



PRODUCER GUIDE

Ratio Milpa 0.1.0 · Ratio Complexus

Your milpa's knowledge, *part of an atlas* of Mexican maize

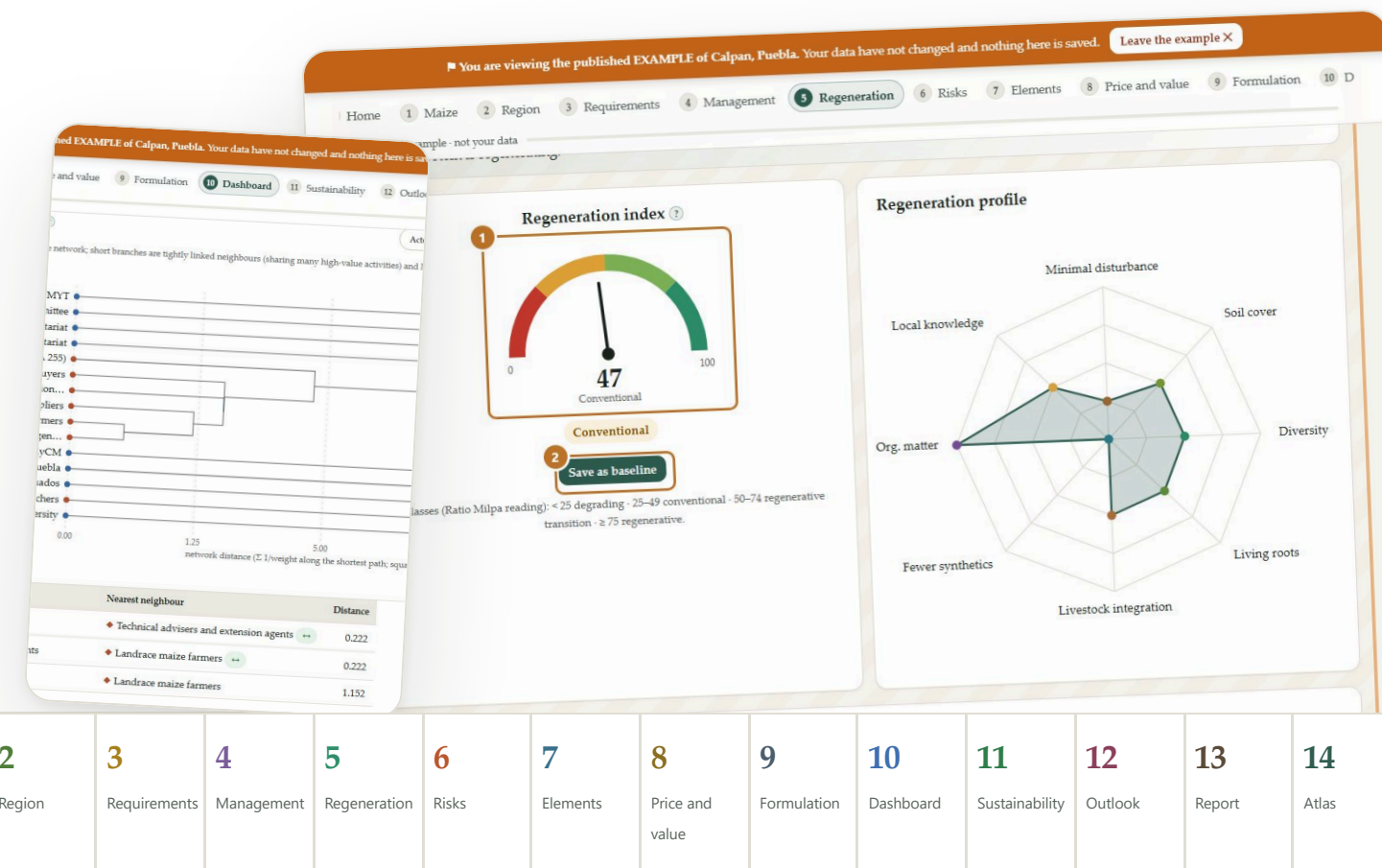
A practical guide to documenting your locality's local maize knowledge with Ratio Milpa — which maize is sown, how it is managed, what regenerates it, what puts it at risk and where it is heading— and to combining many localities into a national atlas. With the published Calpan, Puebla case as a worked example.

1st edition · October 2026 · covers Ratio Milpa 0.1.0

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There is a companion guide for research and teaching: the Scientist Guide.



BEFORE READING

P How to use this guide

Who it is for, how it is organised and what each sign on the page means.

This guide is for whoever knows a milpa or a maize plot and wants to see it whole: farmers, field technicians, extension agents, students doing their social service or thesis in a community. You need no coding or statistics; you need to know your farm and the people who work it.

It follows the app's order: one chapter for each block in the top bar, 1 to 13, each with its own colour. Every example uses **a single case**, the **landrace maize of San Andrés Calpan, Puebla**, documented by Díaz-José and colleagues (2026) with 100 informants between 2022 and 2024. So the numbers in one chapter are the ones that feed the next. Read it start to finish and you will have woven, assessed and projected a real system.

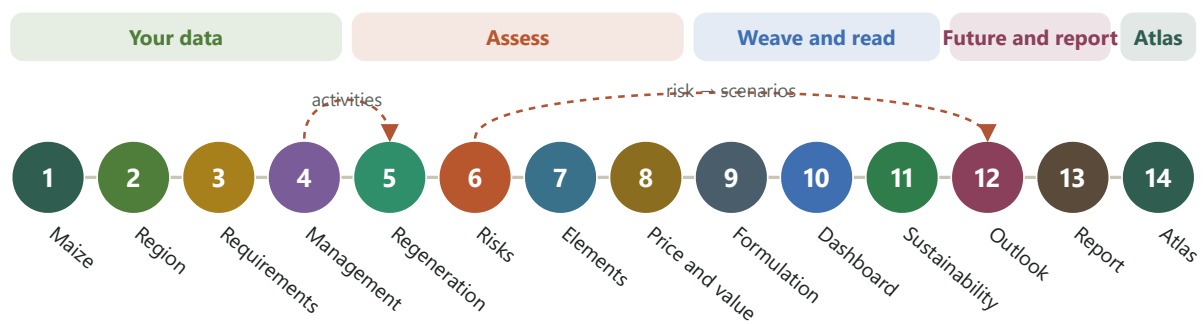


FIGURE P.1 The fourteen blocks. Blocks 1–4 describe your locality; 5–8 assess it; 9 weaves the network, which you read in 10 and 11; 12 looks to the future, 13 sums everything up and 14 combines many localities into the national atlas. Dashed arrows are examples of one block feeding another.

