



Evidence Initiative and Goals

T. Scott Murrell and the APNI Data Science Group

Evidence Initiative

To gather and use high quality evidence to improve the effectiveness of systems-level plant nutrition interventions

Guiding Principle

To participate in **open science** to “...make scientific research and data accessible to all.”

- UNESCO

Open science makes it possible for anyone to:

- ask a question
- evaluate how the body of evidence answers that question

6 Goals

Goal 1

Catalog existing
nutrient
recommendations

CROP PRODUCTION SCIENCE IN HORTICULTURE **18**



OLIVES

Ioannis Therios



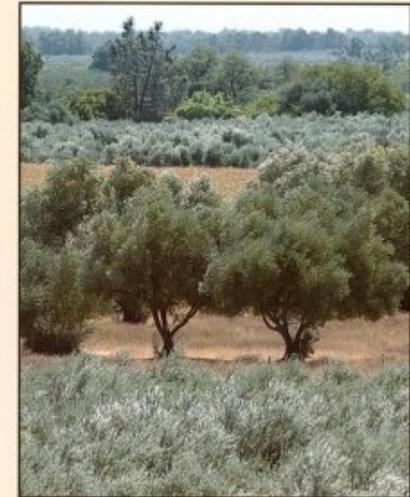
**Manual de manejo
de huerto de olivo**

Editores: Carlos Quiroz E. / Érica González V.

Instituto de Desarrollo Agropecuario - Instituto de Investigaciones Agropecuarias



Second Edition
**OLIVE
PRODUCTION MANUAL**



University of California
Agriculture and Natural Resources
Publication 3353

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Priority crops:

cereals

maize

rice

wheat

tree

cacao

coffee

date palm

oil palm

olive

tea

Desired outcomes:

A centralized, comprehensive collection of existing nutrient recommendations

Published systematic maps based on that collection



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Issue 9 of 12, September 2021

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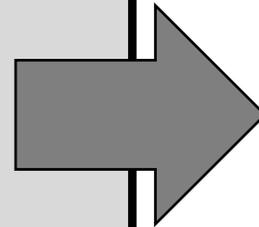
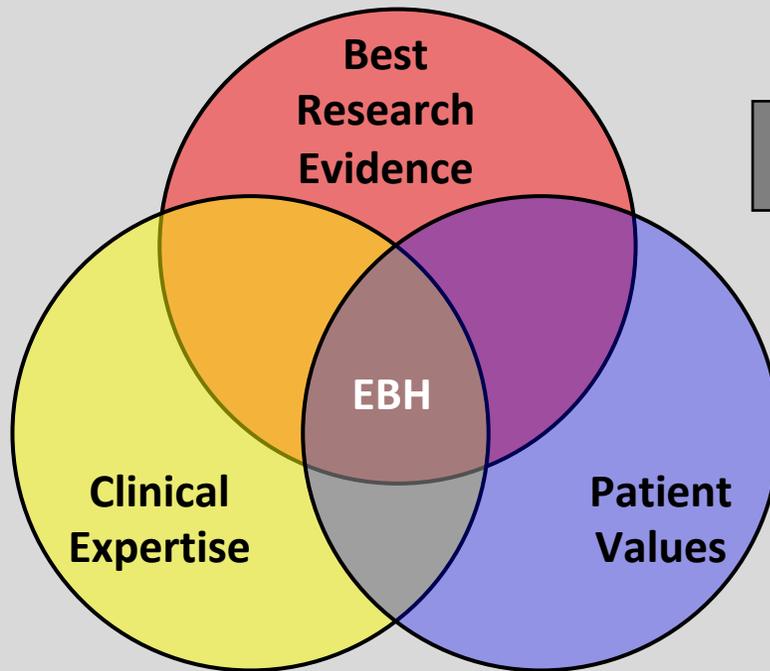
- Whole-cell pertussis vaccine in early infancy for the prevention of allergy in children**
Gladymar Perez Chacon, Jessica Ramsay, Christopher G Brennan-Jones, Marie J Estcourt, Peter Richmond, Patrick Holt, Tom Snelling
Intervention Review 6 September 2021
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- Behavioural and cognitive behavioural therapy for obsessive compulsive disorder (OCD) in individuals with autism spectrum disorder (ASD)**
Sarah J Elliott, David Marshall, Karen Morley, Eleonora Uphoff, Mrityunjai Kumar, Nicholas Meader
Intervention Review 3 September 2021
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Evidence-Based Healthcare

