



WLI 7th Annual Regional Coordination Meeting
03-04 November, 2015
Amman – Jordan

Comparative Analysis of Farmers' Willingness to Adopt WLI Technologies

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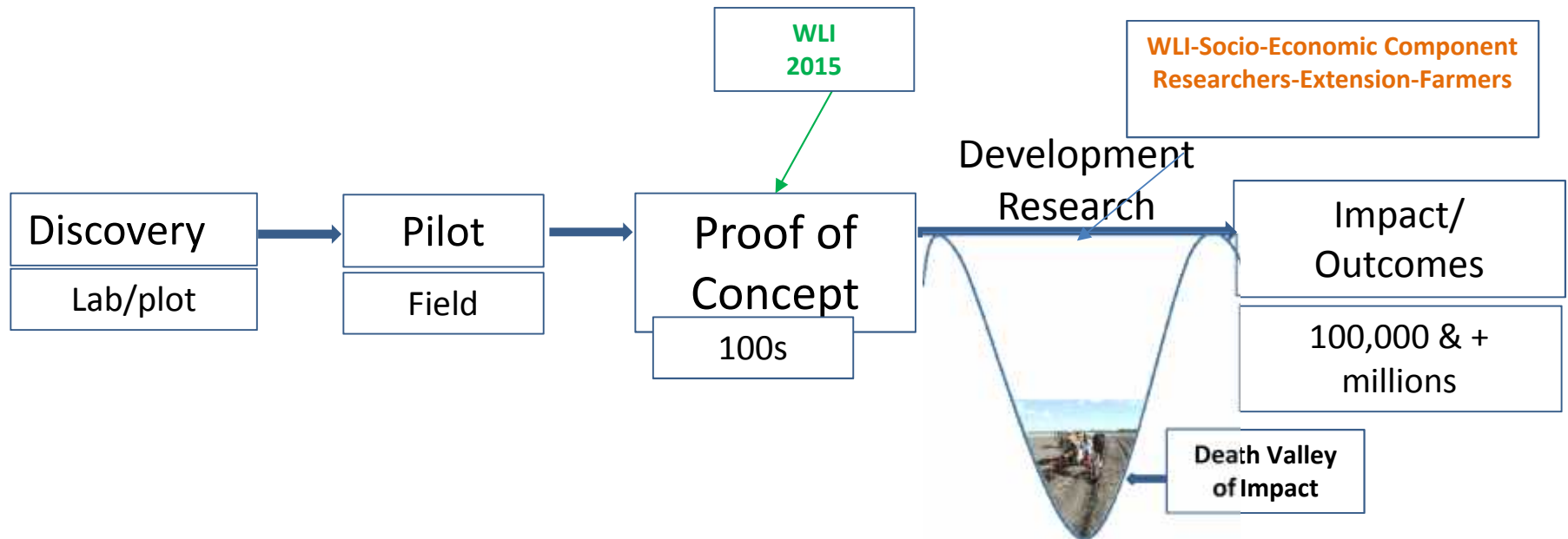
Farmers' Willingness to Adopt WLI Technologies: Setting the Scene

WLI Technologies: An overview

Country	Location	Technology	Who (names)	Institution
Jordan	Jordan Badia	Marabs/WHT	Dr. Samia Akroush	NCARE
Palestine	Nassarya and Tamun	Silage production	Dr. Nasser Shaoli	NARC
Egypt	Old Lands	Raised Bed	Dr. Sha'aban Al Salem	ARC
Iraq	Abu Ghraib	Sub-surface Irrigation under protected Agriculture	Dr. Ahmed Adnan Alfalahi	State Board of Agricultural Research (SBAR), MoA
Lebanon	El Qaa	Conservation Agriculture	Eng Randa Massad	Lebanese Agricultural Research Institute (LARI)
Yemen	Delta Abyan	Supplemental Irrigation of Spate Irrigated Sesame	Dr. Khader Balem Atroosh	Elkod Agricultural Reasearch Station, AREA, MAI
Tunisia	Nabeul	Supplemental Irrigation	Dr. Asma Lasram	INAT-ESHChM

