



Red Palm Weevil Eradication Project Steering Committee Meeting

Aswan, Egypt

Wed. 23rd and Thurs. 24th November 2022

**Socioeconomic Impact
Assessment of the Red Palm
Weevil in NENA Countries
(The Case of Egypt and Saudi Arabia): Ex-post Impact
Assessment**

Boubaker Dhehibi
b.dhehibi@cgiar.org



Background

- Palm trees play a significant roles in the economy, society, and environment of many communities in the NENA countries.
- In the word, more than seven million tonnes of dates are produced annually. In total, around 100 million date palm trees are cultivated today, 60 percent of them in Arab countries.
- RPW has significant socio-economic impact on the date palm production sector and livelihoods of farmers in affect-ed areas (The combined cost of pest management, eradication and replacement of infested palms, and loss of ben-efits was around €90 million by 2013 for France, Italy and Spain).
- In NENA countries, RPW causes economic losses in the millions of dollars annually, whether through lost production or pest-control costs (Almost USD 8 million is lost each year through removal of severely-infested trees alone).-economic context of farmers, level of technology employed and level of enforcement of quarantine measures.

Rationale

- Despite these conceptual challenges, economic assessments of the impacts of RPW are needed to provide credible information to policy makers and to justify costs associated with management efforts.
- RPW is one of the world's major invasive pest species and is the single most destructive pest of some 40 palm species worldwide.
- Cost of pest management, eradication and replacement of infested palms, and loss of benefits are remarkable.
- Continuous challenges facing the successful management and containment of the spread of RPW (i.e. NENA countries and worldwide).
- The assessment of socio-economic and environmental impacts of control and eradication interventions should be at all levels of control and prevention.
- This assessment should be conducted through application of rigorous assessment methods to estimate the impact of RPW control or eradication and the associated costs and benefits for different farming systems and farm size.

Research objectives

- To conduct the ex-post impact assessment of the RPW in the two target countries, this study includes the following objectives:
- Design impact assessment survey tools to collect detailed qualitative & quantitative info & sampling strategies.
- Design data management tools and carry out post-implementation surveys in 2 countries.
- Measure efficiency & effectiveness of control methods applied by the program.
- Impact evaluation of control methods on production & supply of dates.
- Feasibility studies of the suggested approaches.
- Sensitivity analysis to obtain a dynamic scenario among pre-identified variables.

Methodological framework

Data collection, Sampling design, and Selection of the respondents

- For scientific-validity of findings, the sampling frame will be in synergy with the sampling design established by the Arab Organisation for Agricultural development (AOAD) team who are engaged in conduction the ex-post impact assessment study.
- The sampling frame is based on:
 1. The territorial distribution of date palms within each one of the two selected countries (i.e., KSA and Egypt).
 2. The associated incidence of RPW infestation (i.e., Governorate Selection/country) and on the variations in farming systems

Methodological framework

Data collection, Sampling design, and Selection of the respondents

The ex-post impact assessment study will target a total of 840 respondents identified during the ex-ante impact assessment study process (with 360 respondents in Egypt and 480 respondents in Saudi Arabia).

Egypt : 360 respondents	Lower Egypt (Ash Sharqiyah Governorate) (120 HH)
	Upper Egypt (Aswan Governorate) (120 HH)
	Oases (Al Wahat Al Bahriyah) (120 HH)
Saudi Arabia : 480 respondents	Riyadh (120 HH)
	Qassim (120 HH)
	Al Ahsa (120 HH)
	Al Madinah (120 HH)

The sample was randomly selected from each of the selected Governorates.

