SKiM

Strengthening Knowledge Management
for Greater Development Effectiveness
in the Near East, North Africa,
Central Asia and Europe

Central Asia
CLIMATE PORTAL

Leveraging Semantic Analysis for Faster and Better Systematic Maps and Reviews

Dr. Murat Sartas (ICARDA)

murat.sartas@cgmel.org

16th February 2021, International Center for Agricultural Research in the Dry Areas (ICARDA)

IFAD
Investing in rural people

ICARDA
Science for resilient livelihoods in dry areas

CIHEAM
BARI

Procasur

VT

Overview

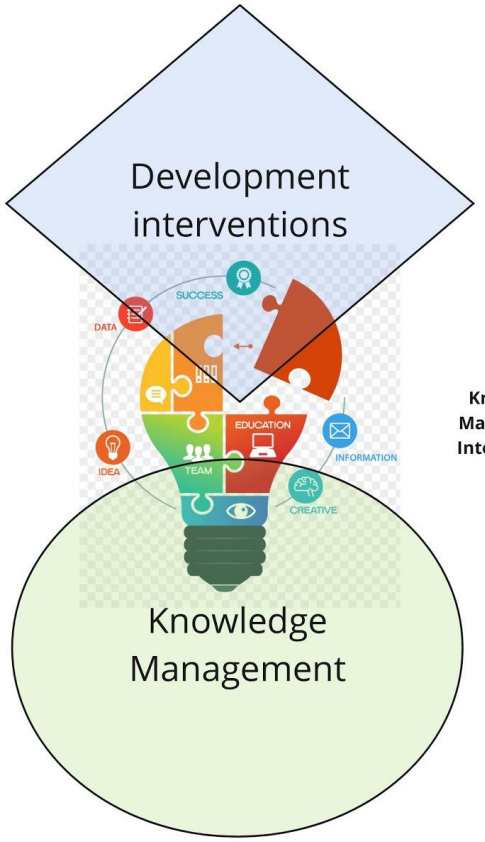
SKiM
Strengthening Knowledge Management for Greater Development Effectiveness in the Near East, North Africa, Central Asia and Europe

1. What are Systematic Reviews and Maps?
   - Create knowledge from data and text
   - Support decisions
   - Create learning for the reviewer team and key stakeholders
2. What is Semantic Analysis?
   - Finding meaning from language structures and objects
   - Documents, sections, paragraphs, sentences, words and their combinations
3. A Few Challenges in Human Only Systematic Maps and Reviews
   - Process challenges (Takes time, not scalable, difficult to replicate, insufficient documentation of the learning)
   - Content challenges (Too many publications, overlapping databases, multiple versions, mainstreamed “strategic cloaking”)
   - Political challenges (Dominant industry interest and funding, resistance to science (covid 19, climate change))
4. A Hybrid Approach to Conducting Systematic Maps and Reviews
   - Combining Lexical Database with Expert Pooled Evidence Dictionaries for Queries
   - Metadata Curation Using Academic Reference Management Tools
   - Combining Computer Mapping with Human Audit
   - A Realist Approach Using Computer Aided Evidence Prioritization

A Case Example from SKiM: What Works in Improving Knowledge Management Systems in Low and Middle Income Countries?