WLI Technologies: Setting the Scene

WLI Technologies Food secure and prosperous farmers



- Changing external environment
- New Paradigm – R4D to transform lives

- Raised bed
- Conservation Agriculture
- Silage production
- Sub Drip Irrigation
- Supplemental Irrigation
- Water harvesting

How Scaling-up Works for WLI Technologies

How Scaling-up Works

- ❖ Proven technologies from pilots
- ❖ Science-based technologies
- ❖ Integrate the technologies for visible impact/benefits
- ❖ Assess the gaps in the impact pathway

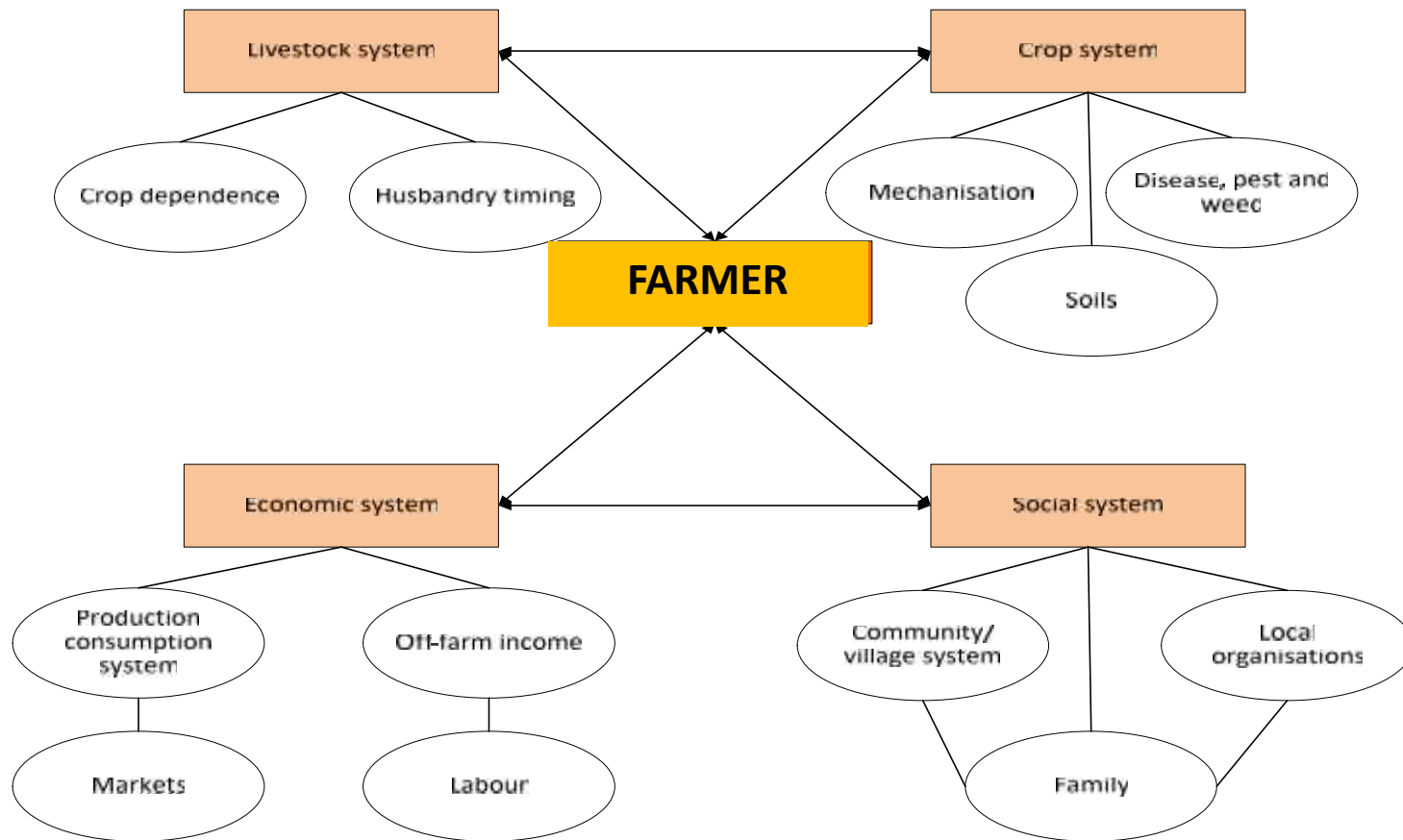


Photo credit: Suha Wani (ICRISAT)