Methodological framework

Components of the EPIA Farm Household Survey Questionnaire

- **Section A : General information**
- **Section B : Sociodemographic characteristics**
- **Section C : Awareness of RPW problems**
- **Section D : Knowledge and qualitative assessment of RPW control methods**
- **Section E : Quantitative assessment of RPW control methods**
- **Section F: Consciousness of RPW control and its assimilation (acceptance and adoption)**
- **Section G : Land ownership and use**
- **Section H : Productions, inputs and treatments**

Methodological framework

Data collection, Sampling design, and Selection of the respondents

Types of Farming System		
Traditional (Scattered)	Traditional (Organized)	Modernized

- **Traditional (Scattered)** are irregularly spaced date palm farming systems based on flood irrigation.
- **Traditional (Organized)** are well-spaced date palm farming systems based on flood irrigation
- **Modernized** are date palm farming systems based on localized irrigation (drip, bubblers, etc.)

Methodological framework

Intensity and Scale of RPW Infestation

Region/Governorate	Rate of RPW Infestation (%)
Lower Egypt (Ash Sharqiyah)	5.94
Oases (Al Wahat al Bahriya)	7.26
Upper Egypt (Aswan)	7.95
Canal and Red Sea	6.27
National Average	6.98
Source : MALR - 2021	

Region	Rate of RPW Infestation (%) 2021-2022
Al Ahsa	0.92
Al Madinah	2.72
Qassim	3.34
Riyadh	1.90
Country Average	2.22
Source : AOAD/MEWA Field Surveys 2022	

Methodological framework

Types of control Methods

Prevention Methods

Checking trees regularly to detect early infestation

Removing offshoots as a protective measure

Pruning and removing fronds in the winter

Using pheromone traps to detect early infestation

Treating lesions resulted from pruning and offshoot detachment by using contact pesticides

Legislative Methods

Not transferring infested trees or offshoots to non-infested areas

Burning and burying infested palm far away after cutting it into small portions

Not transferring infested palm waste to other areas

Surveying RPW-infested palms and inform authorities when necessary

Not allowing anyone to transfer infested offshoots from an infested farm

Cultural Methods

Adhering to the time and depth specified for planting offshoots

Applying moderate irrigation to reduce humidity on farms

Adhering to good plowing before planting

Maintaining the recommended distance between trees

Methodological framework

Types of control Methods

Mechanical Methods

Covering roots of small trees with soil to a height of 20 cm to prevent insect attacks

Removing weeds and dry trunks and disposing of them in the recommended way

Eradicating infested palms

Removing infested or dead trees and the pruning products on neglected farms

Closing all openings on the trunks of palms

Scraping infested areas until healthy tissue is exposed

Chemical Methods

Spraying according to extension recommendations

Spraying pesticides of proper quantity and quality and within the specified time frame

Dusting farms

Methodological framework

Control Methods of RPW in Egypt

Severity of Infestation	Location	Treatment
Low	Offshoots	Dipping with solution of pesticides Manual clearance of the whole place of infestation and covering the pit with mud, pasted sometimes with cement. In few cases chemicals are also sprayed in the pit manually or forced through a motor pump.
	Trunk	Injection of chemicals through holes drilled, manually or mechanically, into the trunk. This is the most widely spread technique in Egypt.
	Top/Head	Dipping with solution of pesticides
Medium	Trunk	Injection of chemicals through holes drilled manually or mechanically Manual clearance of the whole place of infestation and covering the pit with mud, pasted sometimes with cement. In few cases chemicals are also sprayed in the pit manually or forced through a motor pump.
High	Trunk	Injection of chemicals through holes drilled, manually or mechanically, into the trunk Manual clearance of the whole place of infestation and covering the pit with mud, pasted sometimes with cement. In few cases chemicals are also sprayed in the pit manually or forced through a motor pump. Fumigation (used at a limited scale in Egypt)