Conventions

WRITTEN AS	MEANS
Weave the system	An app button or field, with its text exactly as on screen.
Report > Save project	A path: open the first item, then the next.
1.5	A value you type as shown.
1	A marker on a screenshot; it is explained below with the same number.
• Dato publicado · ♦ Lectura de Ratio Milpa	The app's own labels: a figure taken from a cited source, or an app proposal you can change.

The five boxes

♦ IN CALPAN	The worked case, step by step, with the real numbers the app returns.
✓ TIP	Shortcuts and good practice that save time or avoid mistakes.
! CAUTION	Common mistakes that can lead to a wrong conclusion.
? WHY?	The reason behind a recommendation, in a few lines. You can skip it.



DECISION RULE

A short table: if you see this, do that.



RATIO MILPA DOES NOT MAKE UP DATA

Every figure in the app carries its source. What the app proposes is labelled ♦ **Ratio Milpa reading**, and what is not documented shows as **no data**. This guide follows the same rule: the Calpan numbers are those the app returns with the paper's data; when something is an assumption, we say so.

Open the app and meet the screen



O

Ratio Milpa is a web page that runs on its own in your browser. Nothing to install, no account, and your data goes nowhere.

0.1 Opening Ratio Milpa

Go to hectortecumshe-ai.github.io/RatioMilpa from a computer, tablet or phone, or scan the QR code on the “Ratio Milpa on one page” page. It downloads a single file; after that it works offline while the tab stays open, and you can save the page (**Ctrl** + **S**) to use it in the field with no signal.



WHERE IS MY DATA KEPT?

Only in the browser you use. Nothing is uploaded to the internet or to GitHub. To move it to another computer or share it with your adviser use **Report** > **Save project** (a .json file) and on the other computer **Report** > **Open project**.

0.2 The home screen

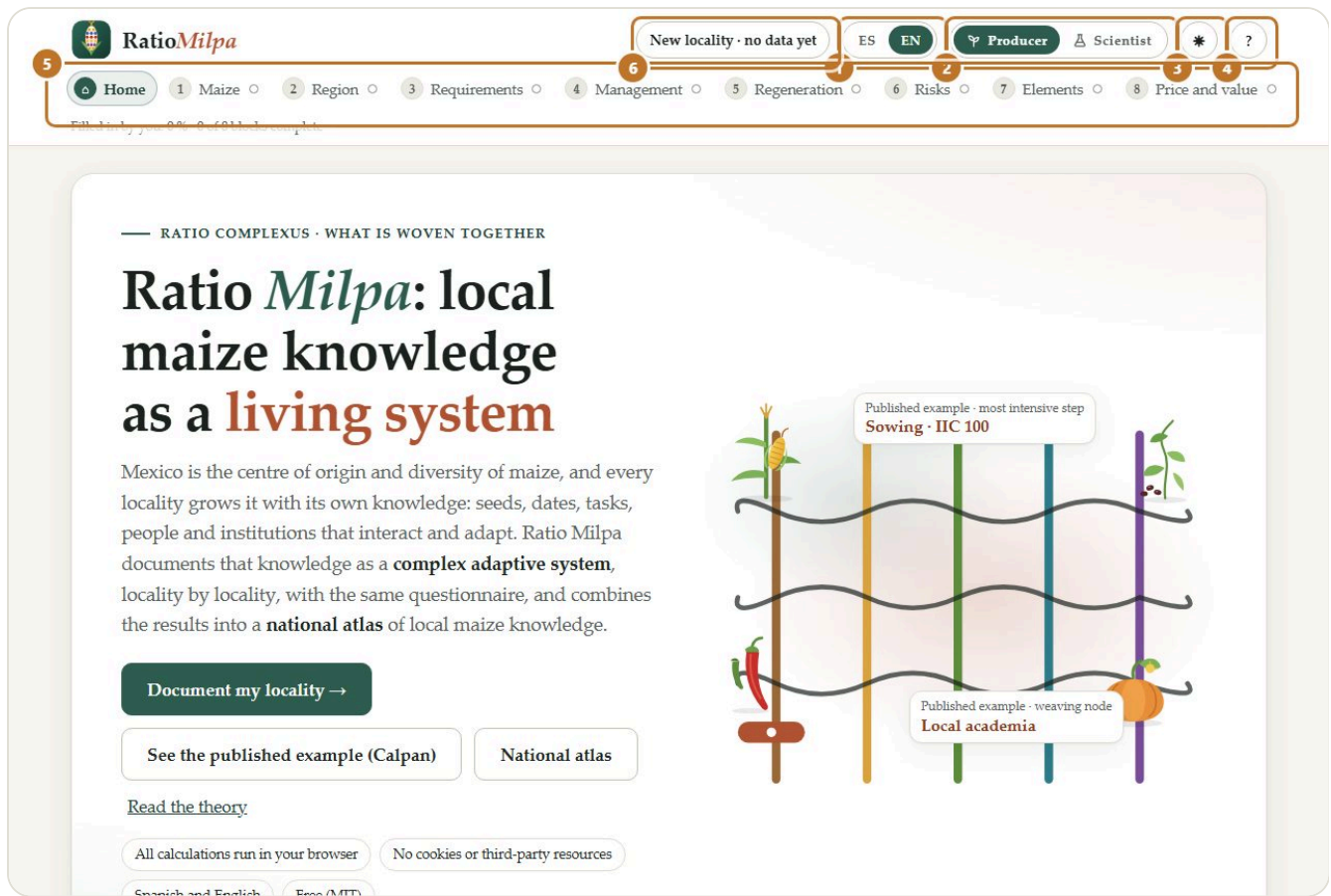


FIGURE 0.1 Home. Everything you need to get around is in the top bar.

- 1** ES / EN switches the language of the whole app, report included.
- 2** **Producer** / **Scientist** switches the view; your data is kept.
- 3** * / ☾ switches between day and night themes.
- 4** ? opens the general help. Every figure also has its own ?.
- 5** The **block bar**, 1 to 13, plus Validation and Theory. You can jump to any of them; next to each block you fill in, a mark says whether it is pending (○), in progress (◐) or complete (●).
- 6** The **pill** reminds you which crop and locality you are weaving; in a new project it says “New project · no data yet”.

0.3 The “?” helps

Next to every important figure there is a ?. Tap it to see what it means, how it is computed and how to read it, with a traffic light: green (good), amber (check) and red (act).