Farmers' Willingness to Adopt WLI Technologies: Methodological Framework

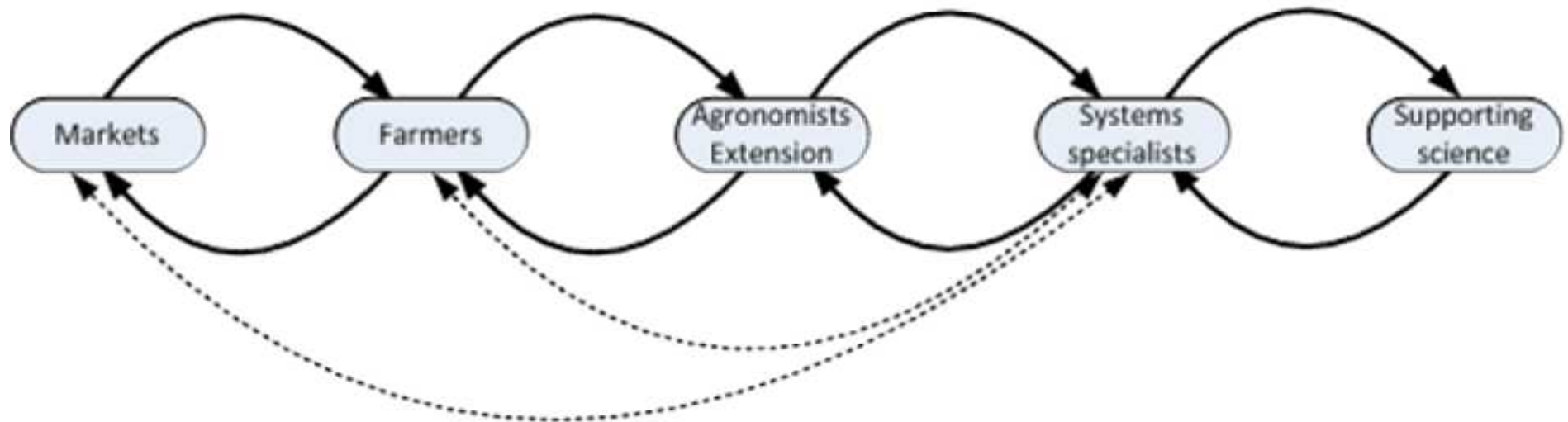
How to Cross Death Valley of Impacts

WLI Project Framework: Understand the Farmer Position



How to Cross Death Valley of Impacts

WLI Project Framework-Understand the Interactions



Types of interactions involving farmers, field scientists and others (derived from Passioura, 2010)

- Solid lines: R&D and knowledge sharing links,
- Dotted lines: Management links; all involve strong feedback pathways