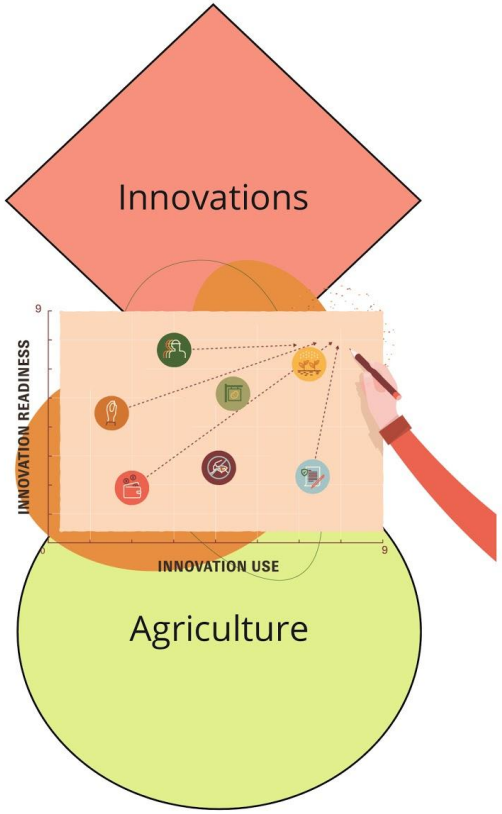
Case Study: Knowledge Management

SKIM
Strengthening Knowledge Management for Greater Development Effectiveness in the Near East, North Africa, Central Asia and Europe

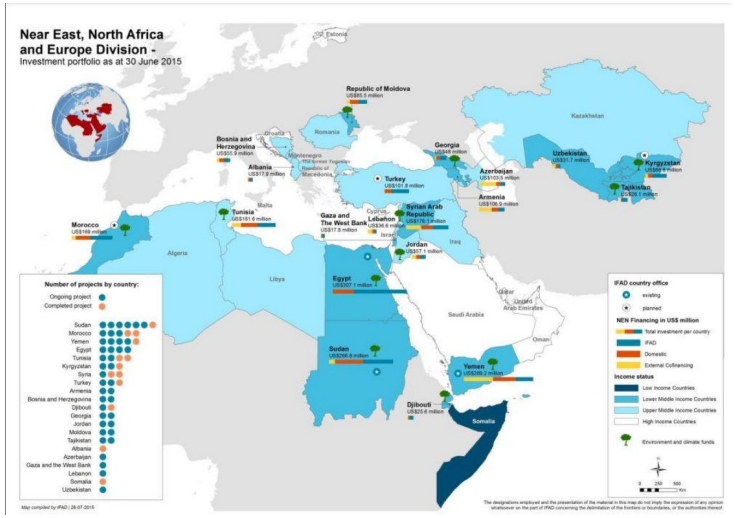


Knowledge Management Interventions

Agricultural Innovation Pipeline



IFAD



A Hybrid Approach to Conducting Systematic Maps and Reviews

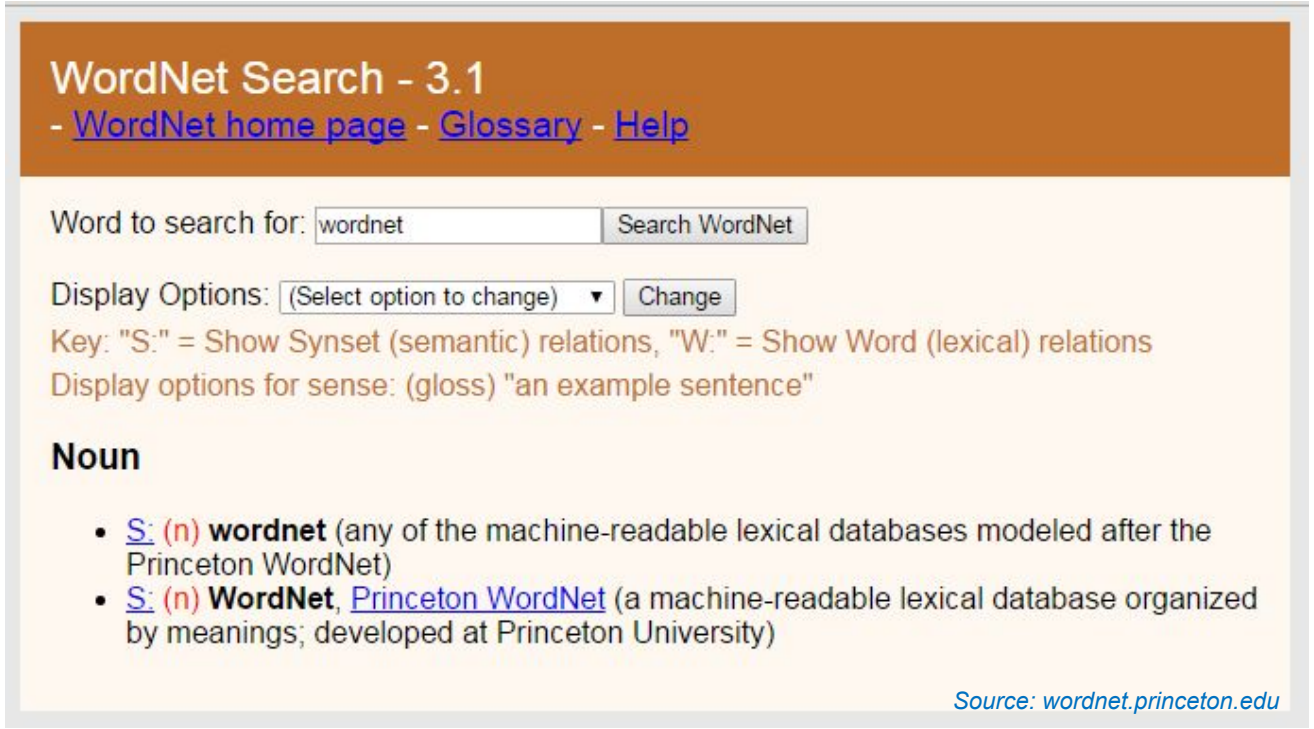
Dictionary + : Combining Lexical Database with Expert Pooled Evidence Dictionaries for Queries