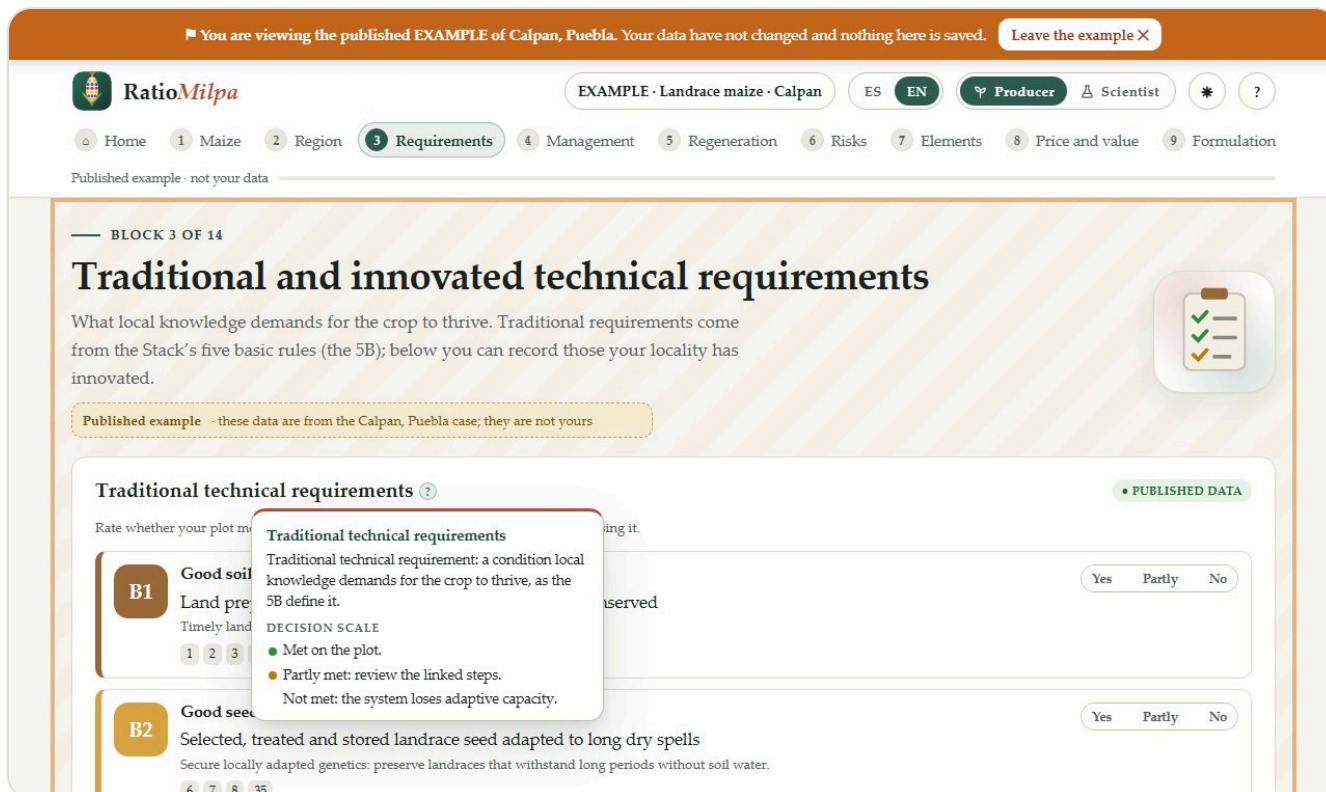


FIGURE 0.2 Help for a figure. The “?” of the traditional requirements.

0.4 Producer and scientist views

The **producer view** shows the essentials in plain language; it is the one this guide describes. The **scientist view** adds full tables, formulas, correlations and validation. You can switch at any time.

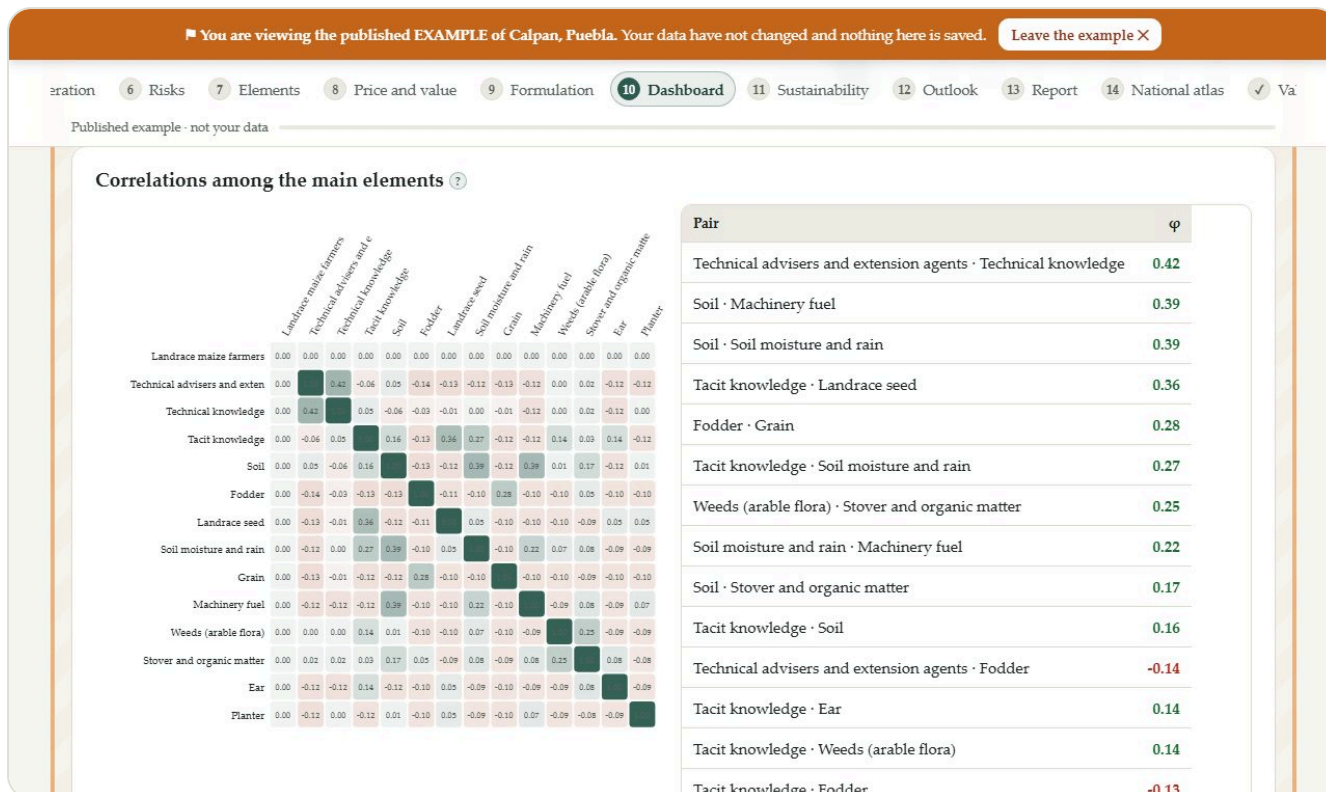


FIGURE 0.3 Scientist view. The Dashboard correlation matrix, shown only in this view.