Evidence-Based Agriculture

“The integration of best research evidence with clinical expertise and patient values”

“The integration of best research evidence with management expertise and stakeholder priorities”



Sackett, 2000. Referenced in Dickersin, K. and M. Mayer. 2012. Understanding evidence-based healthcare: A foundation for action. US Cochrane Center. Available online at <http://us.cochrane.org/understanding-evidence-based-healthcare-foundation-action>

Name	Role
Sylvie Brouder (Purdue Univ.)	Project Director
Carol Barford (Univ. Wisconsin)	Discover legacy, gray and dark data
Kess Berg (Advanced Agrilytics)	Provide high quality on-farm data
Greg Bossaer (Purdue Univ.)	On-farm recommendation testing
Scott Brandt (Purdue Univ.)	Create workflow for creating FAIR data
Chao Cai (Purdue Univ.)	Develop curriculum for graduate students
Bruce Craig (Purdue Univ.)	Systematic reviews and meta-analysis
Nathan DeLay (Purdue Univ.)	Business models for farmers

Name	Role
Bruce Erickson (Purdue Univ.)	Curriculum for practitioners
Matt Ruark (Univ. Wisconsin)	Nutrient management expertise
Scott Murrell (APNI)	Nutrient management, FAIR data, standards
John Scott (WHIN)	On-farm recommendation testing
Nathaniel Thompson (Purdue Univ.)	Business models for farmers
Jeff Volenec (Purdue Univ.)	FAIR data, model development, oversight
Danielle Walker (Purdue Univ.)	Create literature search strategies
Jerry Zhu (Univ. Wisconsin)	Machine learning and data mining

Desired outcomes:

APNI and partners produce freely accessible, findable, regular releases of:

- impactful, high quality reviews published in peer-reviewed journals
- plain language summaries for the public