WLI Technologies Assessment: Qualitative Framework - CBA & IRR

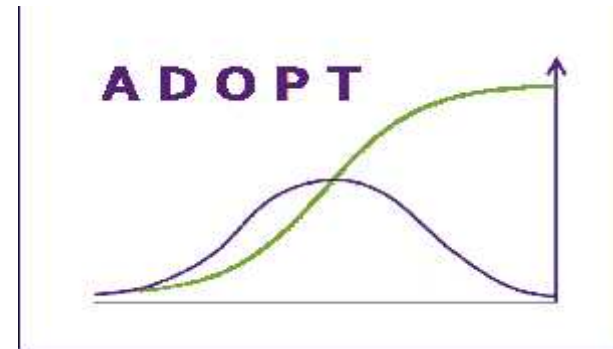
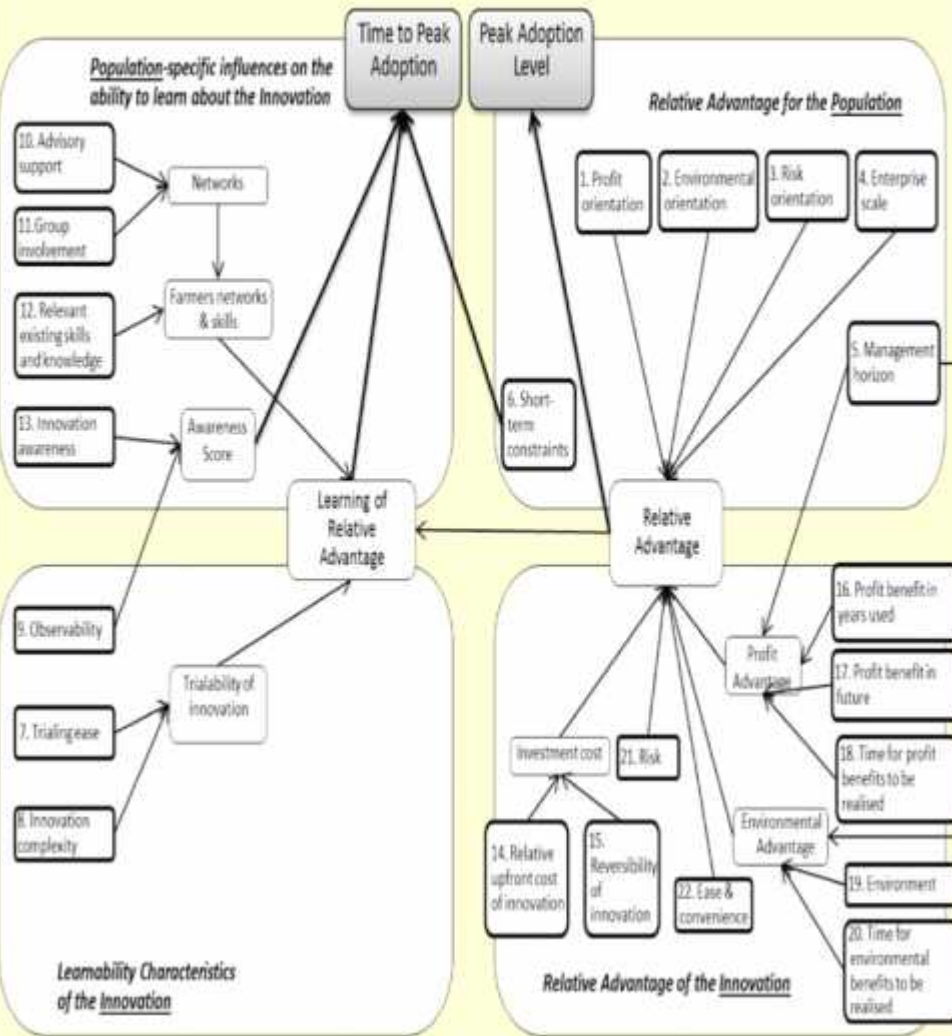
Benefit-cost analysis of technologies using Partial Budget Analysis

Without technology					With technology option				
1	Costs	A	B	C		Costs	D	E	F
2	Inputs	Quantity	Unit price	Total		Inputs	Quantity	Unit price	Total
3	seeds					seeds			
4	fert					fert			
5	pesticides					pesticides			
6	labor					labor			
7	fuel					fuel			
8	machiney					machiney			
9	Total	XX	XX	XX		Total	XX	XX	XX
10									
11	Revenue					Revenue			
12	Main product					Main product			
13	Secondary product					Secondary product			
14	Total revenue	XX	XX	XX		Total revenue	XX	XX	XX
15									
16	Indicators								
17	Net returns			C14-C9					F14-F9
18	% change in NR								(F17-C17)/C17
19	% change in TC								(F9-C9)/C9
20	IRR								Change NR/Change in TC
21	Benefit-cost Ratio			C14/C9					F14/F9

WLI Technologies Assessment: Qualitative Framework

ADOPT - Peak and Time of Adoption

ADOPT: Adoption and Diffusion Outcome Prediction Tool.