0.5 The full route

BLOCK 1 3 min Maize Your maize and its system	BLOCK 2 2 min Region State, municipality, locality	BLOCK 3 3 min Requirements The rules of local knowledge	BLOCK 4 10 min Management Steps, activities and dates
BLOCK 5 4 min Regeneration Regenerating or wearing out?	BLOCK 6 6 min Risks Likelihood × impact	BLOCK 7 4 min Elements Who and what takes part	BLOCK 8 6 min Price and value What it costs and what it is worth
BLOCK 9 1 min Formulation Weave the system	BLOCK 10 5 min Dashboard Network, cladogram, calendar	BLOCK 11 4 min Sustainability Soil, water, SDGs, footprint	BLOCK 12 5 min Outlook At 2, 5 and 10 years
BLOCK 13 2 min Report PDF, CSV and project	BLOCK 14 5 min Atlas Many localities, one atlas		



IF THIS IS YOUR FIRST TIME

The app starts blank. To first see a complete system, tap **See the published example (Calpan)** on Home: you enter **example mode**, walk through the blocks with this guide and leave with **Leave the example**. Then you fill in yours from Block 1.

0.6 Yours, suggested and the example

So that you never mistake an example for your own data, the app tells three things apart at a glance:

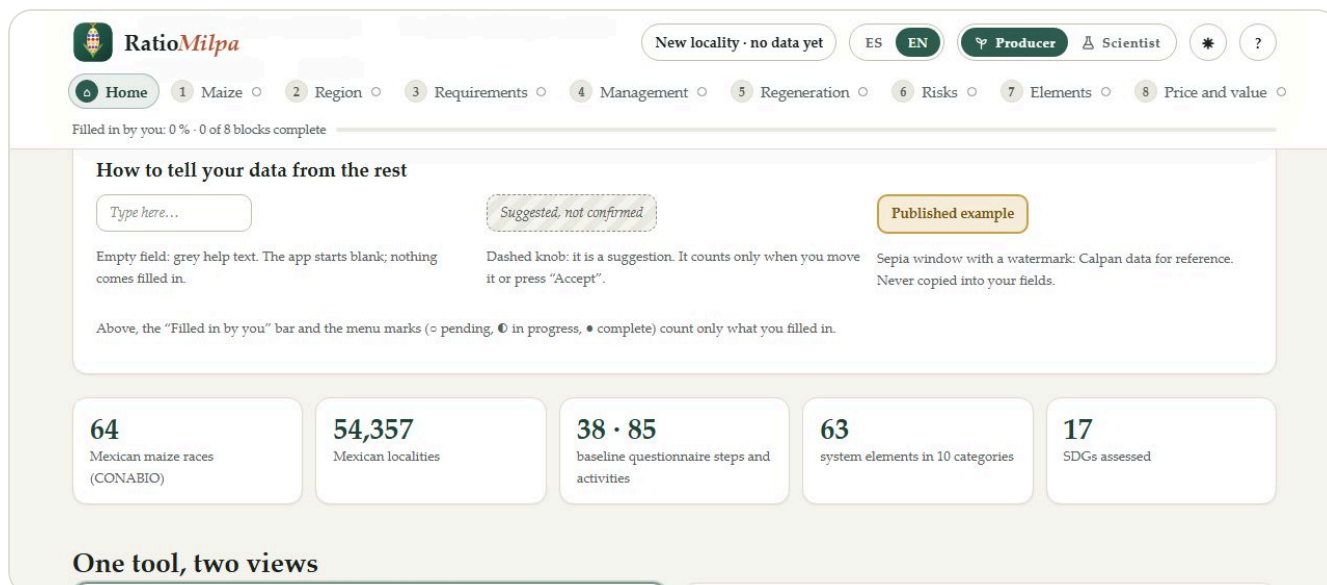


FIGURE 0.4 The guide on Home. Empty field, suggested value and published example.

WHAT YOU SEE	WHAT IT MEANS
Grey italic text inside a field	The field is empty; it is only a hint of what to write. Nothing comes filled in.
Dashed grey knob , “Suggested, not confirmed”	The app proposes a value from your data. It counts as yours only when you move it or tap Accept suggestion .
Sepia window with the “EXAMPLE” watermark	Published Calpan data for reference. When you close it, your fields stay the same.
Orange band at the top of the screen	You are in example mode. Nothing is saved; Leave the example takes you back to your project.

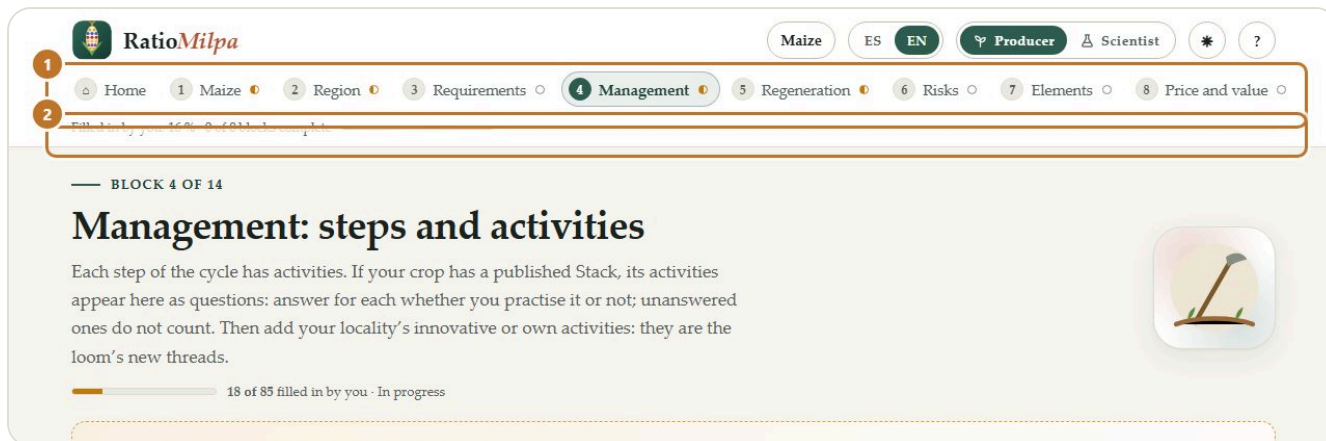


FIGURE 0.5 Filled in by you. The bar and the menu marks count only what you filled in.

- 1 Marks per block: pending, in progress or complete.
- 2 Total share filled in by you.

