decisions • 2.3 Earlier identification of disease resistant lines	o Number of parental lines for ICARDA's six breeding programs evaluated with genome-wide genotyping technology (baseline = 0, target = 2,520 (360 per program)) o Number of mid-breeding cycle breeding lines genotyped with a small marker set to improve selection decisions (baseline = 0, target = 21,000 (3,000 per program) o Number of preliminary and advanced yield trials plots and number of traits phenotyped with high-throughput physiological tools (baseline = 300 per program, target = 5,600 plots (800 per program) with 3 new tools/tests) o Coefficient of variance (experimental error) points decreased on average at each ICARDA breeding program as result of improved mechanization (baseline = 17%, target = 12%) o Number of crop-specific eco-physiological databases with information on crop response under variable micro-climatic and stress scenarios based on experiments and observations at the Advanced Yield Trial stage (baseline = 0, target = 7) o Number of plants screened at early stage as part of the speed breeding strategy for pests and diseases to identify resistant lines (baseline = 2,000 (1 disease), target = 5,000 (2 diseases per crop)
3. Big Data mainstreamed	• 3.1 Data systems and tools are developed • 3.2 Assessments and maps are produced on yield and scalability	o Number of tools created for data interoperability, throughput phenotyping data analytic, management, and validation pipeline to combine climatic, genotypic and phenotyping data (baseline = 0, target = 8) o Minimum number of High Throughput Phenotype data-points stored integrated and processed (baseline = 10,000, target = 5 million) o Number of novel varieties for which performance under climate change and stress factors has been assessed ex-ante, to steer and streamline future breeding activities (baseline = 0, target =20) o Number of scalability maps produced to support the development of operational seed systems (baseline = 0, target =10)
Project Outcomes	• Outcome 1 (CRP-WHEAT 2.5) Breeders develop improved varieties more efficiently via access and use of germplasm and tools • Outcome 2 (CRP-WHEAT 3.3) Partner breeding teams improved breeding processes by adopting new technologies, methodologies, approaches and genetic resources • Outcome 3 priority regions and varieties identified, supporting scaling the seed systems of the 5 crops.	o Number of breeders who report reduced time needed to make selection decisions o Number of breeders who have mainstreamed new data and tools from ICARDA into their work o Number of NARS that are confident to plant the new fixed lines

3.2 Indicators and Key Evaluation questions

The MEL plan, in line with the general M&E principles, identifies two aspects of the Monitoring and Evaluation activities: **routine monitoring** and **periodic evaluation**. **Routine monitoring** is ensured by the production and the analysis of the planned project's deliverables identified in the Proposal. The **Periodic Evaluation** can be implemented according to the needs and the decision of the project's implementers and gives a tangible indication of the project's efficacy. See below for the lists of indicators that will be used for routine monitoring and periodic evaluation.

Routine Monitoring Indicators:

Relation to impact pathway	No.	Indicator	Baseline	Target	Monitoring frequency	Reference ICARDA or CGIAR CRP indicator or milestone
Output 1.1	1	Plant capacity at the new speed breeding facility (ICARDA-Rabat)	2,000	100,000	Annually	
Output 1.2	2	Number of plant lines advanced from F1 stage to preliminary trial under speed breeding	0	35,000	Quarterly	**Supports GLDC FP4 2022 milestone:** New populations/lines for adaptation to heat and water deficit stress and emerging diseases in climate change scenarios developed.
Output 1.3	3	Number of people trained in the use of new breeding technologies and phenotyping pipeline	0	30	Annually	**Direct match to ICARDA indicator**: OP-4 Number of people trained/ Number of people attending capacity development events **Supports GLDC FP4 2022 milestone**: NARS staff trained in new advances and analytics, limited infrastructure development. Annually at least 100 staff trained 10 per crop for Africa and Asia respectively[3]. **Supports GLDC FP5 2022 milestone:** Capacity development of partners in using various technologies in gene discovery and breeding
Output 2.1	4	Number of parental lines for ICARDA's six breeding programs evaluated with genome-wide genotyping technology	0	2,520	Quarterly	
Output 2.1	5	Number of mid-breeding cycle breeding lines genotyped with a small marker set to improve selection decisions	0	21,000	Quarterly	