Methodological framework

Recommended Preventive Measures in Saudi Arabia

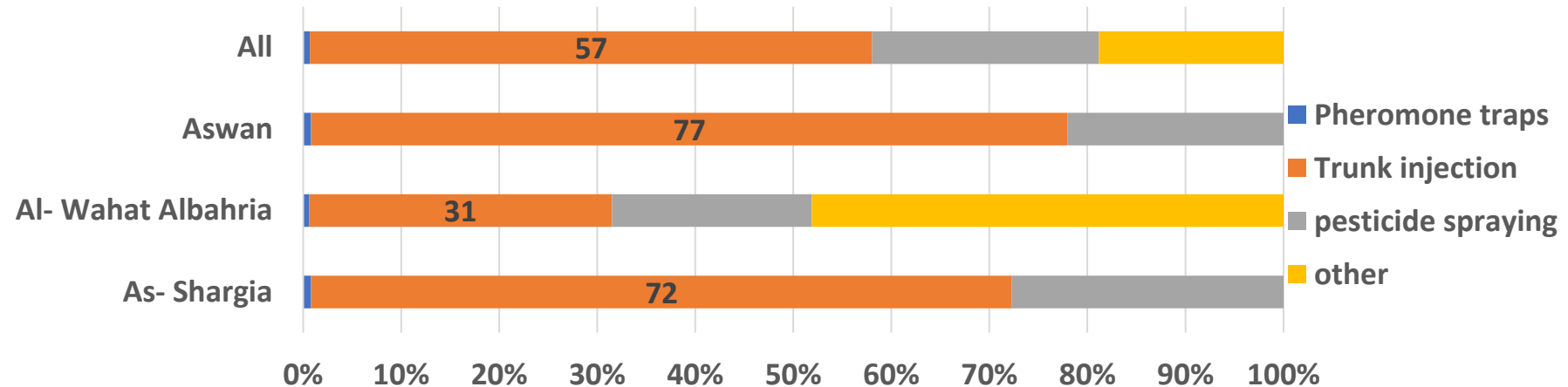
- Regular inspection for early detection
- Separation of off-shoot
- Treatment with contact pesticides of wounds and lesions resulting from pruning and separation of off-shoots
- Prevention of moving infested date palm trees or off-shoots to non-infested areas
- Prevent transferring infected palm waste to other areas
- Separation of off-shoot
- Chopping/shredding of felling Date palms into small pieces and burning and burying the debris
- Survey of palm trees infested with RPW and inform the authorities, when necessary