SKIM
Strengthening Knowledge Management for Greater Development Effectiveness in the Near East, North Africa, Central Asia and Europe

AGROVOC is a controlled vocabulary covering all areas of interest of the Food and Agriculture Organization (FAO) of the United Nations, including food, nutrition, agriculture, fisheries, forestry, environment etc. It is published by FAO and edited by a community of experts.

Source: FAO.org

AGROVOC is a multilingual controlled vocabulary covering all areas of interest to the Food and Agriculture Organization of the United Nations (FAO), including food, nutrition, agriculture, fisheries, forestry and the environment. The vocabulary consists of over 35,000 concepts with up to 671,000 terms in different languages. It is a collaborative effort, edited by a community of experts and coordinated by FAO. (Wikipedia)



Source: wordnet.princeton.edu

WordNet is a lexical database of semantic relations between words in more than 200 languages. WordNet links words into semantic relations including synonyms, hyponyms, and meronyms. The synonyms are grouped into synsets with short definitions and usage examples. WordNet can thus be seen as a combination and extension of a dictionary and thesaurus (Wikipedia)

A Hybrid Approach to Conducting Systematic Maps and Reviews

Dictionary + : Combining Lexical Database with Expert Pooled Evidence Dictionaries for Queries

SKIM
Strengthening Knowledge Management for Greater Development Effectiveness in the Near East, North Africa, Central Asia and Europe

But lexica are not sufficient alone !!!

All systematic reviews and maps have unique elements

Until artificial intelligence software are good enough, the best we have is human brain

Computing wins

- Input and output
- Information processing and memory

Closely matched

- Complex movement
- Vision
- Language
- Structured problem solving

Brain still wins

- Creativity
- Emotion and Empathy
- Planning and Executive Function
- Consciousness

Source: becominghuman.ai

A Hybrid Approach to Conducting Systematic Maps and Reviews

Dictionary + : Combining Lexical Database with Expert Pooled Evidence Dictionaries for Queries