Goal 3

Archive new and legacy data in repositories using FAIR principles



Findable



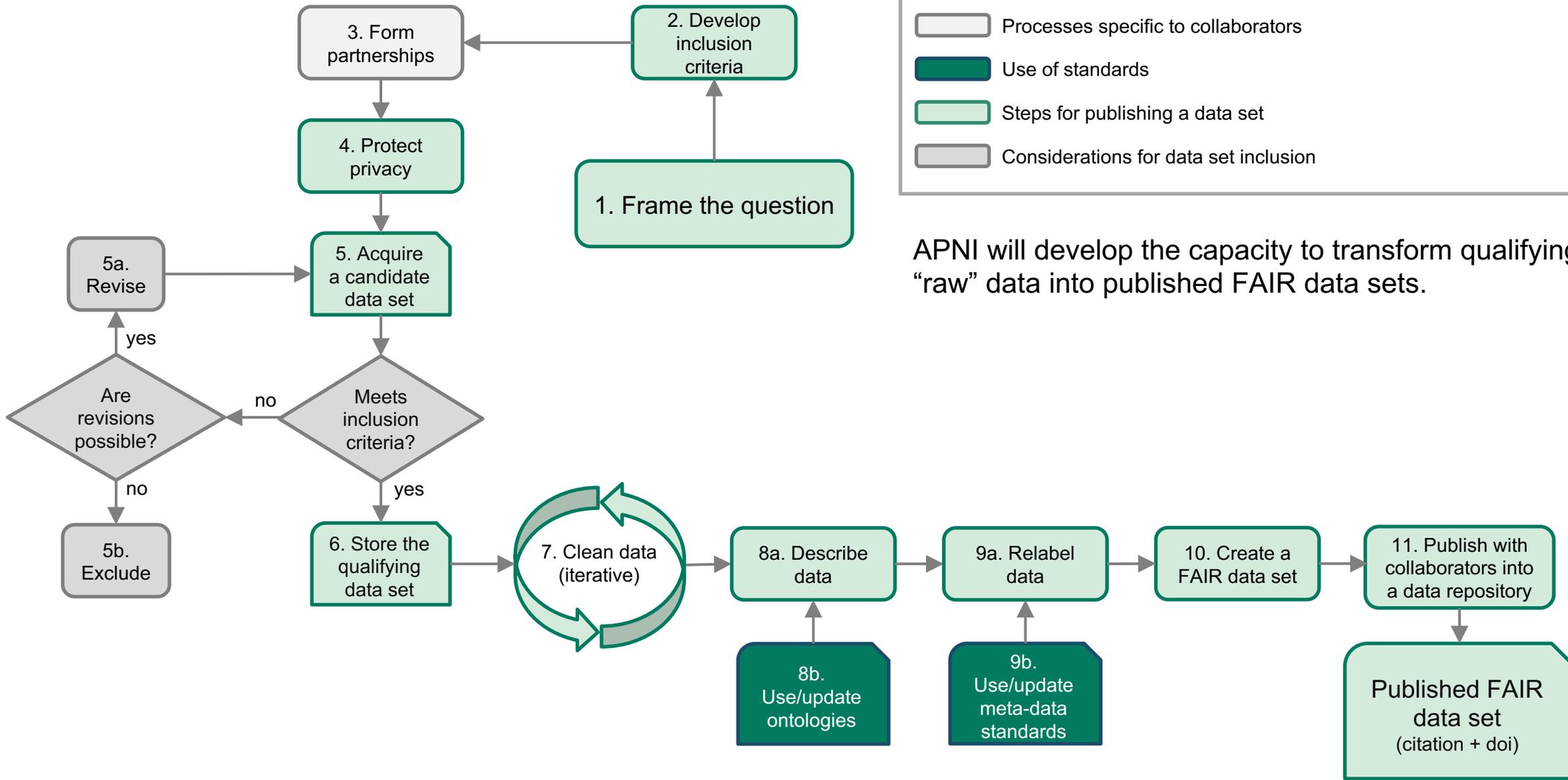
Accessible



Interoperable



Reusable



- Processes specific to collaborators
- Use of standards
- Steps for publishing a data set
- Considerations for data set inclusion

APNI will develop the capacity to transform qualifying “raw” data into published FAIR data sets.

Desired outcome:

APNI regularly publishes open-access FAIR datasets in repositories

Goal 4

Assure quality and standardization for our crop nutrition experiments

doi:10.2489/jswc.69.6.532

Standardized research protocols enable transdisciplinary research of climate variation impacts in corn production systems

E.J. Kladvik, M.J. Helmers, L.J. Abernethy, J.E. Sawyer, R.P. Anex, R.W. Arritt, B. Frankenberger, P.W. Gassman, A.J. Gassman, E.D. Nafziger, N. Nkongolo, M. O'Neil, J. Strock, and M.B. Villamil

Abstract: The important question is how to study increasingly complex and require knowledge and understanding. A study the potential for both mitigation and adaptation to climate variations. The team is measuring the impact of climate change on corn production systems (C), nitrogen (N), and water footprint. The team is measuring existing and novel production practices and their impact on the project, necessitating a well thought out and standardized procedures at 35 research sites. In addition, the data that can be stored and used by participating researchers to develop robust procedures for linking and publication of data from the field to the lab and begin to make sense of the data across the region, detailed research measurements taken and the specific data sets required for analysis and minimum data set required for publication and commitment of all the investigators. The data needed to run the project and individual research teams are collected and standardized protocols, the written procedures to be compared across the region. The data of current researchers on this project are being used for agricultural, ecosystem, and climate change research.