Methodological framework

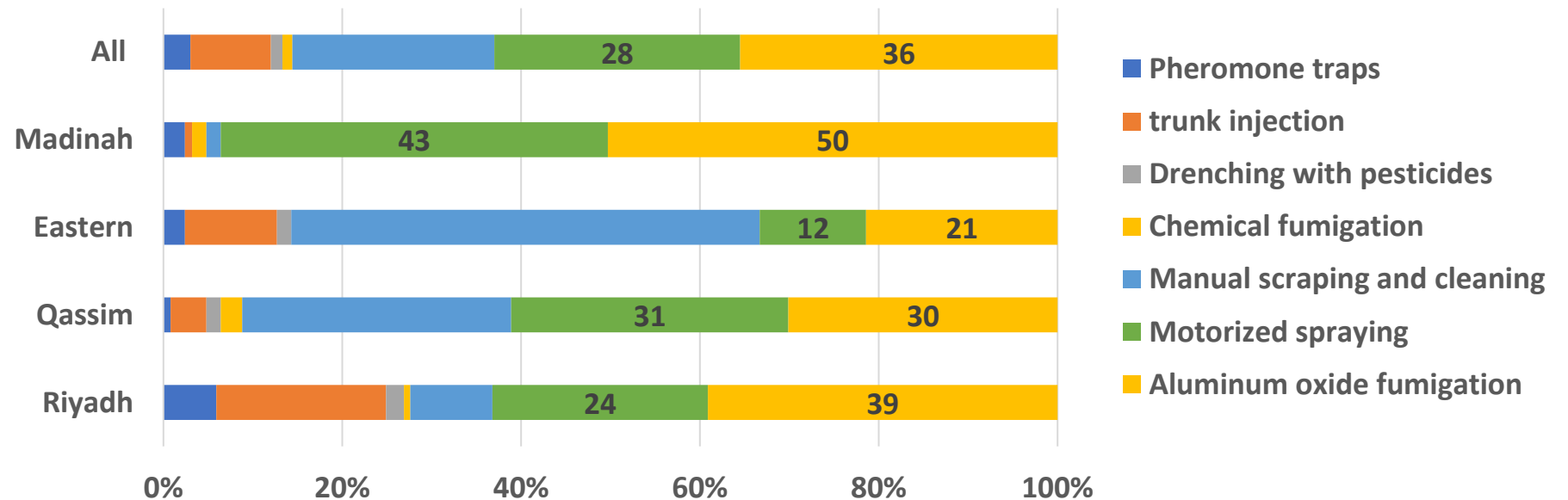
Key information

Farmers Preference of Methods of Control RPW, % (source : AOAD, 2022)

