



المركز الوطني للبحوث الزراعية  
National Agricultural Research Center



## Final AFESD Project Workshop

Enhancing Innovation and Technology Dissemination for Sustainable Agricultural Productivity in Arab Countries

Center of Excellence – Agro-pastoral farming systems

**Socio-Economic Component: Findings, Implications, and Way Forward**

**01 – 02 June 2021**

Boubaker Dhehibi (ICARDA-Tunisia) & Masnat Al Hiary (NARC-Jordan)  
(On behalf of All Team Members)

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International Center for Agricultural Research in the Dry Areas

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# **Deliverables, Findings and Achievements**

Period of intervention: September – December 2019

A Synthesis

# Objectives of the Socio-economic Component - 2019

## General Objective

- Improving the livelihood of small-scale farmers through diversification and sustainable agro-pastoral system-based value chains

## Specific Objectives


- To assess and diagnostic the barely value chain both at the national level and community level
- To conduct an economic and financial valuation of a sustainable Marab (as potential technique to enhance barely production in the *Badia* agro-pastoral farming system)
- Introducing and testing the profitability “*permaculture*” concept at the household level in the *Badia*
- Enhancing the capacity building of different stakeholders (technicians, women, etc.)

## Methodology and data collection

- Desk review, FGD's, rapid rural appraisal surveys, secondary data, personal observations, technical reports, training documents, etc.
- Partial budget analysis tool, value chain analysis tool, Micro-economic analysis, software applications (i.e., trainings), etc.

# Achievements and Deliverables in 2019

Type of deliverable	Deliverable	MEL Link
Checklist instrument tool	Focus groups discussion (FGD's) check list instrument document (In English and Arabic)	<a href="https://repo.mel.cgiar.org/handle/20.500.11766/11084">https://repo.mel.cgiar.org/handle/20.500.11766/11084</a>
Technical report	Technical report from FGD meetings (Women and Men)	<a href="https://mel.cgiar.org/reporting/report/id/9020/detail_id/20142">https://mel.cgiar.org/reporting/report/id/9020/detail_id/20142</a>
Guideline report	Implementation guideline report of permaculture technique at the household level	<a href="http://repo.mel.cgiar.org:8080/handle/20.500.11766/11069">http://repo.mel.cgiar.org:8080/handle/20.500.11766/11069</a>
Technical report	Technical report on the barley value chain at national and community level	<a href="https://repo.mel.cgiar.org/handle/20.500.11766/11068">https://repo.mel.cgiar.org/handle/20.500.11766/11068</a>
Technical report	Technical report on the implementation process of permaculture technique	<a href="https://repo.mel.cgiar.org/handle/20.500.11766/11021">https://repo.mel.cgiar.org/handle/20.500.11766/11021</a>
Training report	Technical Report on Training for Questionnaire Design, Data Management, Analysis, and Reporting in Socio-economics Research: Towards Sustainable Agricultural Productivity in Arab Countries	<a href="https://repo.mel.cgiar.org/handle/20.500.11766/10981">https://repo.mel.cgiar.org/handle/20.500.11766/10981</a>

- 
- There is a **great potential** that the permaculture technology would provide social development, economic wellbeing and environmental sustainability in drought-prone areas like Al Majdiyyah.
  - Barley is considered as a **major crop of economic significance** for farmers in **arid areas** of Jordan due to low water requirement, production of grain and fodder both.
  - **Economic and financial profitability of “Marab”**: The internal rate of return (IRR) of “Marab” is 8%. The cost benefit ratio (CBR) of the “Marab” technology is 1.6 (20 years) and 1.2 (10 years).
  - **Positive feedback** and **request for more trainings** by the participated categories of trainers (Women, researchers, technicians, etc.).

# Concluding Remarks - 2019

- Community **empowerment through training** on permaculture techniques at the household level
- High probability that **permaculture will be adopted** by agro-pastoral farmers.
- The permaculture technology could be considered as one of the **sustainable alternatives** for communities potentially vulnerable to climate change
- **Declining of barley cultivation:** Farmers are shifting to market oriented and cash crops due to unavailability of improved varieties of barley; weather pattern, high cost of seeds and farmers not following the good management practices
- “*Marab*” is **profitable** with an expected potential return in the long run (with an IRR=8% and payback period of about 11 years).