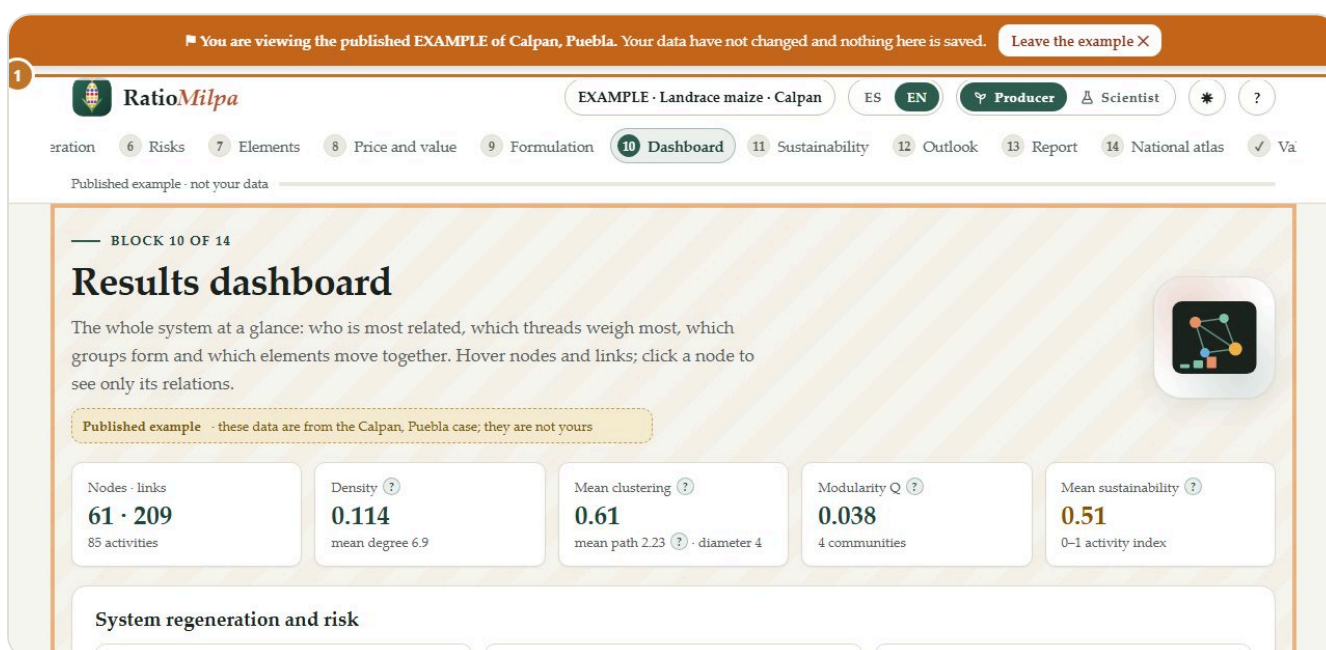


FIGURE 0.6 Example mode. The orange band reminds you that those data are Calpan's, not yours.

? WHAT IF I OPEN A RESULTS BLOCK WITH NO DATA?

Formulation, Dashboard, Sustainability, Outlook and Report do not show empty results: they say which blocks are still to be filled in and take you there.


RatioMilpa

New locality · no data yet
ES
EN
Producer
Scientist
*
?

6 Risks
7 Elements
8 Price and value
9 Formulation
10 **Dashboard**
11 Sustainability
12 Outlook
13 Report
14 National atlas
✓ Va

Filled in by you: 0 % · 0 of 8 blocks complete

BLOCK 10 OF 14



NOT SURE HOW TO FILL IT IN? SEE A PUBLISHED CASE

Landrace maize in Calpan, Puebla (Díaz-José et al., 2026). It opens in a separate window and does not change your data.

See the published example →

There are no data of yours to compute this block yet

Results are computed only from what you fill in. To start, answer in Block 4 which activities you practise or add your own.

1
Maize
0 / 4 · Pending

2
Region
0 / 3 · Pending

3
Requirements
0 / 6 · Pending

4
Management
0 / 85 · Pending

5
Regeneration
0 / 8 · Pending

6
Risks
0 / 19 · Pending

7
Elements
0 / 1 · Pending

8
Price and value
0 / 0 · Pending

Go to Block 4 · Management →
See how it looks with the published example

FIGURE 0.7 A results block with no data.

Your maize, its system and your unit



1

Ratio Milpa works with a single crop, maize. Here you say which maize you sow, in which system and what your production unit is like.

1.1 Which maize do you sow?

First choose whether your maize is **native (landrace)** or **improved or hybrid**; until you choose, the card reads “Not chosen”. If native, choose its race among the **64 reported for Mexico** in seven racial groups (CONABIO, 2020; classification by Sánchez et al., 2000), in the list or by tapping its chip; those marked ° were first described in the Caribbean or Guatemala and have also been collected in Mexico. If improved, type its name as you buy it or as the institution names it.

RatioMilpa Maize Chalqueño ES EN Producer Scientist

Home 1 Maize 2 Region 3 Requirements 4 Management 5 Regeneration 6 Risks 7 Elements 8 Price and value

Filled in by you: 3% - 0 of 8 blocks complete

Which maize do you sow?

1 Native landrace (race) Improved or hybrid

The 64 maize races reported for Mexico in their seven racial groups. 59 are native; those marked ° were first described in the Caribbean or Guatemala and have also been collected in Mexico.

2 Race

Chalqueño

Conical (15)

- Arrocillo
- Cacahuacintle
- Cónico
- Cónico Norteño
- Chalqueño
- Dulce
- Elotes cónicos
- Mixteco
- Mushito
- Mushito de Michoacán
- Negrito
- Palomero de Chihuahua
- Palomero de Jalisco
- Palomero toluqueño
- Uruapeño

Sierra de Chihuahua (6)

- Apachito
- Azul
- Complejo Serrano de Jalisco
- Cristalino de Chihuahua
- Gordo
- Mountain Yellow (Amarillo de Montaña)

Eight-rowed (12)

- Ancho
- Blando
- Bofo
- Bolita
- Elotes occidentales
- Harinoso de ocho
- Jala
- Onaveño
- Tablilla de ocho
- Tabloncillo
- Tabloncillo Perla
- Zamorano Amarillo

Chapalote (4)

- Chapalote
- Dulcillo del Noroeste
- Elotero de Sinaloa
- Reventador

Early tropical (4)

- Conejo
- Nal-Tel
- Ratón
- Zapalote Chico

Tropical dents (11)

- Celaya
- Chiquito
- Choapaneco
- Cubano Amarillo °
- Nal-Tel de Altura °
- Pepitilla
- Tepecintle
- Tuxpeño
- Tuxpeño Norteño
- Vanderío
- Zapalote Grande

Late maturing (12)

- Dzit Bacal
- Comiteco
- Coscomatepec
- Mixeño
- Motozinteco
- Negro de Chimaltenango °
- Olotillo
- Olotón
- Quicheño °
- Serrano °
- Serrano Mixe
- Tehuá

Source: CONABIO (2020). Maize races of Mexico; classification by Sánchez et al. (2000). The Calpan paper covers landraces without specifying race; about 22 are reported in Puebla.