Egypt



Saudi Arabia

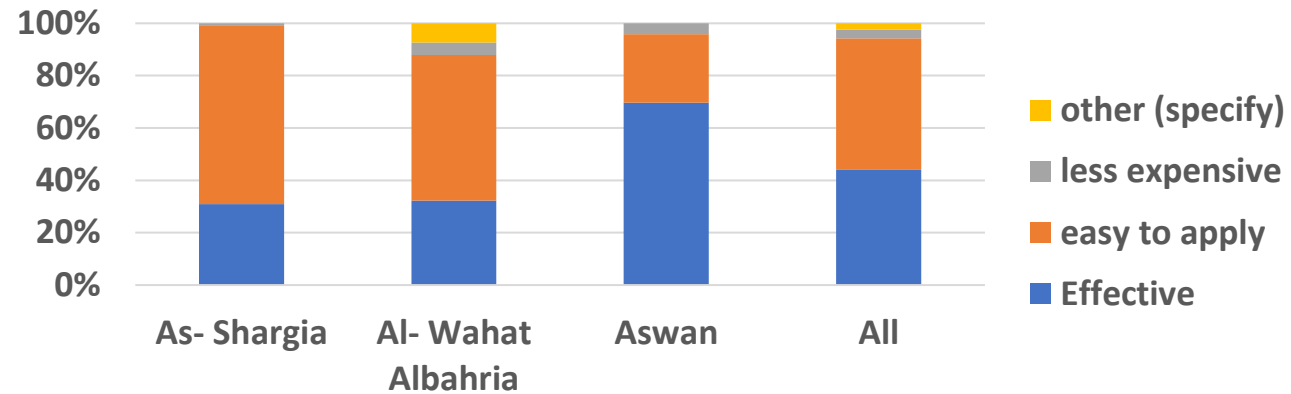


Methodological framework

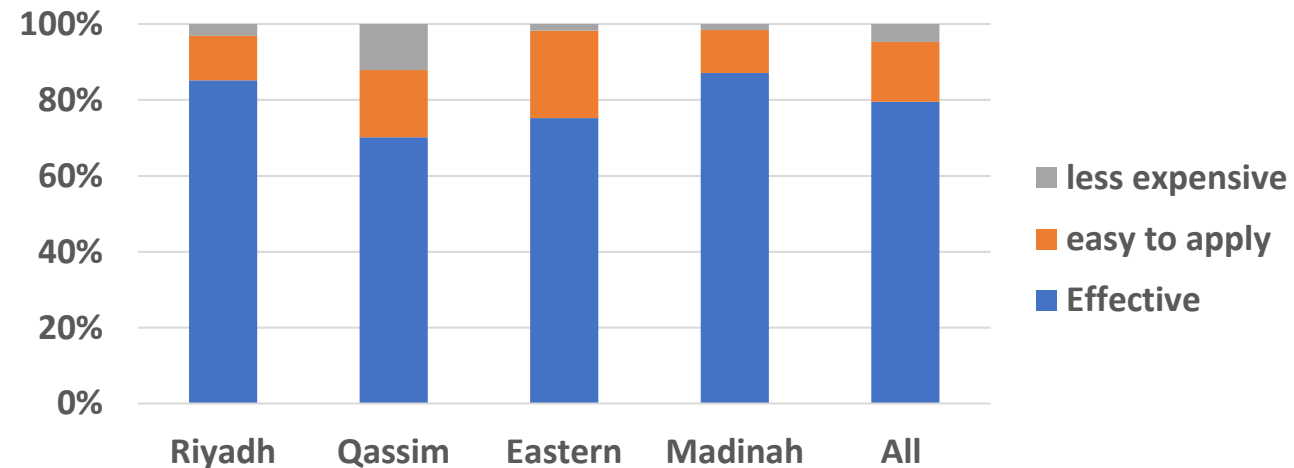
Key information

Farmers Preference of Methods of Control RPW, % (source : AOAD, 2022)