WLI Technologies Assessment: Quantitative Framework

Binary Logistic Regression

-
- Conventional regression analysis (Ordinary Least Squares or OLS) cannot accommodate zero observations on the dependent variable, and the failure of OLS to deal properly with such data led to the development of estimators built on the principle of maximum likelihood (MLE)
 - Limited Dependent Variable (LDV) models are estimated using MLE; the most common of these that are used in adoption literature are the **logit model** (which corresponds to a logarithmic distribution function) and the **probit model** (which assumes an underlying normal distribution)
 - Anemiya (1985) concluded that the choice of which continuous probability distribution to use cannot be justified on theoretical grounds
 - In this exercise, we were using **Logit model**.

WLI Technologies Assessment: Quantitative Framework

Binary Logistic Regression

- **Research Question:** Farm and farmer determinants for the adoption of the X-WLI technology among “WLI” farmers are to be identified and estimated
- This research question is to be tested empirically by the following model (**Logit Model**): A binary logistic regression is to be used to regress the dependent variable, Y, of whether the farmer had adopted X_WLI technology : $\text{Prob}(\text{event}) = \text{Prob}(Y=1)$ represents ith farmer adopted, and 0, otherwise)

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

- Against the estimated factors affecting adoption of this X_WLI technology variables (Liao,1994). The parameter estimates (β) predict the log odds (logit) of the dependent variable (Y). Thus, the prediction equation is (Garson, 2009):

$$Y = \text{Ln}(\text{odds}(\text{event})) = \text{Ln} \left(\frac{\text{prob}(\text{event})}{\text{prob}(\text{nonevent})} \right) = \text{Ln} \left(\frac{\text{prob}(\text{event})}{1-\text{prob}(\text{event})} \right)$$

WLI Technologies Assessment: Quantitative Framework

Binary Logistic Regression

- Let X_i represents the set of variables including socio-economic, farming, institutional factors, etc which influence the adoption decisions of the i th farmer.
- For the farmer Z_i is an indirect utility derived from the adoption decision, which is a linear function of k explanatory variables (X), and is expressed as:

$$Z_i = \beta_0 + \sum_{k=1}^n \beta_k X_{ki}$$

Where:

β_0 : Is the intercept term (constant), and $\beta_1, \beta_2, \beta_3, \dots, \beta_i$ are the coefficients associated with each explanatory variable $X_1, X_2, X_3, \dots, X_i$. These factors explain the X-WLI adoption decision, or the probability that the i th farmer adopts X-WLI technology:

$$P_i = \frac{e^{Z_i}}{1 + e^{Z_i}}$$

P_i : The probability that the i th farmer's adoption decision and $(1-P_i)$ is the probability that $Y_i=0$

WLI Technologies Assessment: Quantitative Framework

Binary Logistic Regression

- The *odds* (Y=1 versus Y=0) to be used can be defined as the ratio of the probability that a farmer adopts (P_i) to the probability of non-adoption ($1-P_i$), namely $odds = P_i/(1-P_i)$.
- By taking the natural log, we get the prediction equation for an individual farmer:

$$\ln\left(\frac{P_i}{1 - P_i}\right) = \ln odds = \beta_0 + \sum_{i=1}^n \beta_i X_{ki} = Z_i$$

Where: Z_i is also referred to as the log of the *odds* ratio in favor of adoption

WLI Technologies Assessment: Quantitative Framework

Data collection

-
- Identify technologies which are demand driven and economically remunerative to the farmers.
 - One questionnaire crossing the WLI countries
 - Around 70 farmers (35 adopters and 35 non-adopters) in each country
 - Same variables used for both qualitative and quantitative analysis
 - Data analyzed and discussed in a [Methodological workshop \(June 2015, Amman-Jordan\)](#) involving all socio economic countries teams

