Qualitative and Quantitative Assessment of Farmers' Willingness to Adopt Water Harvesting Technologies in Jordan Badia

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Research Team

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Goal and Objective of the Study

- **Project Goal:** The overall objective of this research is to improve dissemination strategies and approaches to promote adoption of proven water and land management technologies (water harvesting) by identifying farmer perceptions and constraints to adoption of WLI project technologies

- **Specific Objectives:**

1. Assess farmer's perceptions of, and exposure to water harvesting technologies and to determine the major factors influencing farmer's adoption decisions to adopt such technologies.
2. Identify factors influencing farmers' willingness to adopt water harvesting practices. ''Willingness to adopt'' refers to a farmers' motivation to adopt a new innovation, technology, and/or practice in their business (Anderson, 1993).
3. Identify potential challenges and opportunities for technology adoption by farmers.

Water harvesting technologies

Water harvesting Vallerani system(Contour ridges), Marabs, cisterns, and water harvesting for rangeland shrub and barley growth, which have been studied over many years in the Jordanian Badia.

Water harvesting technologies

Selection criteria: The WLI project activities in Jordan aims to pilot test strategies for sustainable land and water management in the Jordanian rangelands (Badia), focusing on the adaptation of water harvesting techniques.

- **Information on the technology**

Purpose : capture runoff flows ,to restore degraded and drought-prone areas, maximizing water productivity, increase production , income generation, and other livelihood benefits in a harsh dryland environment.

Tested and developed at (Majidyya & Muharib) at the middle Badia benchmark site (2006).

Benefit -Cost Analysis (BCA) of different water harvesting techniques at the study area

Water harvesting Technique	Economic BCA (Discount rate 10%)		
	IRR %	NPV (JD/ha)	B/C Ratio
Traditional Pits	7.4	97	1.75
Shrubs with water harvesting	**13**	208	2.5
Barley farmer practice	7.8	52	1.17
Barley with water harvesting	**17**	63	1.16

*Investing 1 JD in planting Barley with WH resulted into 1.17 JD

Interventions dissemination Strategy

- Testing and fine-tuning potential water harvesting intervention to suit the arid environment

- ✓ Successful out-scaling and adoption of research outputs…
- ✓ Example: implementing Vallerani system by different development, Research and Governmental programs across Jordan

Mechanisms for scaling up

- Field days
- Farmer to farmer
- Visits
- Linkages with other projects
- Linkages with different institutions

District	Area (ha)	Research / Development Program
Al-Karak / Al-Irak	73	Mountain project / WLI
AL-Taibah	44	Agricultural Resource Management Program(MOA) / WLI
Al-Qasr	22	
Al-Karak	21	
Al-Lajoun	15	Agricultural Resource Management Program(MOA)
Al-Azraq	273	Badia Rehabilitation Program
Al-Safawi	413	Badia Rehabilitation Program
Rweished	722	Badia Rehabilitation Program
Al Majdyyah & Muhareb	172	Water Benchmark Program / Water and Livelihood Initiative(WLI)
Al Mafraq	2.7	WLI
Tafilah	40	CRP-DS
Hashemiah	40	HFDJB (Hashemite Fund for Development of Jordan Badia)
Tafila\ Al-Eiss	40	Mashreq-Magreb project
Total (Area)		**1877.7 ha**

Methodology

1. Study area: *Muhareb & Majedya, Jordan*

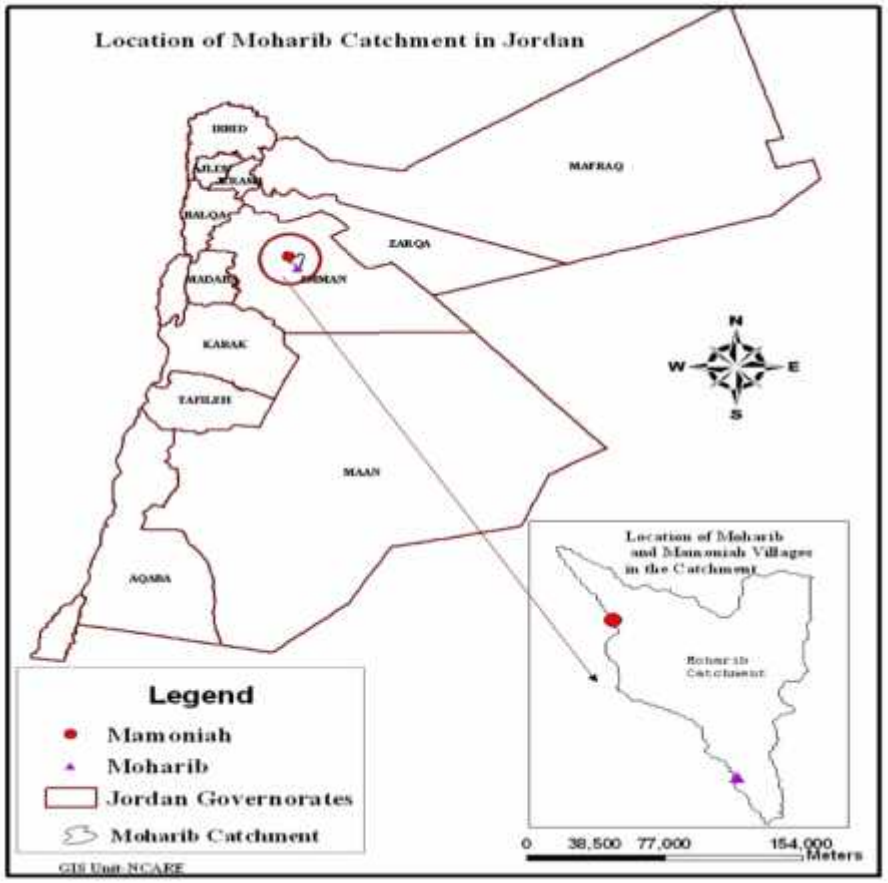
Water basin (60km2)