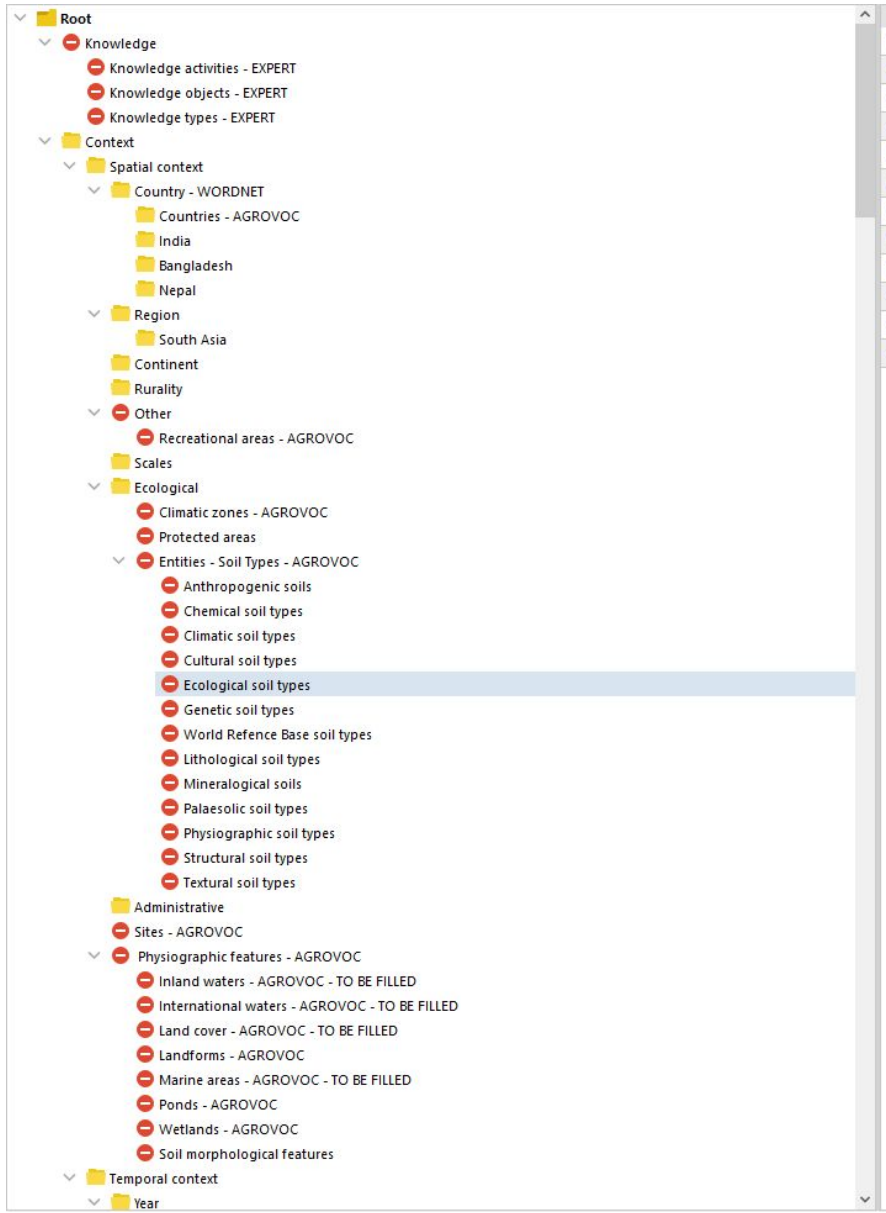
SKIM
Strengthening Knowledge Management for Greater Development Effectiveness in the Near East, North Africa, Central Asia and Europe

1. Create a dictionary from speciality lexicon (Agrovoc)
2. Update the dictionary with filling the gaps in the speciality lexicon with general lexicon (Wordnet)
3. Collect evidence related to the map or review content from a set of (randomly sourced) experts
4. Analyze the evidence set to identify most common and central words and phrases
5. Update the dictionary with the vocabulary from the evidence set
6. Convert it into query