Variables in the Empirical Binary Logistics Model

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	-
EDUC	Educational background of the household head		+
FSIZ	Household in number of people	Numbers	+
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	?
OFFA	Farmer has any off-farm activity	Dummy (1 if yes, 0 if no)	?
INCO	Level of family income	Total income (US\$) per year	+
CRED	Obtained credit	Dummy (1 if yes, 0 if no)	+
CBOS	Member to CBO's	Dummy (1 if yes, 0 if no)	+
VLIVST	Importance of livestock in the farming system	Dummy (1 if yes, 0 if no)	+
CONT	Contact with research, extension	Dummy (1 if yes, 0 if no)	+
KNT	Knowledge of the new technology	Dummy (1 if yes, 0 if no)	+
ATTI	Attitudes of farmer toward X-WLI technology	Dummy (1, feels that will have positive effects, 0 if negative)	+
SPE_VAR	Specific Technology Variable (Marketing, irrigated crop, etc...)		

Farmers' Willingness to Adopt WLI Technologies: Comparative Analysis Results

Qualitative Framework Results

CBA & Adoption Peak and Time

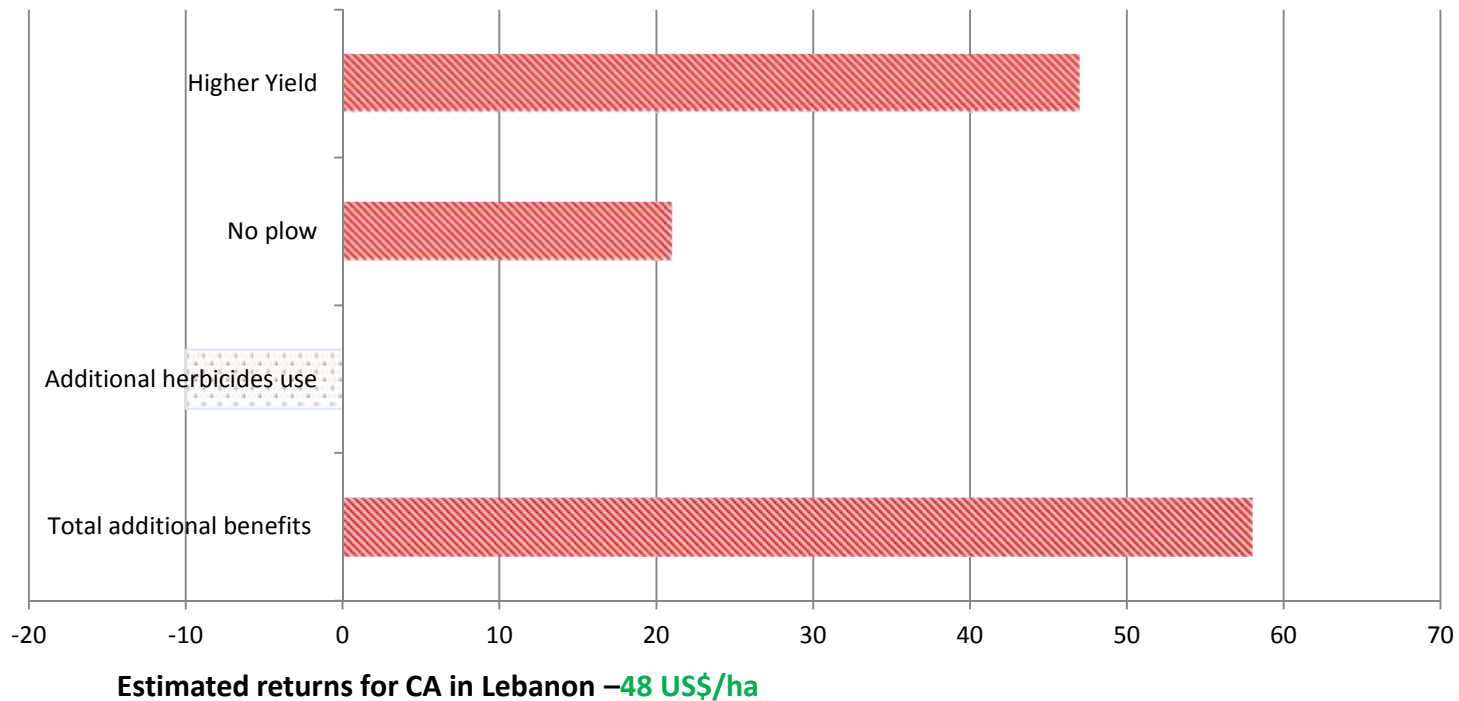
Country	Technology	CB Analysis IRR-%	ADOPT	
			Peak Adoption Rate (%)	Time to Peak Adoption Level (Years)
Jordan	Marabs/WHT	17	95	11.9
Palestine	Silage production	6.9	95	9.1
Egypt	Raised Bed	8.9	31	18.5
Iraq	Sub-surface Irrigation under protected Agriculture	5.7	95	7.3
Lebanon	Conservation Agriculture	-5.71	87	22.1
Yemen	Supplemental Irrigations	38.31	91	20.4
Tunisia	Supplemental Irrigation	n.a	n.a	n.a