## **Deliverables, Findings and Achievements**

Period of intervention: January 2020 – May 2021

**A challenging period: COVID-19**

# Objectives of the Socio-economic Component – 2020-2021

## General Objective

- Improving the **livelihood of small-scale farmers** through diversification and sustainable agro-pastoral system-based value chains

## Specific Objectives

- Conducting a **holistic impact assessment** and cost savings of rainwater harvesting at the watershed scale: The Marab case
- Conducting a **feasibility study** of on-farm sheep and goat milk processing, packaging, and marketing through an inclusive business model
- Piloting and documenting the **feasibility study of PERMACULTURE** framework: Business plan
- Implementing a **training course** on “Advanced Statistical Analysis using SPSS”



# Achievements and Deliverables in 2020-2021

Type of deliverable	Deliverable	MEL Link
Survey Instrument tool	Primary level data collection survey instrument (In Arabic)	<a href="https://hdl.handle.net/20.500.11766/11133">https://hdl.handle.net/20.500.11766/11133</a>
	Primary level data collection survey instrument (In English)	<a href="https://hdl.handle.net/20.500.11766/11132">https://hdl.handle.net/20.500.11766/11132</a>
Policy brief	Enhancing a Traditional Water Harvesting Technique in Jordan's Agro-pastoral Farming System"	<a href="https://repo.mel.cgiar.org/handle/20.500.11766/11506">https://repo.mel.cgiar.org/handle/20.500.11766/11506</a>
Technical report	Permaculture Design and Business Plan for Sustainable Livelihoods Programming: Low-Cost, Sustainable Solutions for Food and Nutrition Insecure Agro Pastoral Communities in Jordan	<a href="https://dx.doi.org/20.500.11766/12460">https://dx.doi.org/20.500.11766/12460</a>
Technical report	Dairy farming business plan - Feasibility Study for Milk Processing Unit at Household for the Agro Pastoral Communities in Jordan	<a href="https://dx.doi.org/20.500.11766/12628">https://dx.doi.org/20.500.11766/12628</a>

# Achievements and Deliverables in 2020-2021

Type of deliverable	Deliverable	MEL Link
Curated dataset	Dairy farming business plan - Feasibility Study for Milk Processing Unit at Household for the Agro Pastoral Communities in Jordan	<a href="https://dx.doi.org/20.500.11766.1/FK2/65JXMF">https://dx.doi.org/20.500.11766.1/FK2/65JXMF</a>
Training report	Advanced Statistical Analysis using SPSS	<a href="https://dx.doi.org/20.500.11766/12902">https://dx.doi.org/20.500.11766/12902</a>
Brochure	Permaculture Design and Business Plan for Sustainable Livelihoods Programming: Low-Cost, Sustainable Solutions for Food and Nutrition Insecure Agro Pastoral Communities: Permaculture as a development tool to managing dry land resources	<a href="https://mel.cgiar.org/reporting/report/id/9020/del_id/27545">https://mel.cgiar.org/reporting/report/id/9020/del_id/27545</a>



# Synthesizing Research

*Converting fruit into fruit smoothies*

Design/methodologies/approach/Data/Findings/Results/  
Implications

# Show Case Study 1: Marab WHT Innovation

**Running title:** Enhancing a Traditional Water Harvesting Technique in Jordan's Agro-pastoral Farming System

**Purpose:** Economic and financial evaluation of “Marab” innovation technique

**Design/methodology/approach/Data:** Partial budget analysis tool, rapid rural appraisal, CBA, NPV, IRR, PBP

## Hypothetical findings

- Inadequate public investment resources to develop new WHTs
- Inefficient public-private partnerships and lack of common vision and effective coordination, perception, and assessment of generated benefits of ecosystem services
- Low adoption rates of proven WHT practices
- Lack of effective policy instruments and mechanisms

## Enhancing a Traditional Water Harvesting Technique in Jordan's Agro-pastoral Farming System

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### Background

Water scarcity restricts agro-pastoral farming systems, and thus the development and economic growth of arid environments' communities, which face several challenges that are interconnected with water scarcity including land degradation, low productivity, and food insecurity. Providing sustainable water harvesting technique (WHT) is one option to ensure efficient use of scarce and fragile resources; to restore degraded lands in drought-prone areas, and to expand income generation opportunities and improved livelihoods.

### What this Policy Brief is about

This Policy Brief draws lessons from research conducted by the International Center for Agricultural Research in the Dry Areas (ICARDA) and the National Agricultural Research Center (NARC) in Jordan, focusing on the development and monitoring of a scientific-driven WHT called “Marab” in a participatory approach with the local community.

This Policy Brief has been developed for policymakers at national and local levels of government to highlight lessons learned and provide recommendations for policy, while also highlighting the principles of an effective adaptation and coping strategy to re-establish the productive functioning of Jordanian Badia<sup>2</sup> environments. The Brief also identifies how investing in Marab at the community level could improve the livelihoods of rural households and communities in the Badia, where water scarcity, land degradation, and food insecurity are widespread.