Egypt



Saudi Arabia

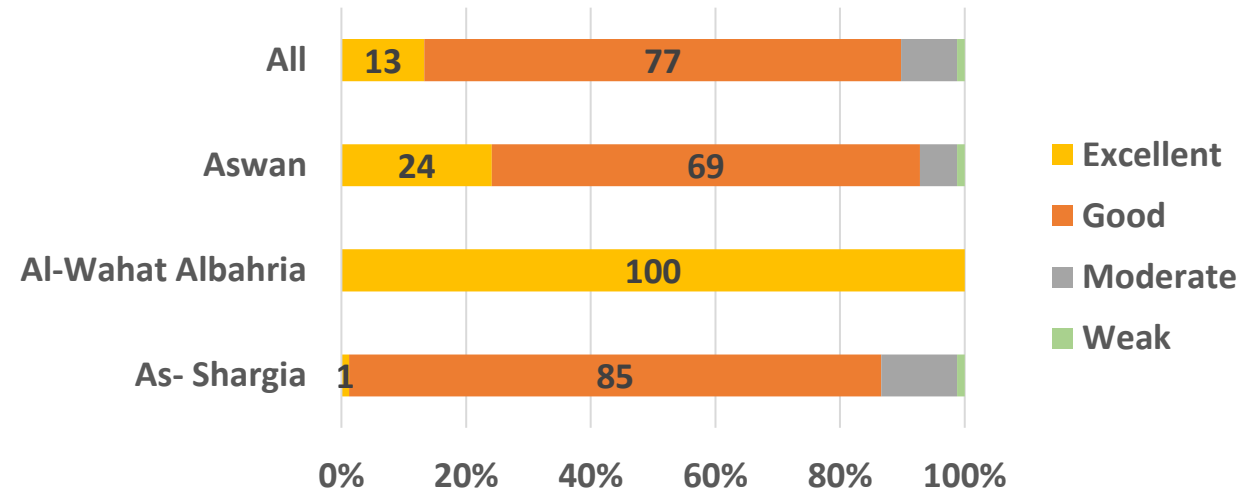


Methodological framework

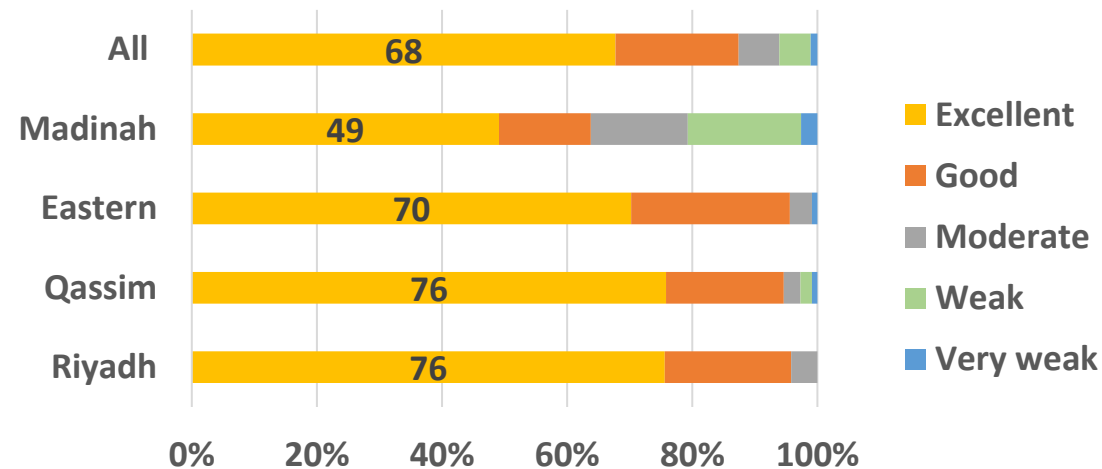
Key information

Efficiency of detection in identifying palms infected with red palm weevil,% (source : AOAD, 2022)