Qualitative Framework Results

Profitability Analysis – CA in Lebanon

CA can make money – Lebanon

The adoption of CA decrease cost by 5% and increases revenue by 28% compare to the non-adoption of CA technology



Quantitative Framework Results

Determinants of Adoption

Country	Technology	N	Determinants of Adoption						
			AGE	EDUC	EXP	LTENU	CRED	INCOME	CBOS
Jordan	Marabs/WHT	59	Neutral	+		-			
Palestine	Silage production	48							
Egypt	Raised Bed	70							
Iraq	Sub-surface Irrigation under protected Agriculture	70							
Lebanon	Conservation Agriculture	22							
Yemen	Supplemental Irrigation of Spate Irrigated Sesame	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
Tunisia	Supplemental Irrigation	70							

Quantitative Framework Results

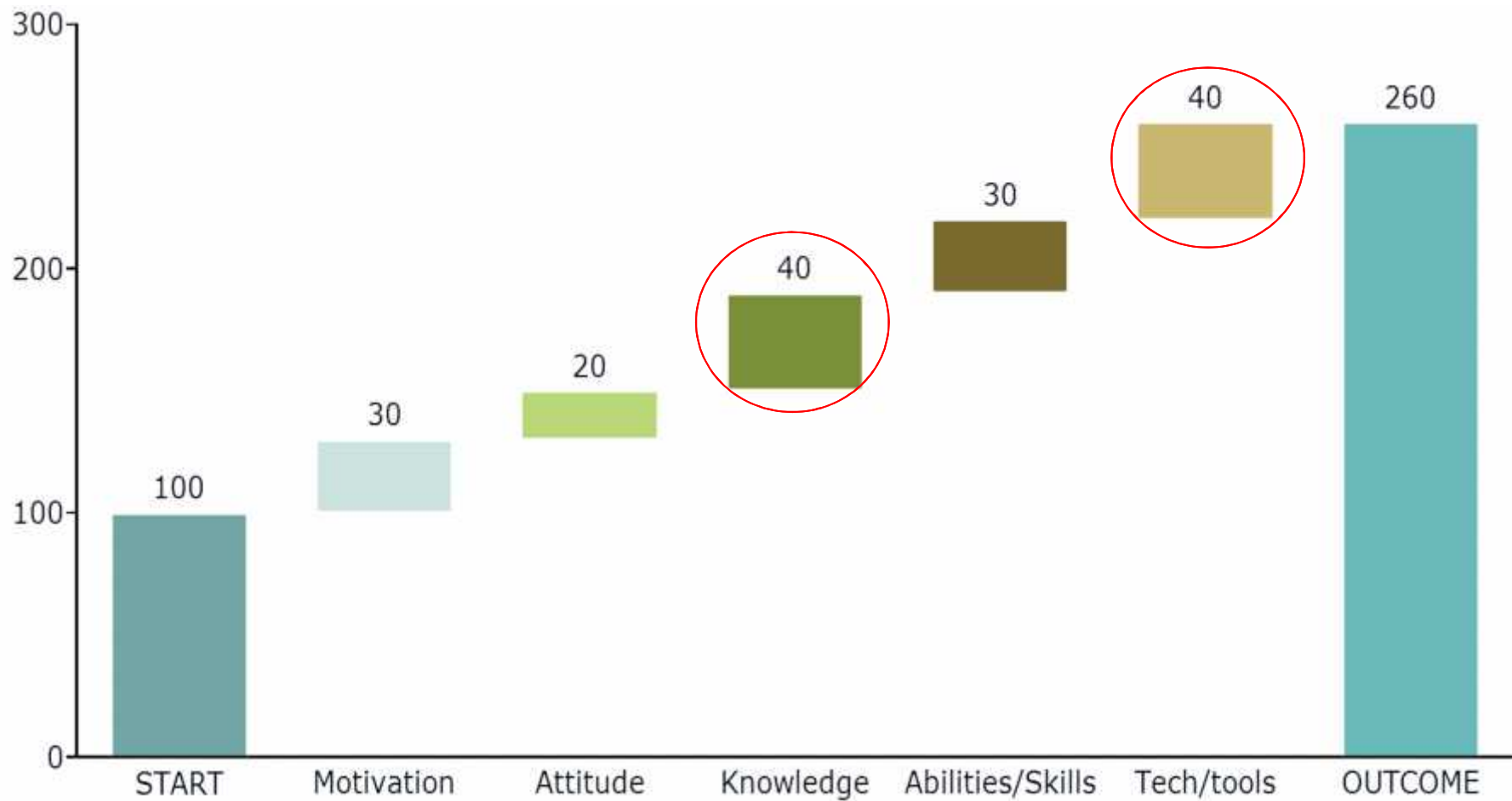
Farmer's Perception to WLI Technologies Characteristics