### Box 1: Key messages

- An appropriate WHT for agriculture, such as Marab, can contribute to both poverty alleviation and climate change adaptation in agro-pastoral farming systems.
- Community and geographical contexts must be considered when reviewing the anticipated benefits of implementing Marab.
- The Marab innovation could enhance and sustain a range of various ecosystem services such as water purification, retention of sediments, enhancement of soil fertility, increased land cover, and reduction of downstream flooding to cities and villages.
- Economic and financial indicators suggest that this WHT approach, when implemented at the community level with barley, is profitable and cost-effective. This would contribute to secure fodder crops for small livestock keepers and at the same time also provides acceptable quality grain for human consumption.
- Given its profitability, it is recommended that the Jordanian government increase public investment in implementing Marab to support to develop new pathways to raise water productivity, and production of fodder crops, and livestock products.

<sup>1</sup> Marab is an ancient and simple concept: the floodplain levelling and dam and spillway-based intervention distributes excess rainfall received from upland watershed areas, generated during erratic rainstorms, over the downstream Badia, and thus enhances local water availability for enhanced crop production. ICARDA has been working to optimize this concept through advanced land suitability assessment and design considering diverse local environmental factors. The upgraded Marab layout allows for optimized water collection, deep infiltration and soil water storage for targeted field crop support – considering downstream water requirements – and, therefore, sustainably embedding the Marab agro-pastoral technology into basin water management. Locally, the Marab helps dryland farmers to extend growing windows, raise productivity, and reduce pressure on fragile resources.  
<sup>2</sup> It is an area known to Jordanians as “al-Badia” (pronounced “BAD-ya”) – a classical Arabic word meaning both “arid area” and “the place where the Bedouins come from”.

# Show Case Study 1: Marab WHT Innovation

## Empirical findings

- Scenario I: 10-year life cycle of *Marab* planted with barley - CBR = 1.64; IRR = + 36%; PBP = 2 years
- Scenario II: 20-year life cycle of *Marab* planted with barley - CBR = 1.28; IRR = + 20%; PBP = 2 years

## Originality / Value

- An appropriate WHT for agriculture, such as *Marab*, can contribute to both **poverty alleviation** and **climate change** adaptation in agro-pastoral farming systems
- *Marab* innovation could enhance and **sustain a range of various ecosystem services** such as water purification, retention of sediments, enhancement of soil fertility, increased land cover, etc.

## Practical and political implications emerging from this research

- Providing **greater political and institutional** input into this technology
- Strengthening **public private partnerships** to accelerate *Marab* deployment across Jordan's *Badia* areas
- Involving **rural communities** and increasing their knowledge and perception of the merits of this innovation
- Including *Marab* within the **government's development** agenda

# Show Case Study 2: Permaculture Design Process

**Running title:** Permaculture Design and Business Plan for Sustainable Livelihoods Programming: Low-Cost, Sustainable Solutions for Food and Nutrition Insecure Agro Pastoral Communities: Permaculture as a development tool to managing dry land resources

**Purpose:** Piloting and conducting a feasibility study for permaculture concept in Al Majidyaa

**Design/methodology/approach/Data:** Partial budget analysis tool, business model, rapid rural appraisal, statistical analysis and data monitoring, PI, CBA, NPV, IRR, PBP

## Hypothetical findings

- Permaculture is a programming concept as a response to food and nutrition insecurity for agropastoral communities
- Permaculture is a non-donor dependent tool for improving the health, food and nutrition security, and livelihoods of agropastoral communities and their families
- Permaculture make efficient dry land resources, using diversity, and Encourage multifunctionality

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## FACT SHEET

### Permaculture Design and Business Plan for Sustainable Livelihoods Programming: Low-Cost, Sustainable Solutions for Food and Nutrition Insecure Agro Pastoral Communities:

Permaculture as a development tool to managing dry land resources

Boubaker Dhehibi<sup>1</sup>, Masrat Al Hary<sup>2</sup>, Omamah Al Hadidi<sup>1</sup>, Malek Abo Roman<sup>1</sup>, Ala Al Abdalaziz<sup>1</sup>, Majdy Al Adwan<sup>2</sup>, Ala'a Awaideh<sup>2</sup>

<sup>1</sup> Social, Economic, and Policy Research Team (SEPR), International Center for Agricultural Research in the Dry Areas (ICARDA), Tunis - Tunisia

<sup>2</sup> Socioeconomic Studies Directorate - National Agricultural Research Center (NARC) - Jordan



Working beds systems in Al Majidyaa (Credit: Socio-economic Team - NARC - Jordan)