Egypt



Saudi Arabia

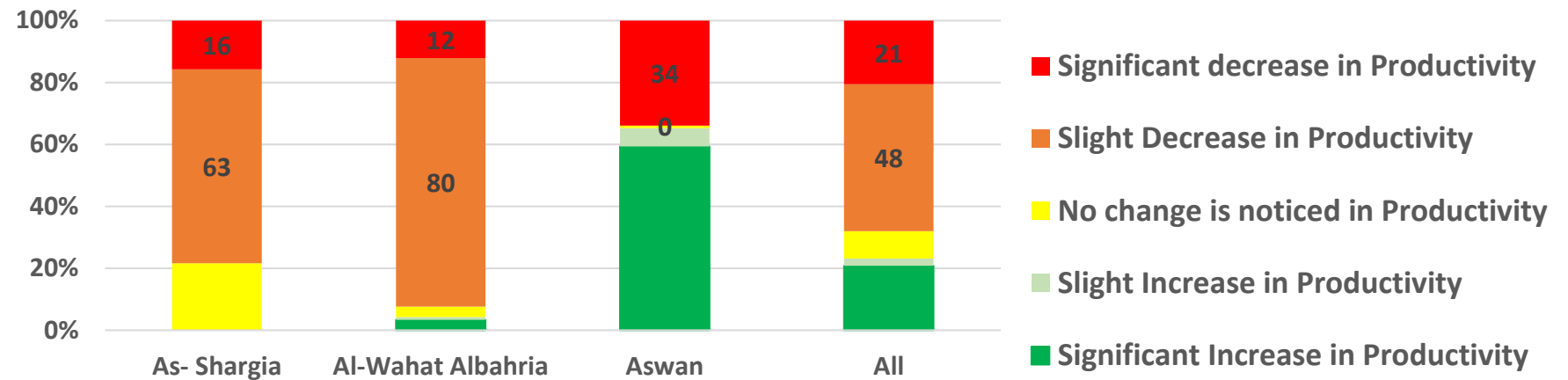


Methodological framework

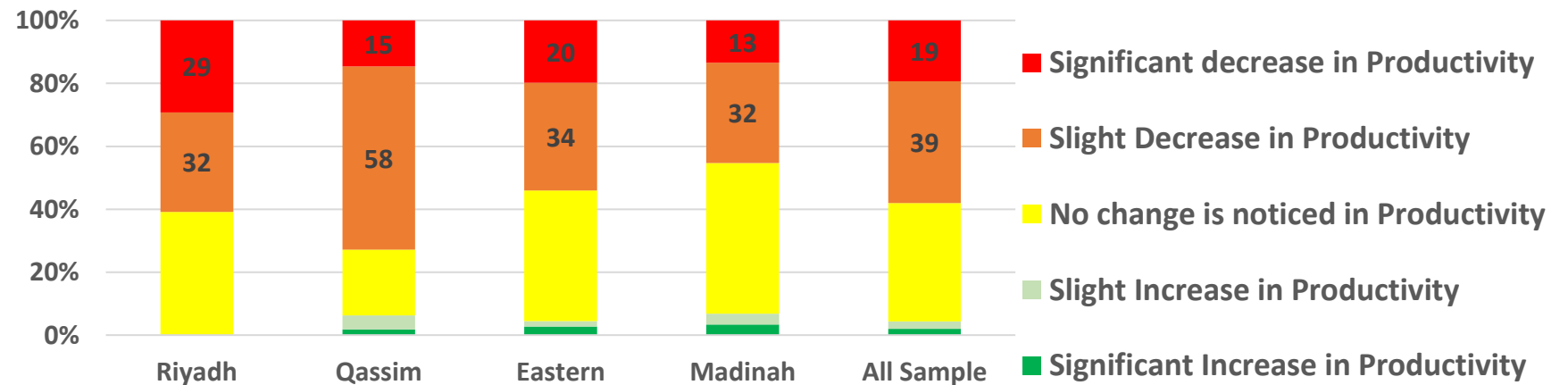
Key information

Farmers Perception of the Impact of RPW infestation on Tree Productivity, % (source : AOAD, 2022)

Egypt



Saudi Arabia



Methodological framework

Quantitative economic assessment techniques

In the literature, several conceptual modelling frameworks have been proposed, and the choice of an approach depends largely on the objective of the model and the availability of data. In the literature, three techniques for quantitative economic assessment: Partial budgeting, partial equilibrium analysis and computable general equilibrium analysis:

Partial budgeting

- Is a method that addresses the additional costs and lost revenues that are incurred at the producer level when the RPW invades.
- This method takes into account the area attacked by the RPW, the loss per unit area, and the price of the product.
- It does not include relationships between production volume and prices, or interlinkages between markets.
- is the easiest and fastest to conduct.

Partial equilibrium analysis

- Take into account the price effects of changes in production volume in addition to those factors already taken into account by partial budgeting.

Methodological framework

Quantitative economic assessment techniques

Computable general equilibrium analysis

- Address linkages to other agricultural markets, e.g. due to substitution of one product by another.
- Computable general equilibrium modelling techniques are the most comprehensive and complex tools to look at effects of RPW on the whole economy.
- Is the most difficult and time consuming technique.

These techniques differ markedly in scope (the extent to which the impacts for the economy at wide are addressed), the data requirements, the level of expertise needed to conduct the analysis, and the time investment required to complete an analysis.

Methodological framework

Partial budget analysis (PBA) : Selected method

- The need for the use of analytical techniques other than PBA is precluded since the RPW infestation in the targeted countries *does not affect the quality of dates nor cause reduction in production to the extent that significantly influences market forces and prices* (producers' interviews), and henceforth warrants the use of other analytical techniques that could capture these market changes, such as partial and general equilibrium analysis.
- The partial budget analysis (PBA) technique evaluates the economic consequences of an adjustment or change that impacts part of the farm organization through direct changes to cost and revenue streams, as illustrated below.

Partial Budget Analysis (PBA)	
<u>A) Additional costs incurred:</u> Costs under the RPW Spread and Treatment that are not required under the Control situation	<u>E) Costs foregone:</u> Costs under the Control situation that will be avoided under the RPW Spread and Treatment
<u>B) Revenue foregone:</u> Returns under the Control situation that will not be received under the RPW Spread and Treatment	<u>D) Additional Revenue generated:</u> Returns under the RPW Spread and Treatment that are not received under the Control situation
Total Costs: $C = A + B$	Total Benefits: $B = E + D$
Net Change: $(B - C)$	

Methodological framework

Decomposition analysis : Proposed method

- Numerous models can be used to analyze the economic performance of RPW control methods including the decomposition model. This model is a mathematical technique to break down something that is aggregated into its components, so it is possible to allocate the difference in the dependent variable to each independent variable.
- This model had been used to analyze the contribution of each independent variable on income differences, production, and productivity in several studies. Example : Deder et al (2004) used decomposition analysis to assess the impact of the implementation of the Integrated Pest Management Farmer Field School (IPM-FFS) on rice productivity and pesticide use.
- The decomposition model of productivity was done between controlled infested area and no controlled infested area through variables that contributed to create differences.