Technology Characteristics

Country	Technology	Divisibility	Compatibility	Communicability	Easy to follow up	Easy to implement	Environmental benefits	Reduce risk	Increase profit	Reduce costs	Affordable	Complex Tech	Needs skills know
Jordan	Marabs/WHT	+ SA									-SD		-+
Palestine	Silage production												
Egypt	Raised Bed												
Iraq	Sub-surface Irrigation under protected Agriculture												
Lebanon	Conservation Agriculture												
Yemen	Supplemental Irrigation of Spate Irrigated Sesame	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
Tunisia	Supplemental Irrigation	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a

Farmer's Perception to WLI Technologies Characteristics

The MAKAT Approach Results



Mitigation Measures Needed to Overcome the Constraints Facing WLI Technology Adaptation

- ❖ A compulsory institutional involvement in costs & maintenance and, specially, in training the young farmers is needed.
 - ❖ Feasibility and demonstration studies (within each country) at local conditions are needed in order to assess their applicability according to the real needs and possibilities.
 - ❖ Dissemination and communication strategies to raise public awareness regarding the technology.
 - ❖ Enhancing scientific collaboration and knowledge transfer at Institutional level.
 - ❖ Enhancing public, development and private participation in the application and adaptation of technology.
 - ❖ Regular information to the end users of the costs and difficulties encountered in the handling of new technologies, if any.
-

WLI Socio Economic Thematic Team

The Way Forward – 2016 POW

- ❖ Formulating a plan and publishing the socio economic findings
 - ❖ “[WLI Scio-economic Book](#)”: Synthetizing the main results and findings per country (Chapters) and across the WLI countries
 - ❖ [ISI-Journal published articles](#) (countries case studies papers and comparative regional paper)
 - ❖ [Special Issue](#) (Elsevier, Springer, Routledge, etc.) including all papers

- ❖ Developing strategies for scaling-up/out WLI technologies

Objective: Enhance dissemination and communication strategy of WLI technologies

Data: Surveys, expert meetings, focus group discussion and consultation

Expected outputs:

1. Practical recommendations to enhance researchers-extentionist-farmers collaboration
 2. Guidelines to improve dissemination strategies.
 3. Knowledge exchanges approach that stimulate uptake and scaling up of WLI techno.
-



Thank you

...these hands that translate
knowledge into practice

WLI Socio Economic Team that are taking
with the owners of the hands



**Research Coordinators under the Socio-Economic Thematic
Group**

- Bezalet Dessalegn, ICARDA
- Samia Akroosh, NCARE
- Sandra Russo, UF

Country Socio Economic Thematic Group

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