Output 2.1	6	Number of preliminary and advanced yield trials plots and number of traits phenotyped with high-throughput physiological tools with 3 new tools/tests	300 per program	5,600 plots	Quarterly	**Supports ICARDA indicator**: OP-1 Number of research and development innovations **Supports GLDC FP5 2019 milestone**: Precision phenotyping for key traits for these collections and genotyping to identify novel alleles for 2 traits in 2 crops that have limited variability in breeding populations[3]. **Supports WHEAT milestone:** improved precision of GS models using high throughput phenotyping and/or environmental data (from 2017 annual report)
Output 2.1	7	Coefficient of variance (experimental error) points decreased on average at each ICARDA breeding program as result of improved mechanization	17%	12%	Quarterly	
Output 2.1	8	Number of crop-specific eco-physiological databases with information on crop response under variable micro-climatic and stress scenarios based on experiments and observations at the Advanced Yield Trial stage	0	7	Annually	**Supports GLDC FP5 2022 milestone:** All GLDC trait discovery programs migrate data to IBP, BMS, GOBII to manage genotypic and phenotypic data
Output 2.3	9	Number of plants screened at early stage as part of the speed breeding strategy for pests and diseases to identify resistant lines (baseline = 2,000 (1 disease), target = 5,000 (2 diseases per crop)	2,000 (1 disease)	5,000 (2 diseases per crop)	Quarterly	
Output 3.1	10	Number of High Throughput Phenotype data-points stored integrated and processed	10,000	5 million	Quarterly	**Similar to ICARDA indicator**: OP-3 Number of datasets generated by ICARDA scientists **Supports WHEAT FP2 2020 milestone:** Centralized breeding data management system and associated tools deployed to provide breeders with better access to germplasm, genealogical, phenotypic, and genotypic data
Output 3.1	11	Number of tools created for data interoperability, throughput phenotyping data analytic, management, and	0	8	Endline	**Supports ICARDA indicator**: OP-1 Number of research and development innovations

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[3] Indicators for CRP GLDC are currently under development, therefore GLDC milestones have been used as proxies for indicators.

		validation pipeline to combine climatic, genotypic and phenotyping data				**Supports WHEAT FP2 2020 milestone:** Centralized breeding data management system and associated tools deployed to provide breeders with better access to germplasm, genealogical, phenotypic, and genotypic data
						Supports WHEAT FP2 indicator: Number of new or improved methods or tools for validation and use in breeding programs
						Supports WHEAT FP3 2020 milestone: Fully operational, integrated network of 6-8 precision phenotyping platforms developing and sharing information & germplasm with partners.
						Supports GLDC FP5 2022 milestone: Develop and validate genomic selection tools for at least 1 cereal and 2 legumes
Output 3.2	12	Number of novel varieties for which performance under climate change and stress factors has been assessed ex-ante, to steer and streamline future breeding activities	0	20	Annually	**Supports ICARDA indicator** PR-3: Number of accessions in long-term storage and safely duplicated at 2 levels
						Supports ICARDA indicator: OP-1 Number of research and development innovations
						Supports WHEAT FP1 2017 milestone: Ex-ante impact assessments identify potential opportunities, threats and game changes for WHEAT
Output 3.2	13	Number of scalability maps produced to support the development of operational seed systems	0	10	Annually	**Similar to/supports ICARDA indicator** OP 2 – Number of research papers published

Periodic Evaluation Indicators:

Relation to impact pathway	No.	Indicator	Baseline	Target	Monitoring frequency

Outcome 1	14	Number of breeders who report reduced time needed to make selection decisions	TBD by Breeder survey	TBD	Baseline End of Year 1 Endline
Outcome 2	15	Number of breeders who have mainstreamed new data and tools from ICARDA into their work	N/A	TBD	Endline
Outcome 3	16	Priority regions and varieties identified	N/A	N/A	Endline

Key evaluation questions are essential to identify the purposes of the evaluation of a project. To our knowledge, AFESD does not have an evaluation guidance document, therefore evaluation questions have been adapted from CRP-WHEAT, CRP-Grains Legumes, and CRP-Dryland Cereals evaluation questions[4].

AFESD Breeding Project Evaluation Questions	
Relevance	
1	Was the project design appropriate to improve the situation at hand?
2	Did the project address or contribute to the priorities of NARS in the 5 target countries?
Effectiveness	
3	Has this project achieved its target outputs and contributed towards the identified CRP-WHEAT and CRP-GLDC outcomes, GGIAR SRF, and ICARDA SRPs?
4	Did the impact pathway logically link the activities to outputs and outcomes through plausible theories of change that take risks, and assumptions into account?
Efficiency	
5	Were financial, material, and human resources used in the best possible way?
6	Have the resource allocation processes and timing affected the implementation of the program's research activities?
Capacity Building	
7	How did the training activities in this project contribute to building the capacity of NARS scientists?
8	To what extent is ICARDA's ability to efficiently serve the national agricultural research centers (NARS) improved?
Sustainability	
9	Are financial, material, and human resources secured to continue speed breeding activities at ICARDA-Rabat?
Scaling Up	
10	Is the project adequately addressing enabling factors for scaling up speed breeding activities at ICARDA facilities?

4. Why to develop a MEL Plan?

- **To foresee potential problems** and to quickly identify the solutions
- **To follow the chain of results** (through the Logical Framework, the Theory of Change and/or Impact Pathway) it is important to have a clear overview of the main risks during the project's activities deployment. Indicators will provide information of the project in terms of achievement of results, both during the implementation phase and at the end of the project.
- **To contribute to the development of knowledge sharing activities** (research papers, briefs, workshops on the project's topic…)
- **To develop side activities** (research papers, workshops…) based on data of the MEL Plan indicators

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[4] Note that GLDC was formerly separated as two CRPs: Grain Legumes and Dryland Cereals. The latest evaluations were conducted while these CRPs were still separate, thus evaluation questions from both CRP evaluations were reviewed.