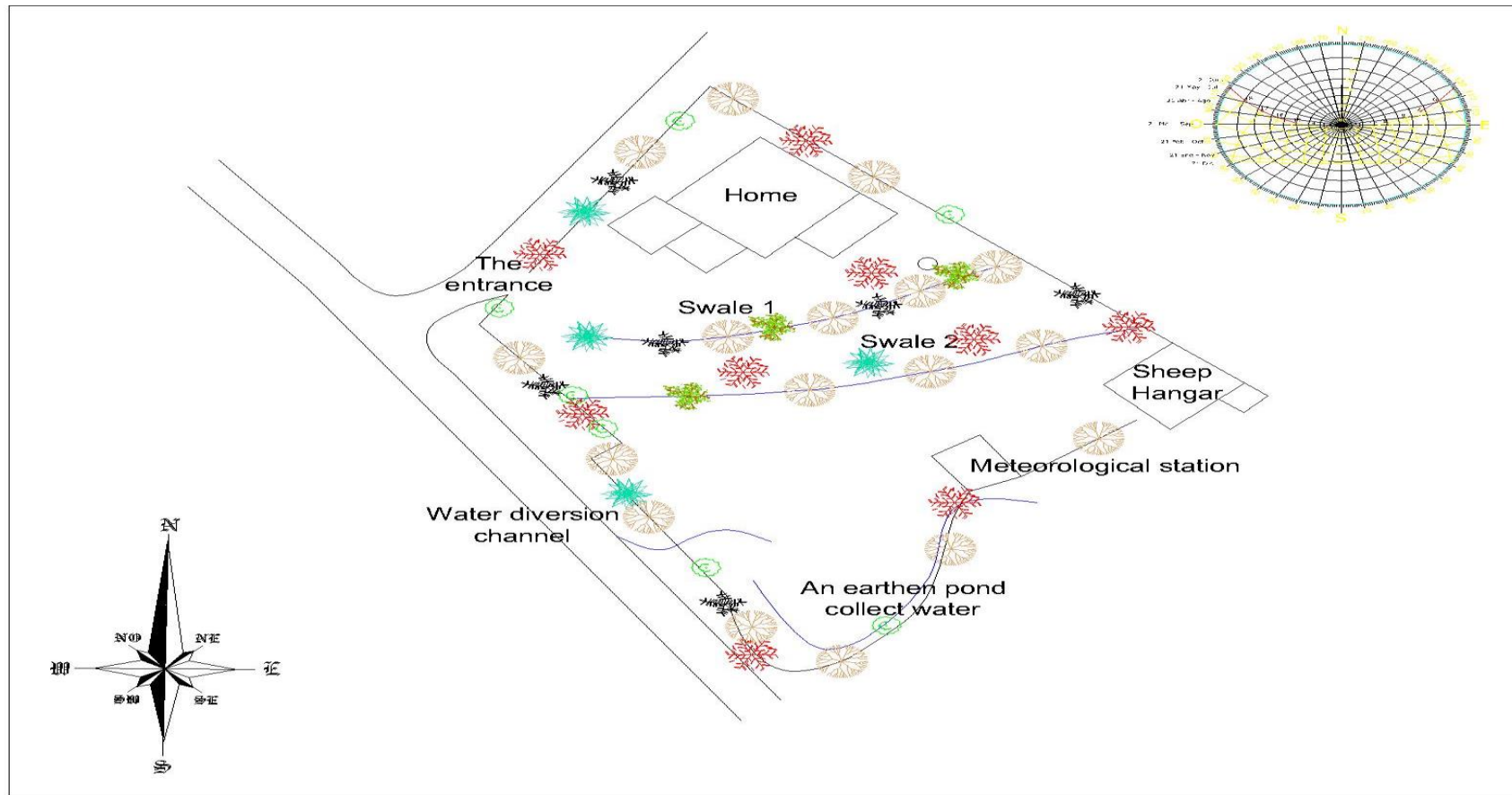
### Understanding the Context

There is a serious threat posed to human survival by food insecurity, especially among vulnerable communities such as agropastoral living in dry land areas. The overwhelming effects of the land degradation, low productivity, and food insecurity in the agropastoral farming systems have again called attention to the need for a longer-term response to the problems of food security and rural development in the agropastoral dry areas. Evidenced climate change threats, water scarcity, and resources degradations are the main factors that have exacerbated these problems. They will continue to do so until more sustainable responses are in place. Solving these problems will require an integrated approach that encompasses the main themes of this volume. These include managing productive resources throughout the climate change threats, understanding ways to promote change, and managing dryland resources. There is considerable accumulated experience on options to help tackle these problems.