Production system ? Production unit

FIGURE 1.1 Which maize do you sow? Native, with the Chalqueño race chosen.

- 1 Native landrace / Improved or hybrid.
- 2 Race (also chosen with the chips below).



IF YOU DO NOT KNOW THE RACE

Leave it “not specified” and write in the project notes what it is called locally (for example, “hillside blue maize”). For a national study, a well-recorded local name is worth more than a guessed race.

1.2 Production system and unit

The system says how maize is grown: **milpa** (maize, bean, squash and other species), **MIAF** (milpa intercropped with fruit trees), monoculture, intercropped with another crop, in rotation, agroforestry or slash-and-burn, backyard or fodder with livestock; if yours is missing, add it with

+ Your system is missing? Add it. Then choose the unit type (milpa, plot, crop or mixed farm, ejido or communal plot, demonstration plot or **Other**), the area and the project name.

FIGURE 1.2 System and unit.

1

Milpa chosen.

2

Unit type; “Other” shows a field to type it.



IN CALPAN

The published case is landrace maize, race not specified (about 22 are reported in Puebla), in **milpa** and MIAF, on farms under 5 ha. The MIAF includes tejocote, pear, walnut, apple, peach and capulin.

2

Region, municipality and locality



Every locality farms its own way. Locate your plot and the app brings INEGI's official data.

2.1 From country to locality

Tap your state on the map or pick it from the list; then the **municipality** and the **locality**. The app knows 2,478 municipalities and 54,357 INEGI localities, with their 2020 population, altitude and map point. The region (North, North-central, Central or South) is set automatically. At the start the three fields read “— Choose... —” in grey.

You are viewing the published EXAMPLE of Calpan, Puebla. Your data have not changed and nothing here is saved. [Leave the example X](#)

RatioMilpa EXAMPLE · Landrace maize · Calpan ES EN **Producer** Scientist * ?

Home 1 Maize **2 Region** 3 Requirements 4 Management 5 Regeneration 6 Risks 7 Elements 8 Price and value 9 Formulation

Published example · not your data

BLOCK 2 OF 14

Region, municipality and locality

Every farmer works their own way and every place has its own climate, altitude and people. Pick your state on the map and go down to municipality and locality: Ratio Milpa places your point and loads official INEGI data.

Published example these data are from the Calpan, Puebla case; they are not yours

1

CENTRE

Puebla

State
Puebla

Municipality
Calpan

Locality (?)
San Andrés Calpan · 8,195 hab.

Mexico > Centre > Puebla > Calpan >

San Andrés Calpan

FIGURE 2.1 Block 2. Puebla highlighted; the red dot is the locality.

1 Map of Mexico by region.

2.2 Your locality's data

You are viewing the published EXAMPLE of Calpan, Puebla. Your data have not changed and nothing here is saved. [Leave the example X](#)

Home 1 Maize 2 **Region** 3 Requirements 4 Management 5 Regeneration 6 Risks 7 Elements 8 Price and value 9 Formulation

Published example - not your data



PUEBLA

State
Puebla

Municipality
Calpan

Locality ?
San Andrés Calpan · 8,195 hab.

Mexico > Centre > Puebla > Calpan >
San Andrés Calpan

North Centre-north **Centre** South

Outlines: Natural Earth (public domain). Regions: Banco de México. The locality dot uses its INEGI coordinates (approximate position on simplified outlines).

Locality: population 2020 8,195 urban	Altitude 2,421 m 19.108° N, 98.459° O	Municipality: population 2020 15,271 3,605 inhabited dwellings	State 6,583,278 217 municipalities · 6,583,278 people
--	--	---	--

Source: INEGI, Geostatistical catalogue; 2020 Population and Housing Census.

PUBLISHED DATA Documented case: Calpan, Puebla

- Municipal coordinates: 19°06'14.08" N, 98°27'28.66" O
- EAP of 4,882 people: 50 % primary, 15 % processing, ~35 % trade and

FIGURE 2.2 INEGI data and the documented case.

◆ IN CALPAN

Puebla (Central region) > Calpan > **San Andrés Calpan**: 8,195 inhabitants at 2,421 m; the municipality has 15,271 inhabitants (INEGI, 2020). The app also shows what the paper says about the municipality: borders, communities studied and their systems.

✓ IF YOUR LOCALITY IS MISSING

Choose the nearest one and note it in the project notes. Very small localities sometimes appear under another name in INEGI's catalogue.



3

Traditional and innovated requirements

What the crop needs to do well, according to local knowledge, and what the locality has adopted over the years.

3.1 The five basic rules (5B)

Calpan's farmers summed up their knowledge in five rules: **good soil** (timely land preparation to capture moisture), **good seed** (adapted genetics that withstand drought), **good sowing** (arrangements that reduce competition for water), **good nutrition** (fertilising at key moments) and **good watchfulness** (monitoring pests, diseases, weeds and moisture). For each one you mark whether it is met on your plot: **Yes**, **Partly** or **No**.

You are viewing the published EXAMPLE of Calpan, Puebla. Your data have not changed and nothing here is saved. [Leave the example X](#)

Home 1 Maize 2 Region 3 Requirements 4 Management 5 Regeneration 6 Risks 7 Elements 8 Price and value 9 Formulation

Published example - not your data

Traditional technical requirements ? PUBLISHED DATA

Rate whether your plot meets each requirement. Numbers are the Stack steps addressing it.

B1
Good soil

Land prepared on time, with moisture captured and conserved
Timely land preparation, mainly to capture and manage soil moisture.
1 2 3 4 5 32

Yes Partly No

B2
Good seed

Selected, treated and stored landrace seed adapted to long dry spells
Secure locally adapted genetics: preserve landraces that withstand long periods without soil water.
6 7 8 35

Yes Partly No

B3
Good sowing

Sowing with density and layout matched to landrace morphology and purpose (grain or dual), on the date set by weather and moon
Correct establishment: planting arrangements matched to landrace morphology and purpose (grain only or dual purpose) to reduce intraspecific competition, especially for water.
9 10 11 12 17 18

Yes Partly No

B4
Good nutrition

Granular and foliar nutrition at key moments, guided by soil analysis
Granular and foliar fertilization at the key moments identified by farmers, for better nutrient uptake.
13 14 15 16 23 29

Yes Partly No

B5
Good watchfulness

Yes Partly No

FIGURE 3.1 Traditional requirements. The 5B with their description, taken from the paper.