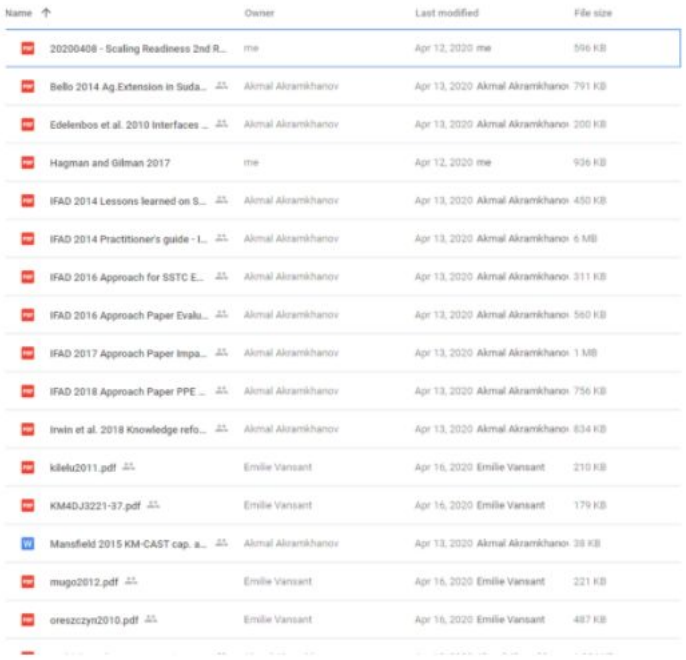
A Hybrid Approach to Conducting Systematic Maps and Reviews

Dictionary + : Combining Lexical Database with Expert Pooled Evidence Dictionaries for Queries

SKIM
Strengthening Knowledge Management for Greater Development Effectiveness in the Near East, North Africa, Central Asia and Europe



Search items	Whole word	Case sensitivity	Starting letters
ecological soil	☑	☐	☐
bog soil	☑	☐	☐
forest soils	☑	☐	☐
grassland soil	☑	☐	☐
heathland soil	☑	☐	☐
marshland soil	☑	☐	☐
prairie soil	☑	☐	☐
rangeland soil	☑	☐	☐
scrubland soil	☑	☐	☐
swamp soil	☑	☐	☐
virgin soil	☑	☐	☐
wetland soil	☑	☐	☐



Expert Pooled Evidence

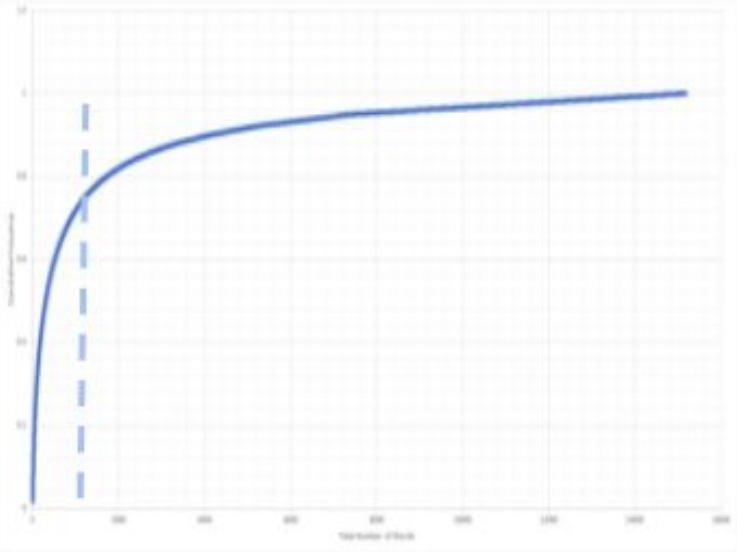
1. Scanned more than 100 people (LinkedIn and ResearchGate)
2. Outreached to more than 30 ppl
3. 9 people (mostly insiders) returned with literature resources
4. About 40 journal articles, book chapters, communication products collecte

A Hybrid Approach to Conducting Systematic Maps and Reviews

Dictionary + : Combining Lexical Database with Expert Pooled Evidence Dictionaries for Queries

SKIM
Strengthening Knowledge Management for Greater Development Effectiveness in the Near East, North Africa, Central Asia and Europe

Word	Part of Speech(POS)	Frequency	Cumulative	Word length
knowledge	Common Noun	2799	0.01817957445	9
development	Common Noun	1244	0.02625938531	11
farmer	Common Noun	1157	0.03377412902	6
project	Common Noun	1141	0.04118495233	7
agricultural	Adjective	1036	0.04791379803	12
management	Common Noun	1036	0.05464264373	10
KM	Proper Noun	1003	0.06115715362	2
process	Common Noun	975	0.06748980281	7
innovation	Common Noun	907	0.07338079031	10