One development approach that shows promise for agropastoral farming systems communities programming, particularly in a dryland context, is permaculture. Therefore in the frame of the *Strengthening Innovation and Technology Adoption towards Sustainable Agricultural Productivity in Arab Countries* project and under the diversification of agropastoral system-based value chains activity, the International Center for Agricultural Research in the Dry Areas (ICARDA) in collaboration with the National Agricultural Research Center (NARC - Jordan) designed and implemented this technique in the agropastoral region of Jordanian Badia (i.e., Al Majidyaa).

# Show Case Study 2: Permaculture Design Process

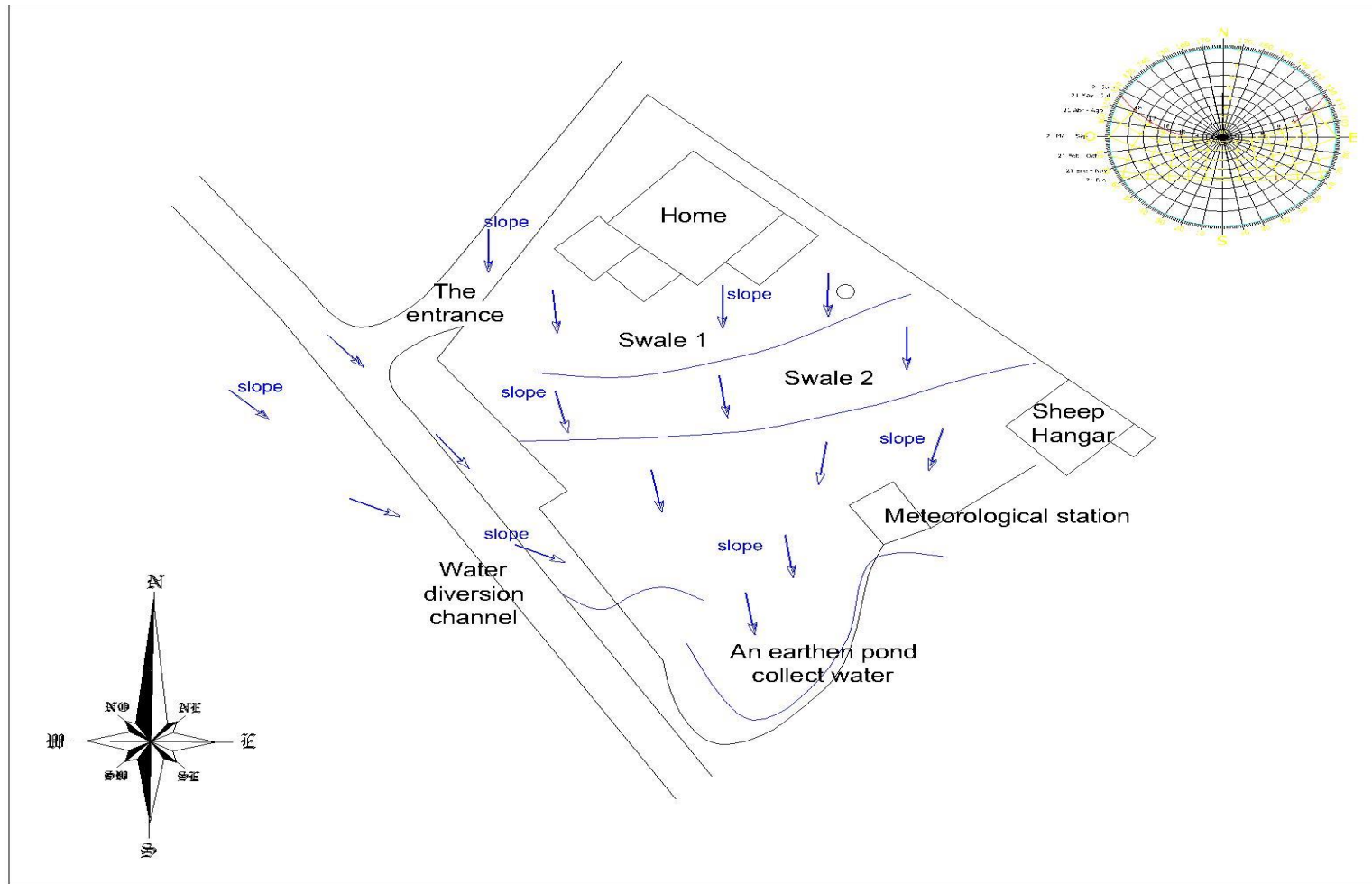
## Permaculture design





# Show Case Study 2: Permaculture Design Process

## Map of the direction of rainwater flow





# Show Case Study 2: Permaculture Design Process

## Location before work begins



# Show Case Study 2: Permaculture Design Process

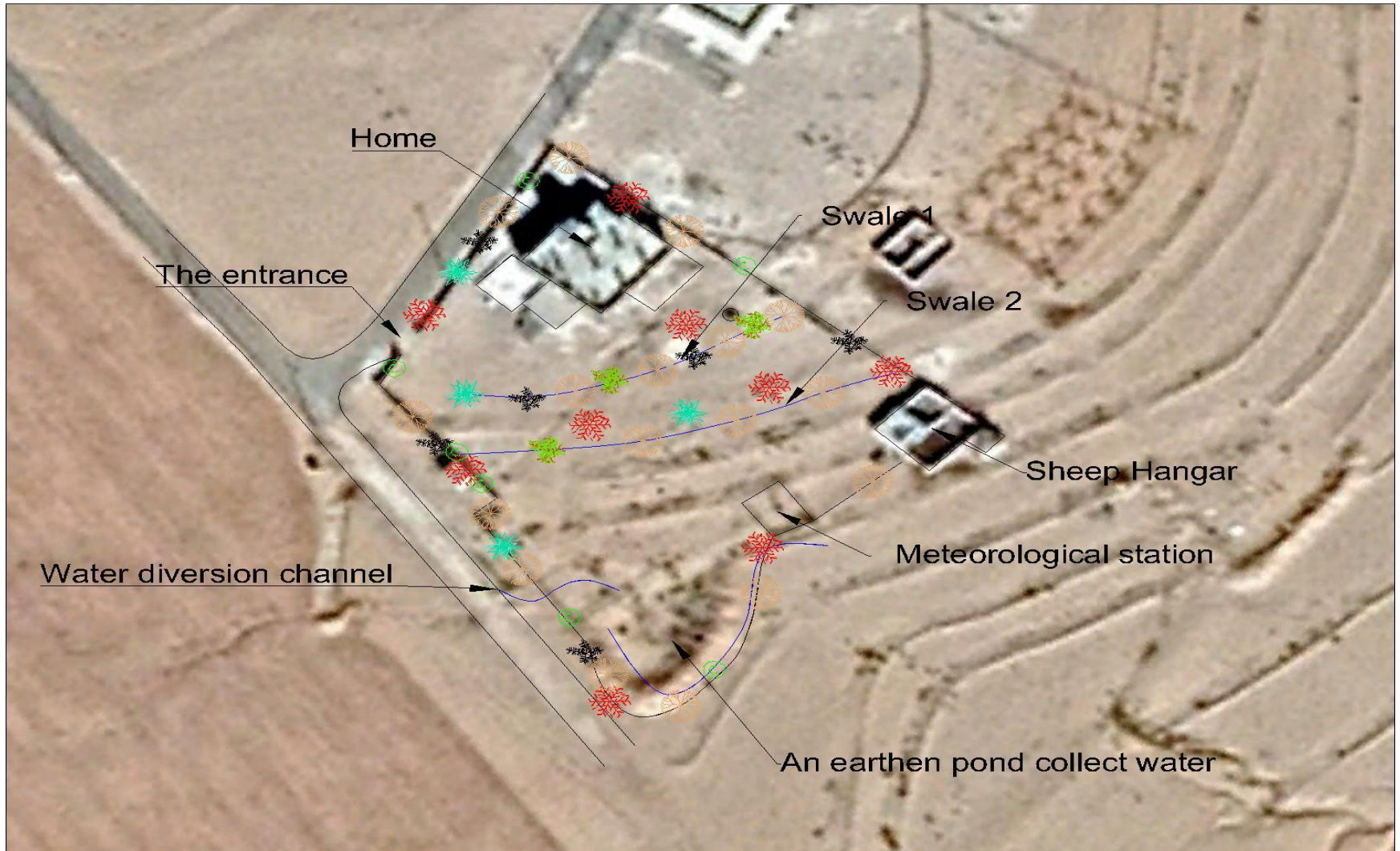
**Total Station for the surface and dropping the site of the water harvesting technology and its implementation on the ground**





# Show Case Study 2: Permaculture Design Process

## Permaculture implementation



# Show Case Study 2: Permaculture Design Process

## *Monitoring the permaculture concept*

### Follow-up water harvesting techniques

- Water harvesting for house roof technique
- Swales water harvesting technique
- Water Pond harvesting technique





# Show Case Study 2: Permaculture Design Process

## *Monitoring the permaculture concept*





# Show Case Study 2: Permaculture Design Process

## *Monitoring the permaculture concept*





# Show Case Study 2: Permaculture Design Process

## *Monitoring the permaculture concept*



# Show Case Study 2: Permaculture Design Process

## *Monitoring the permaculture concept*





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## *Monitoring the permaculture concept*