3.2 Innovated requirements

Below you add what the locality has innovated: write the requirement, choose the rule it belongs to, a description and the source (farmer, adviser, research, programme), and tap **Add requirement**.

You are viewing the published EXAMPLE of Calpan, Puebla. Your data have not changed and nothing here is saved. [Leave the example X](#)

Home 1 Maize 2 Region 3 Requirements 4 Management 5 Regeneration 6 Risks 7 Elements 8 Price and value 9 Formulation

Published example - not your data

Requirements innovated in the locality ?

Requirement	Rule	Source
Soil test before sowing	Good soil	Technical adviser, 2025

Innovated requirement:

Rule it belongs to:

Description or rationale:

Source (farmer, adviser, research, programme):

+ Add requirement

← Region **4 · Management: steps and activities** Next

There are more apps in the Ratio family
Free and open, with DOIs. Jump straight into the one you need.

[See the whole suite →](#)

- RatioBos**
NUTRITIO
Least-cost rations for
- RatioAvis**
NUTRITIO
Phase diets for broilers,
- FormulAves**
NUTRITIO
The first of the family:
- RatioTelar**
COMPLEXUS
Local farming

FIGURE 3.2 A recorded innovated requirement. Illustrative example, not from the paper.



ALWAYS RECORD THE SOURCE

“Said by Mr Ramiro, 2025” or “CBTA 255 recommendation” is enough. The source is printed in the report and gives your record its worth.

4

Steps, activities and dates

The heart of the system: what is done, in what order and when. Everything that follows is computed from these activities.

4.1 Calpan's 38 steps

The app brings the paper's Figure 4 38 steps and 83 activities as **questions**, from plot assessment in December to harvest and economic balance. None comes answered. At the top you see how many you answered, how many you practise (they enter the network) and how many not; the **sowing date** reads "not entered" until you move its slider, and then steps set in days after sowing follow. The 5B buttons filter steps by rule.

RatioMilpa EXAMPLE · Landrace maize · Calpan ES EN Producer Scientist * ?

Home 1 Maize 2 Region 3 Requirements 4 **Management** 5 Regeneration 6 Risks 7 Elements 8 Price and value 9 Formulation

Published example · not your data

BLOCK 4 OF 14

Management: steps and activities

Each step of the cycle has activities. If your crop has a published Stack, its activities appear here as questions: answer for each whether you practise it or not; unanswered ones do not count. Then add your locality's innovative or own activities: they are the loom's new threads.

Published example - these data are from the Calpan, Puebla case; they are not yours

TIP Open a step and answer "Yes, I practise it" or "No" for each activity; "All yes" or "All no" is faster. Use "+ Innovative activity" for what you do differently. Coloured boxes show whether the activity adds (green) or subtracts (red) for soil, water, air, vegetation and fauna.

Answered by you 85 / 85 activities of the published Stack	Practised (enter the network) 85 85 from the Stack · 0 innovated or own	Not practised 0 stay out of the network
---	---	---

1 Sowing date: Mar 21 Move the date and steps set in days after sowing follow.

The paper reports two possible sowing dates in March–April depending on rain and phenomena such as El Niño/La Niña. Open each step to set its main-activity dates (sowing, weeding, cutting, pruning, harvest...); they build the circular calendar in the Dashboard and Report.

Source: Díaz-José et al. (2026), [doi:10.22231/asyd.v23i3.1822](https://doi.org/10.22231/asyd.v23i3.1822)

FIGURE 4.1 Block 4.

1 Sowing date (21 March in the case).

2 Filter by 5B rule.

4.2 Inside a step

Opening a step shows its activities. For each one answer **Yes, I do** or **No**; those left “not answered”, with a striped background, do not enter the network. **All yes** or **All no** answers the whole step. Then check the **coloured squares**, which show whether the activity adds (green) or subtracts (red) for soil, water, atmosphere, vegetation and fauna, and correct them if your case differs; and set the **dates** of main activities (sowing, weeding, fertilising, cutting, harvest). With **+ Innovative activity** you add what your locality does differently today, choosing the elements involved.

You are viewing the published EXAMPLE of Calpan, Puebla. Your data have not changed and nothing here is saved. [Leave the example X](#)

Home 1 Maize 2 Region 3 Requirements 4 **Management** 5 Regeneration 6 Risks 7 Elements 8 Price and value 9 Formulation

Published example · not your data

18

Sowing
Good sowing · 2 published activities · ✓ 2 of 2 answered · 2 yes

IIC 100.0 ?

Answer the whole step:

Main activity

From

To

Sowing ★

dd/mm/aaaa

dd/mm/aaaa

No own date: computed from your sowing date (Mar 21–Mar 27)

Yes, I do

ZH Speed control

Soil

Wate

Atmo

Vege

Faun

No

Landrace maize farmers

Planter

Machinery fuel

0

0

-1

0

0

Yes, I do

ZI Visual check of mechanisms and seed supply

Soil

Wate

Atmo

Vege

Faun

No

Landrace maize farmers

Planter

Landrace seed

0

0

0

-2

0

► + Innovative activity in this step ?

19

First crop check
Good watchfulness · 2 published activities · ✓ 2 of 2 answered · 2 yes

20

Second crop check
Good watchfulness · 2 published activities · ✓ 2 of 2 answered · 2 yes

IIC 80.0 ?

21

Third crop check
Good watchfulness · 2 published activities · ✓ 2 of 2 answered · 2 yes

IIC 80.0 ?

22

Cultivator pass
Good watchfulness · 2 published activities · ✓ 2 of 2 answered · 2 yes

FIGURE 4.2 Step 18, sowing. Answers, impact by compartment and dates.