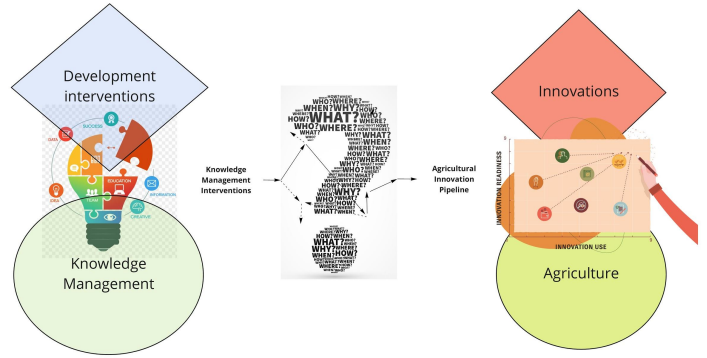
- Text frequency analysis
- Full text
- 304 words corresponding to the 50% of all words

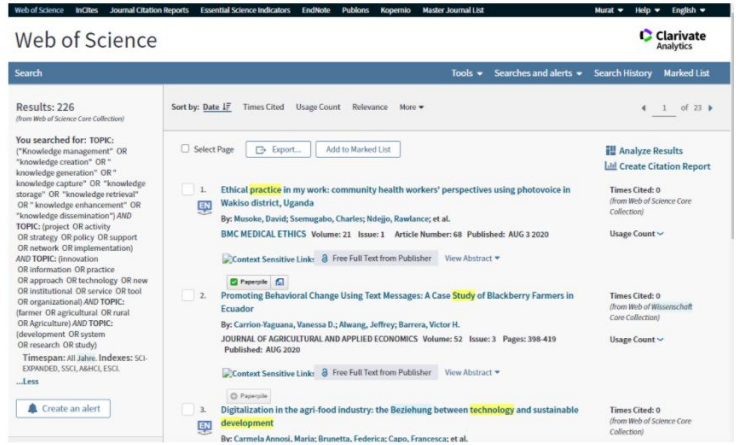
A Hybrid Approach to Conducting Systematic Maps and Reviews

Dictionary + : Combining Lexical Database with Expert Pooled Evidence Dictionaries for Queries

SKIM
Strengthening Knowledge Management for Greater Development Effectiveness in the Near East, North Africa, Central Asia and Europe

Knowledge Management	Intervention (30)	Innovation (45)	Agriculture (15)	Pipeline (14)
knowledge	project	innovation	farmer	development
management	activity	information	agricultural	system
KM	strategy	practice	rural	research
KMS	policy	approach	agriculture	study
	support	technology	crop	design
	network	new	water	assessment
	implementation	institutional	field	plan
	government	extension	land	paper



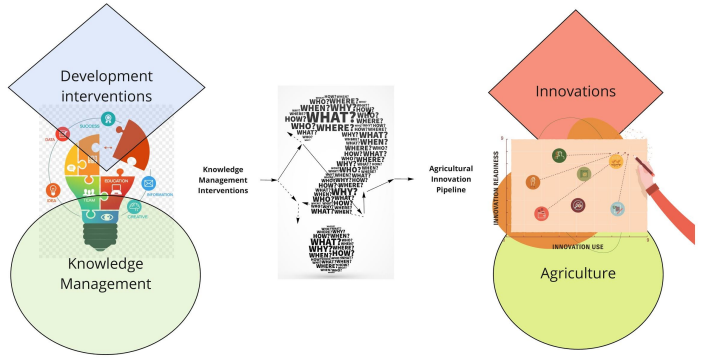


A Hybrid Approach to Conducting Systematic Maps and Reviews

Metadata Curation Using Academic Reference Management Tools

SKIM
Strengthening Knowledge Management for Greater Development Effectiveness in the Near East, North Africa, Central Asia and Europe