ARC LIBYA-ICARDA COLLABORATIVE PROGRAM

FIELD GUIDE FOR AGRONOMIC TRIALS

Mohamed Boutfiras
Mohammed El Mourid

DOC 16

NOVEMBER 2010



International Center for Agricultural
Research in the Dry Areas (ICARDA)



Agricultural Research Center
Great Jamahiriya (ARC-Jamahiriya)

Outcome:

All APNI studies use standardized:

- experimental protocols
- quality control measures
- quality assurance methods

Current efforts:

APNI:

- protocols for maize measurements

Partners and APNI:

- data standards for nutrient omission trials
- CPCN
- Purdue University and University of Wisconsin

Goal 5

Create powerful
experimental designs
for field trials and
conduct appropriate
analyses

Applied Statistics in Agricultural, Biological, and Environmental Sciences

Barry Glaz and Kathleen M. Yeater, editors

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CHAPTER 4: POWER AND REPLICATION— DESIGNING POWERFUL EXPERIMENTS

Michael D. Casler

Power is the probability of correctly rejecting a null hypothesis that two or more treatment means are equal to each other when in fact they are different. Designing experiments with high power is critical for detecting small, but biologically meaningful, treatment mean differences and for situations in which the researcher expects the null hypothesis of no treatment differences to represent the true state of nature. Biological researchers should be able to define the experimental unit in every biological research scenario and should be able to replicate treatments at the level of the experimental unit. Power analyses can be extremely effective to provide researchers with an objective mechanism to choose the number of replicates to balance statistical and logistical concerns. Power analyses can also be used to efficiently allocate resources among various types or forms of replication, including locations, years, and sampling units, among others.

“Everything is different from everything else,” so it was always said by Prof. Frank N. Martin of the University of Minnesota to the students in his introductory statistics courses. By far, most of the comparative experiments conducted in biological research are designed to detect differences between treatments or systems. As such, researchers create treatment designs in which the individual treatments are viewed as “different” from each other and likely to result in rejection of the null hypothesis for measurement variables of interest to the researcher. Power is simply the probability of correctly rejecting a null hypothesis that two or more treatment means are equal to each other when in fact they are different—in nontechnical terms, the likelihood of “getting it right” with a high degree of confidence, for example, $\alpha = 0.05$ or 95% confidence. The trick, or secret, according to Prof. Martin, is to design experiments that are unlikely to fail in this regard.

Conversely, we occasionally find ourselves in the situation in which our null hypothesis that there are no treatment differences is exactly what we expect to happen. For example, in a breeding and selection program, we often test whether promising new candidate cultivars have disease resistance similar to that of a commercial reference cultivar. In these situations it is imperative that powerful

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Applied Statistics in Agricultural, Biological, and Environmental Sciences
Barry Glaz and Kathleen M. Yeater, editors

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5585 Guilford Road, Madison, WI 53711-5801, USA

Outcome:

APNI staff and partners:

- use powerful experimental designs
- conduct appropriate statistical analyses
- generate impactful visualizations

Goal 6

Develop and test
new approaches to
improving crop
nutrition



Outcome:

- APNI partners with businesses in the supply chain to develop and test new approaches
- Businesses use high quality scientific evidence from APNI to provide effective nutrient management interventions in Africa

Operational Goals:

1. Catalog existing recommendations
2. Generate high quality reviews
3. Archive FAIR data sets
4. Develop a QMS for experiments
5. Create powerful experimental designs
6. Develop and test new approaches

Required Technical Expertise

Catalog

Review

Archive

Assure

Design

Develop

plant nutrition

sociology & economics

data governance (*privacy, security, ethics*)

data wrangling (*structure, standardization, cleaning*)

data mining (*acquisition*)

library science

statistics

experimental design

statistics

predictive modeling