Methodological framework

Multi criteria decision making techniques: Proposed method

- Decision making in controlling harmful plant diseases is a complex process involving a large range of stakeholders with different and often conflicting interests. Their views may represent the interests of the farming community, other sectors of the economy, the consumer or the environment.
- MCDM techniques deal with complex problems that are characterized by any mixture of quantitative and qualitative objectives. It establishes preferences between alternatives to an explicit set of objectives and measurable criteria (Mourits and Oude Lansink, 2006).
- The applied Multi-Criteria Analysis (MCA) involves eight steps: (1) Establish the decision context, (2) Identify the alternatives to be appraised, (3) Identify objectives and criteria, (4) Scoring, (5) Weighting, (6) Calculate overall value, (7) Examine the results and (8) Sensitivity analysis.

Hypothetical findings

What we can expect:

- Significant impact of RPW on the date palm production sector and livelihoods of farmers in affected areas.
- High direct and indirect economic damage caused by RPW in the affected areas.
- Remarkable costs associated with managements efforts to eradicate, eliminate, or minimize the impact of RPW.
- The impact, efficiency, and effectiveness of applied control methods depends on the infestation level of the RPW.
- The economic efficiency and effectiveness of the applied control methods and their suitability depends on farming systems and farm size.
- There is a considerable impact of control methods on date production, productivity, supply, and all dates value chain.

What practical implications could emerge from this research

Ex-post assessment results will:

- Inform stakeholders (palm growers, communities, development agencies and decision makers) in the region at large about the efficiency and the effectiveness of the introduced control methods and the feasibilities of other available alternative methods.
- Make a clear evidence of the impacts on date palm production and yield, date qualities, growers' income, the national supply of dates and impact on trade.
- Prioritize the applied control/prevention methods in terms of interventions at farm level.
- Incentivizing adoption of control techniques to reduce the impact of RPW.
- Raising awareness towards better understanding of impact of RPW infestation and control/prevention measures at field, community, national and regional levels.

Originality / value

- The existing estimations costs remains a significant underestimate of the total economic value of affected palms by RPW (No concrete studies of the risk and economic impact of RPW on date palms).
- The expected findings will enhance the literature by providing empirical evidence of the impact assessment of RPW in the NENA region.
- Develop an understanding and assessment of the socio-economic impacts and damages of RPW on the livelihoods of the NENA date palm growers' community (i.e.; income, yield and productivity, and labour employment).

References

- Alaa M. R. El-Sabea, J. R Faleiro and Mahmoud M. Abo-El-Saad. 2009. The threat of RPW *Rhynchophorus ferrugineus* to date palm plantations of the Gulf Region in the Middle East: AN ECONOMIC PERSPECTIVE; Date Palm Research Centre (Centre of Excellence), King Faisal University, Kingdom of Saudi Arabia.
- AOAD, 2022. The Socio-Economic Impact of the Red Palm Weevil in NENA Countries (The Case of Egypt and Saudi Arabia), 45 pages.
- Mohamed Kamal Abbas. 2019; The economic impact of red palm weevil *Rhynchophorus ferrugineus* Olivier in Egypt. Arab Journal of Plant Protection, 37(2): 205-205.
- Mourits, MCM and Oude Lansink, AGJM 2006, Multi-criteria decision making to evaluate quarantine disease control strategies. in AGJM Oude Lansink (ed.), New approaches to the economics of plant health. Frontis, Wageningen, pp. 131-144.
- G. Feder, R. Murgai, and J. B. Quizon, 'Sending farmers back to school: the impact of farmer field school in indonesia', Review of Agricultural Economics, vol. 26, no.1, pp. 45– 62, 2004.

THANK YOU
Comments / Questions