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# Show Case Study 2: Permaculture Design Process

## *Monitoring the permaculture concept*





# Show Case Study 2: Permaculture Design Process

## *Monitoring the permaculture concept*



# Show Case Study 2: Permaculture Design Process

## Empirical findings

### Economic and financial indicators – Permaculture business plan in Al Majidyya (Jordanian *Badia*)

Item	Indicators	@Discount Rate 3%	@Discount Rate 6%
Non-discounted profitability criteria	Average Net Profit (JD)	5753.33	5753.33
	Profitability Index (PI)	<b>13.22</b>	<b>10.97</b>
	Payback Period (Years)	2	2.1
	Return on Investment (ROI)	1.51	1.51
	Break-Even Analysis	<b>0.2</b>	<b>0.2</b>
Discounted profitability criteria	Net Present Value (JD)	45964.07	37492.37
	Benefit Cost Ratio (BCR)	<b>1.38</b>	<b>1.16</b>
	IRR (%)	89	84

Source: Project team elaboration based on Amman market price (2020).

Note: (1) Area of the permaculture investment: 4 dunums (0.4 hectares); (2) 1 JD=1.41 US\$.

# Show Case Study 2: Permaculture Design Process

## Originality / Value

- Permaculture is a **potential development tool** for managing dry land resources that shows promise for agropastoral farming systems communities programming
- Permaculture is a **low cost, relevant and profitable sustainable** solution for food and nutrition insecure agropastoral communities
- The benefits associated with permaculture from economic return is **increased savings** from **reduced input**, high yields, and affordability of this technique

## Practical and political implications emerging from this research

- Enhancing the **adoption** of this concept for being effective in supporting multiple objectives in the agropastoral farming systems
- Providing **institutional support** as permaculture holds the key to increasing dietary diversity within households and enhancing social and ecological resilience
- Increasing **allocated funds** to support research and development for such transitions model

# Show Case Study 2: Permaculture Design Process

## CONCLUDING REMARKS AND IMPLICATIONS

- Solving climate change threats, water scarcity, and resources degradations problems will require an integrated approach that encompasses the main themes of permaculture business plan.
- permaculture holds the key to increasing dietary diversity within households and enhancing social and ecological resilience (support livelihood activities and improve the ability of agro pastoral).
- There is a potential profitability of investing in this technique in the dry land areas ( Al Majidyya).
- implies a transition from conventional production system in agro pastoral towards an array of sustainable regenerative production systems.
- the role of people as not mere producers of food, but also as managers of ecological systems that produce a suite of ecosystem services is needed.
- entails a strong emphasis on alternative agricultural practices in national strategies.
- increasing allocated funds to support research and development for such transitions model will be required from community to national levels in order to advance socio-economic development in these less favorite areas.



# Show Case Study 3 : Dairy farming business plan

**Running title:** Dairy farming business plan - Feasibility Study for Milk Processing Unit at Household for the Agro Pastoral Communities in Jordan

**Purpose:** an economic feasibility study of on-farm sheep and goat milk processing, packaging, and marketing through an inclusive business model

**Design/methodology/approach/Data:** business model, economic and statistical analysis, desk review, stakeholders' workshops, household surveys (Al Khanasri and Al Majdiyyah), SPSS software

## Hypothetical findings

- Business planning is an important part of owning and managing a dairy processing business
- Willingness from agro-pastoral producers traditionally to go through the dairy business planning process
- There is an interest in the manufacturing of dairy products to have milk product which comply with standards

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## Dairy Farming Business Plan Report

Feasibility Study for Milk Processing Unit at Household for the Agro Pastoral Communities in Jordan



*Strengthening Innovation and Technology Adoption towards Sustainable Agricultural Productivity in Arab Countries*

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February 2021

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# Show Case Study 3 : Dairy farming business plan

## Socio-economic Surveys



### Socio Economic Survey Questionnaire Instrument

(أداة استبيان المسح الاجتماعي والاقتصادي)

(v1.0)

### Economic Feasibility Study of Dairy Processing (Sheep and goat milk) at the Household Level: Case of Jordanian Badia Communities

دراسة الجدوى الاقتصادية لتصنيع منتجات الألبان (حليب الأغنام والماعز)  
على مستوى الأسرة: حالة مجتمعات البادية الأردنية

### Strengthening Innovation and Technology Adoption towards Sustainable Agricultural Productivity in Arab Countries (Case of Jordan)

تعزيز الابتكار واعتماد التكنولوجيا لتحقيق انتاجية الزراعة المستدامة في البلدان العربية (حالة الأردن)