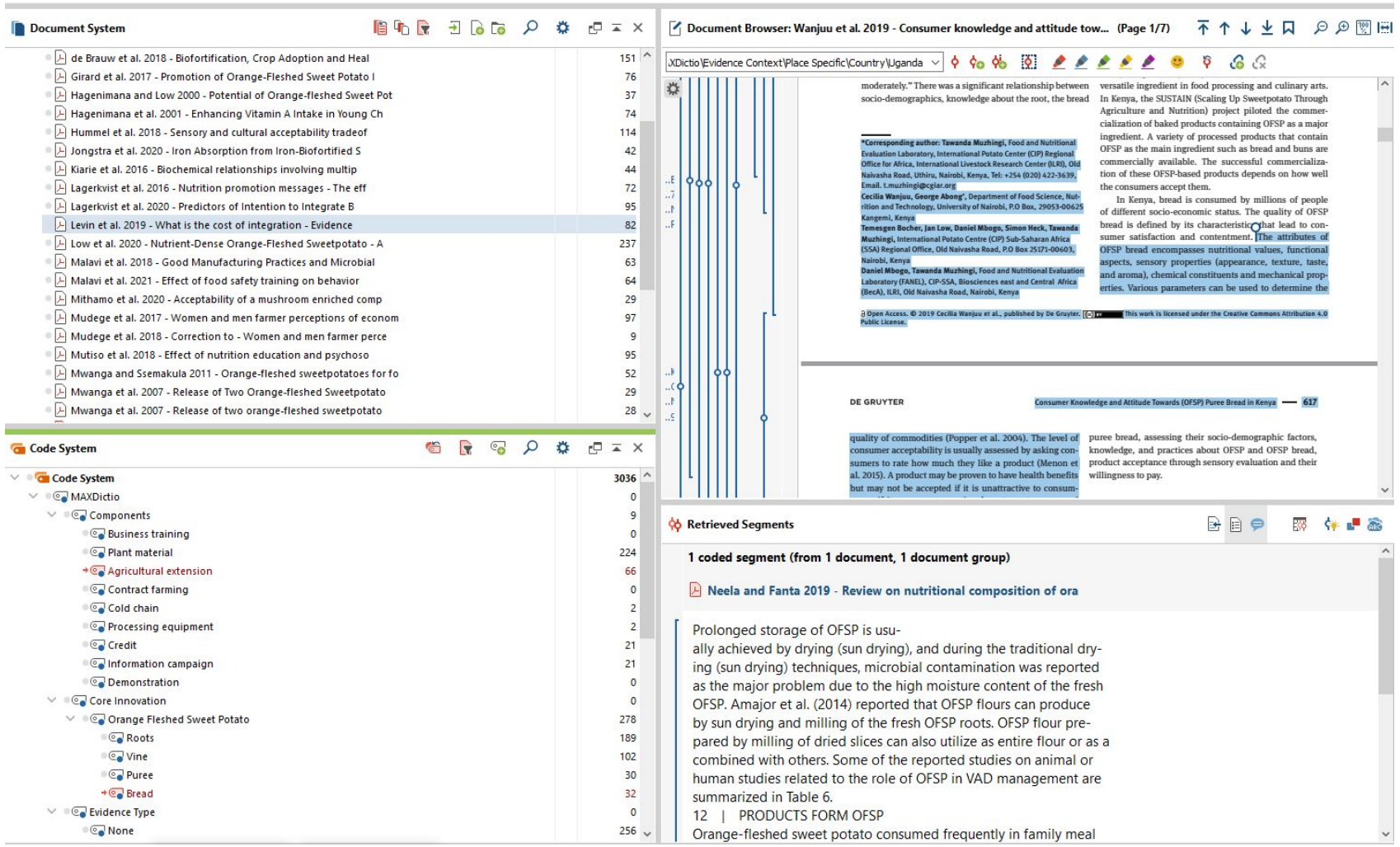
Database Name	Literature Found	Duplicates	Has PDF	Has No PDF	Journal Article	Book	Book Chapter
Scopus	657	55	313	289	312	207	81
WoS	225	78	145	2	116	2	1
AGRIS	290	113	139	38	48	12	2
Pubmed	75	0	72	3	72	0	0
AgEcon	10	0	10	0	4	0	1
Cab Abstracts EBSCOHOST	618	14	433	171	453	0	0
Cab Abstracts OVID	200	16	121	63	180	0	0
Total V2.	1715	556	554	873	837	226	86
Total v3.	2075	276	1233	566	1185	221	85
Overall - Cutpoint	1539	0	1001	538	910	230	90
After Final Curation			936				