Benchmark site (848ha)

Up scaling area (610ha)

Target population

- 2 villages
- 70 households
- 420 total inhabitants
- 55 % adult male , 45% adult female



Methodology

2. Data collection method

A Farmer's questionnaire been prepared to collect information to achieve the study objectives.

The questionnaire was designed to capture information about the following aspects

-Farmers Socio economic conditions
- Main crops planted and inputs used.
- Animals owned
- Marketing livestock products
- Source of fodder/animal feed
- Water sources
- Access to credit
- Engagement in community based organizations
- Farmers Knowledge of the new technologies
- Basic criteria for technology adoption
- Water harvesting technology characteristics
- Challenges in current agricultural practices.

Regional socio economic thematic group:

Within the activities of the socio economic thematic group, a detailed Methodological guideline was prepared for data collection, coding and analysis of farmer's questionnaire for all WLI counties.

Methodology

3. Sample size

A sample of 59 farmers has been selected using random sampling procedure. The survey was done on a sample of 25 adopter's farmers and 34 non-adopters of water harvesting techniques.

Distribution of sample by location

Farmers group/location		No. of farmers	%
Adopters	Middle Badia(WLI site)	13	52.0
	Karak governorate	12	48.0
	Total	25	100.0
Non-adopters	Middle Badia(WLI site)	34	100.0

Methodology

4. Methods of data analysis

4.1. Descriptive statistics

- Qualitative and quantitative methods of data analyses.
- The collected data was coded, entered into the SPSS software for further processing and analysis .
- Descriptive statistics (frequencies, mean, minimum, maximum, standard deviations, etc.) of factors influencing adoption of water harvesting techniques.

4.2. Logit model

A binary **logistic regression** is used to regress the dependent variable, Y, of weather the farmer had adopted water harvesting technology: Prob (event) = Prob (Y,1 represents ith farmer adopted, and 0, otherwise)

$$Y = \begin{cases} 1: adopted \\ 0: otherwise \end{cases}$$

Against the estimated factors affecting adoption of water harvesting technology.

Methodology

Variables in the Empirical Binary Logistics Model

Selection of independent variables (assumptions and hypothesis)

Acronym	Description	Type of measure	Expected Sign
Dependent variables			
ADOP	Whether a farmer has adopted or not	Dummy (1 if yes, 0 if no)	
Explanatory variables			
AGE	Household head's age	Years (1, 2, 3, 4)	-
EDUC	Educational background of the household head	1, 2, 3, 4,5, 6	+
FEXP	Household head's farming experience	Years	+
LABE	Labor force size	Active labor force numbers	+
TENUR	Status of land ownership	1, fully owned; 2, rented; 3, shared	?
CRED	Obtained credit	Dummy (1 if yes, 0 if no)	+

Results

Farmer's factors influencing adoption of water harvesting in Jordan Badia

Results from the regression model and interpretation

Parameter estimates of the binary logistic regression model for factors influencing adoption of water harvesting in Jordan Badia

Variable	B	S.E.	Wald	Sig.	Exp(B)
AGE	.015	.030	.254	.615	1.015
EDUC**	.457	.298	2.358	.125	1.580
FEXP*	.067	.036	3.448	.063	1.070
LABE	.324	.501	.420	.517	1.383
TENUR**	-1.670	.695	5.777	.016	.188
CRED	.567	.719	.622	.430	1.763
Constant	-2.440	2.350	1.078	.299	.087

Hosmer and Lemeshow Test: Chi-square, 3.881; df., 8; Sig., 0.868

-2 Log likelihood 57.613a ; Cox & Snell R Square, .321; Nagelkerke R Square, .431

The overall percentage of correct predictions, 69.5 %.

*Significance at 5%.

**Significance at 10%.

Exp(B) shows that holding all other explanatory variables constant, for every 1-unit increase in EDUC score, we expect a 1.58 times increase in the log-odds of adoption (the probability of adoption).

Results of the Binary Regression model and discussion

1. Farmers' resource endowment and socioeconomic characteristics

- **AGE:** there is **no significant** relationship between age the probability of adoption of water harvesting technologies so farmer age is not a determinant factor for adopting the technology.

- **Education :** it has a positive impact in the adoption of water harvesting and there is a significant relationship at 10% level.
- **Farm Experience :** As hypothesized, farm experience (FEXP) **significant** and is positively correlated with adoption at 10% level.