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# Show Case Study 3 : Dairy farming business plan

## Socio-economic Surveys



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# Show Case Study 3 : Dairy farming business plan

Focus Group on (Dairy Manufacturing Challenges and Opportunities)

Al Mafraq Agricultural Research Center/ July 13, 2020



# Show Case Study 3 : Dairy farming business plan

## Empirical findings

- Livestock numbers are declining in Al Majidyya due to the lack of pastures, land degradation and the lack of veterinary services
- Young ladies lack the interest and skills on dairy processing among young people at the household level and it declines among older women
- Women contributes to all livestock activities
- Dominance of traditional milk processing system
- Milk is reserved for processing rather than consumption
- Jameed, ghee, and *labaneh* are the main dairy products produced
- *Jameed* is the most common product in the area, and improvement of the quality and quantity is possible.
- Jameed, white cheese, and *shaninah* are the most profitable products

## Show Case Study 3 : Dairy farming business plan

No.	Item	Milk	Jameed	White cheese	Shanina ( buttered milk)
	Purchase (or sales)price(JD/100 kg)	100			
1	Average amount of fresh 100 kg milk needed to produce (kg)	100	10	21.62	150
13	Total fixed cost		87.05	77.54	84.45
18	Total variable cost	0	14.16	13.6	13.16
19	Total cost		101.21	91.14	97.61
26	Total return	0	130.8	108.1	120.8
27	Net profit (JD)		29.59	16.96	23.19

It was found also that “Jameed” gives the highest net return and it has long shelf life

# Show Case Study 3 : Dairy farming business plan

## Originality / Value

- Sheep and goat dairy processing units **plays an important** role in the economy and food security of dry land communities
- Provide a **comprehensive review** to understand the system of dairy production, milk marketing channel in which smallholder dairy farmers sell dairy products in agro-pastoral contexts
- Examine how the **market is functioning** by identifying the role of women along the dairy value chain and constraints for their participation
- Outline **challenges and opportunities** for development of dairy value chain in *Badia*

## Practical and political implications emerging from this research

- Need to **activate** the role of agricultural extension in dairy processing and veterinary services
- Enhancing the **know-how** of women through focus trainings on dairy hygiene, health, certification, etc.
- Enhancing the **awareness** regard producing “*Jameed*” as it gives good return and can be exported to other countries benefitting from the geographical indicator



# Show Case Study 4 : Capacity building



**Training title:** Advanced Statistical Analysis using SPSS

**Venue:** NARC – Jordan

**Schedule:** 28-31 March 2021

**# Participants:** 11



## Training Technical Report

"Advanced Statistical Analysis using SPSS"  
28-31 March, 2021.



**Strengthening Innovation and Technology Adoption  
towards Sustainable Agricultural Productivity In Arab  
Countries**

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April 2021





- **WHT – *Marab***
  - Develop Agropastoral-wide climate, agricultural, environmental, and stakeholders policy coherence analyses for promoting “*Marab*” concept in Jordan (and similar contexts)
- **Concept-Permaculture**
  - Assess relevant policy processes and mechanisms to promote the permaculture business
  - Ensuring this concept is tailored to suit the agropastoral ecosystems through more research for development (R4D)
- **Dairy business model**
  - Investing in female entrepreneurs and dairy farming
  - Empowering women and youth in dairy and agribusiness
- **Capacity building**
  - Continue strengthening training and capacity building at All levels (researchers, technicians, farmers, etc.)

# Power of Partnership: ICARDA & NARC Research Team

- **ICARDA Team**

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Eng. Tayseer Aladwan

Eng. Ala`a Alawaydeh

Eng. Alaa Alabdallat

Mr. Ehab Mhawish

Mr Ali Madallah

Eng. Oday Al-Neamat

Eng. Omamah Alhadidy

Eng. Thikrayat Al-Qutifan

Eng. Ola Arabiat

Eng. Ragda Aldaradka

Eng. Nebal Aburomman

# ACKNOWLEDGMENTS

## Special Thanks

The project team would like to thank all **NARC socio-economic**, technical team for their devotion and commitment to implementing this work.

We would like to acknowledge the participation of the **farmers** in all outlined studies areas and thank them for sharing with us their ideas and knowledge.

## Disclaimers

*(1) The views expressed in this presentation are the authors' own and do not necessarily reflect ICARDA, NARC, AFESD, CGIAR or any involved research and development partners in this research program*

*(2) Personal information including Name, Business Title, Email, Phones, Images and GPS points included in this PPT have been authorized in writing or verbally by the data subject*



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# Thank You

## Comments – Questions

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