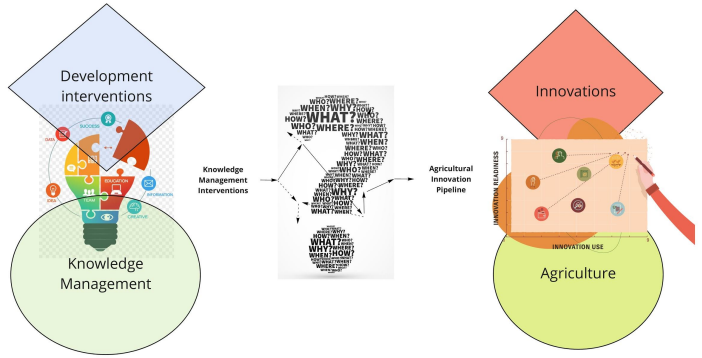


A Hybrid Approach to Conducting Systematic Maps and Reviews

Combining Computer Mapping with Human Audit

SKIM
Strengthening Knowledge Management for Greater Development Effectiveness in the Near East, North Africa, Central Asia and Europe



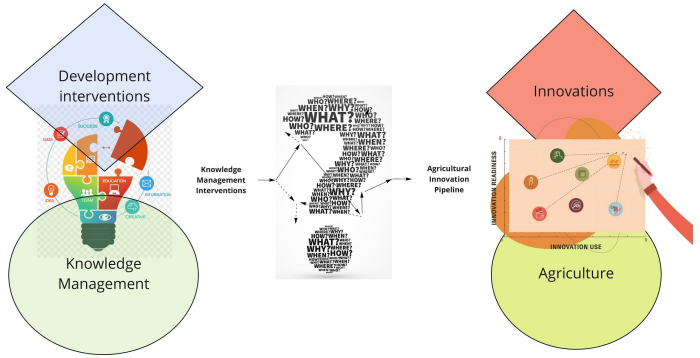


A Hybrid Approach to Conducting Systematic Maps and Reviews

A Realist Approach Using Computer Aided Evidence Prioritization

SKIM
Strengthening Knowledge Management for Greater Development Effectiveness in the Near East, North Africa, Central Asia and Europe

	Knowledge	Knowledge\Knowledge activities	Knowledge\Knowledge objects	Context	Context\Spatial context	Context\Spatial context\Country	Context\Spatial context\Region	Context\Spatial context\Other	Context\Spatial context\scales	Context\Spatial context\Ecological	Context\Spatial context\Continent
Aabeyir and Kabo-bah 2012 - Experiences in mainstreaming monito	13	8	88	55	73	0	0	0	73	7	4
Aare et al. 2020 - Methodological Reflections on Monitoring Int	86	9	262	24	46	3	0	0	191	11	4
Abee 2006 - Application of criteria & indicators of sustainable	0	0	70	23	7	10	0	0	48	29	0
Abenet Yabowork et al. 2017 - Making CGIAR outputs open and acc	22	15	118	8	27	3	0	0	89	6	2
Abubaker 2019 - Book of Abstracts - 6th International Conferenc	14	7	79	13	14	2	0	0	111	7	3
Abubaker and Abeysinghe 2018 - 5th International Conference on	9	1	597	124	74	94	5	0	2387	96	207
….	19	0	305	31	62	16	1	0	118	5	19



SKiM

Strengthening Knowledge Management
for Greater Development Effectiveness
in the Near East, North Africa,
Central Asia and Europe

Thank You

IFAD
Investing in rural people

ICARDA
Science for resilient livelihoods in dry areas

CIHEAM
BARI

Procasur

VT