- Labour (LABE) was found to be **non-significant relationship** with adopters, it reflects that such technologies don't need many labor force especially the mechanized water harvesting .

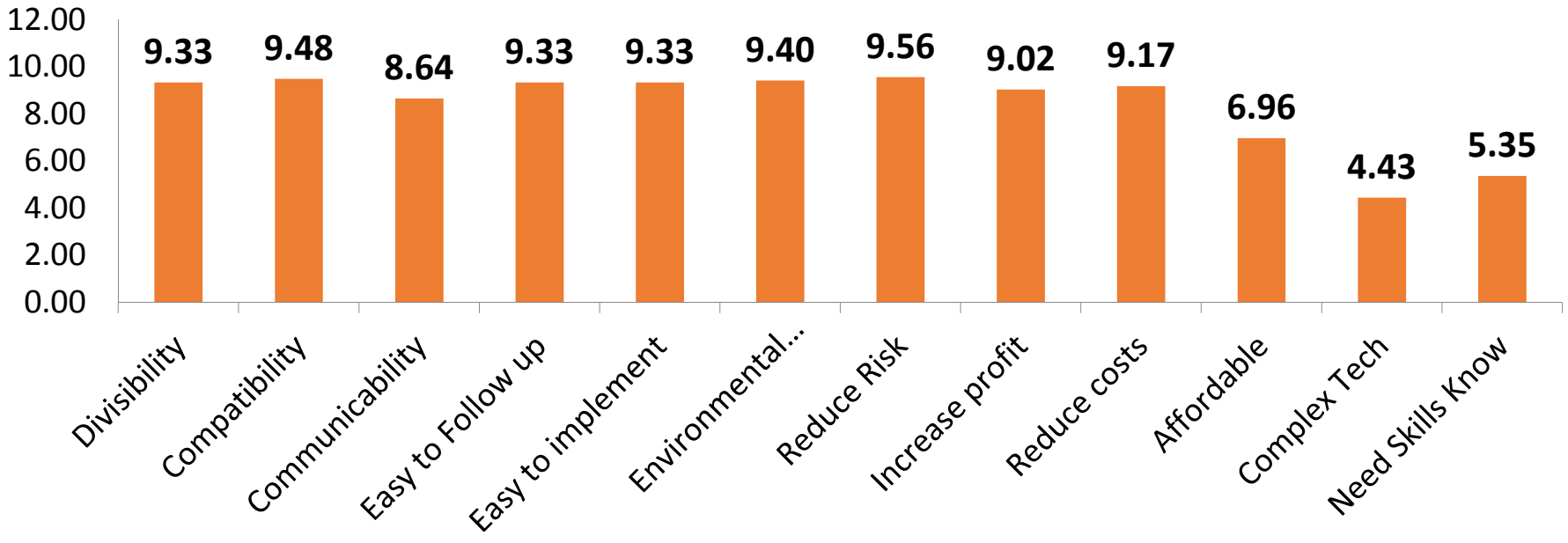
2. Institutions and policy

- **Credit services (CRED)** are **non-significant** in explaining water harvesting adoption decisions. This implies farmers do not use credit for the purpose of establishing water harvesting technologies which is very high.

- **Land Tenure** : We found a **significant relationship** between land tenure (TENUR) and adoption. This implies that adoption decreases when land is privately owned.

Results Contd.

Figure :Criteria of water harvesting technology characteristics



A Likert scale of five, strongly agree (5) and strongly disagree (1) was used to assess the above mentioned chrematistics of adopters of water harvesting technologies at the WLI project site.

Farmer's agreed to adopt water harvesting technology:

- It reduces risk in agriculture production (Coefficient 9.56)
-Technology is compatible (coefficient 9.48),
-Triable technology ,easy to follow up and easy to implement (coefficient 9.33)
- Has an environmental benefits (coefficient 9.4).

The majority of farmers doesn't agree that this technology :

- It is affordable especially the Vallernai water harvesting technique where the machine is expensive and cannot be affordable to farmers(Coefficient 6.96).
- It needs skills and knowledge (coefficient 5.35),
- Complex (coefficient 4.43).

Conclusions and recommendations

- ✓ WLI project and other water harvesting projects implemented by NCARE and Ministry of Agriculture (MOA), should incorporate consideration of farmer age, farmer educational level, and farmer experience.
- ✓ Many of the earlier efforts to promote and extend water harvesting are based on the purely agronomic and biophysical characteristics.
- ✓ The lessons from this report are that non-consideration of household socioeconomic aspects can lead to inappropriate targeting of the water harvesting and would hinder the dissemination of the technology at larger scale.

Conclusions and recommendations

- ✓ It is suggested that policy support to encourage farmers to adopt this technology at their farms by providing loans with low interest rates, since the mechanized water harvesting is costly and not affordable by farmers, help would help promote water harvesting adoption.

- ✓ Increasing farmers' knowledge and perception of the merits of water harvesting through better access to technical information, extension, and training will help them develop a positive economic assessment of water harvesting technologies.

WATER AND LIVELIHOODS INITIATIVE - WLI

Thank you for listening

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