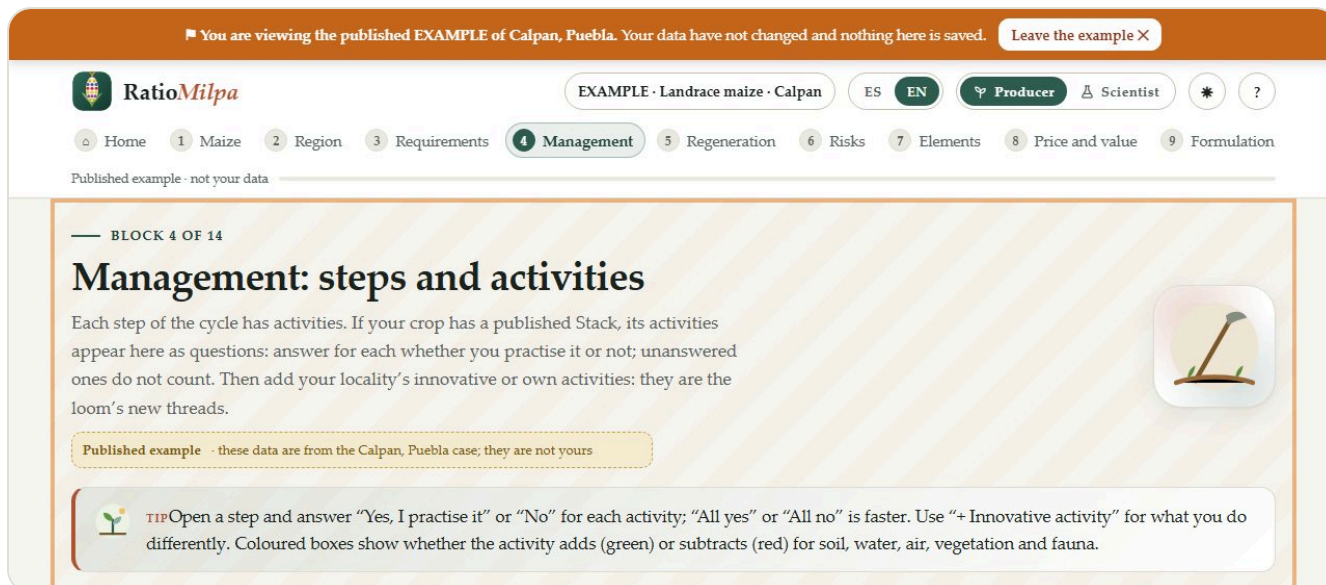


FIGURE 4.3 Yes / No answers. One activity practised, one not and one not answered.

? WHY DO EACH ACTIVITY'S ELEMENTS MATTER?

Because that is how the network is woven: two elements taking part in the same activity become linked. If an innovative activity uses “bio-inputs” and “technical advisers”, that practice strengthens the link between them.

4.3 The example window

Every block shows the golden box “Not sure how to fill it in? See a published case”. Tapping

See the published example

opens a sepia window, with the “EXAMPLE · NOT YOUR DATA” watermark, showing what was recorded in Calpan for that block and how to fill it in with your data. It is for reference only: when you close it your fields stay the same. From there you can also enter example mode.

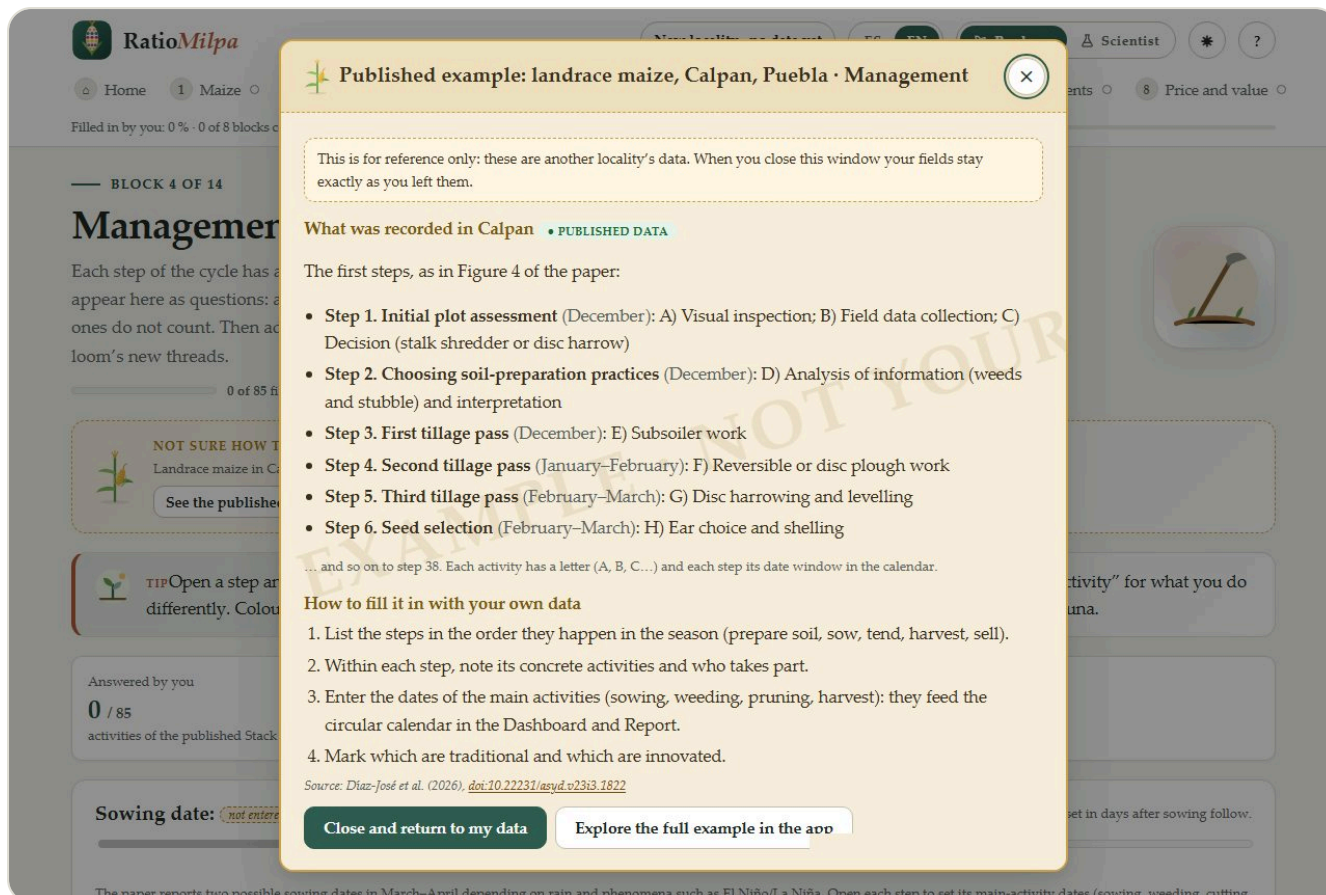


FIGURE 4.4 Published example window in Block 4.

◆ IN CALPAN

With every activity answered “yes”, the app counts **85 practised activities**, all traditional; none innovated yet. In this worked case sowing was set on **21 March**, within the March–April window the paper reports depending on rains and phenomena such as El Niño and La Niña.



5

Is your system regenerating or wearing out?

Eight 0–4 knobs measure whether practices give back to soil, water and biodiversity more than they take.

5.1 The regeneration index

The gauge sums up the eight knobs in a 0–100 number and a class: **degrading** (under 25), **conventional** (25–49), **regenerative transition** (50–74) and **regenerative** (75 or more). Next to it is the **regeneration profile**, a radar that shows at a glance which principle is strong and which weak.

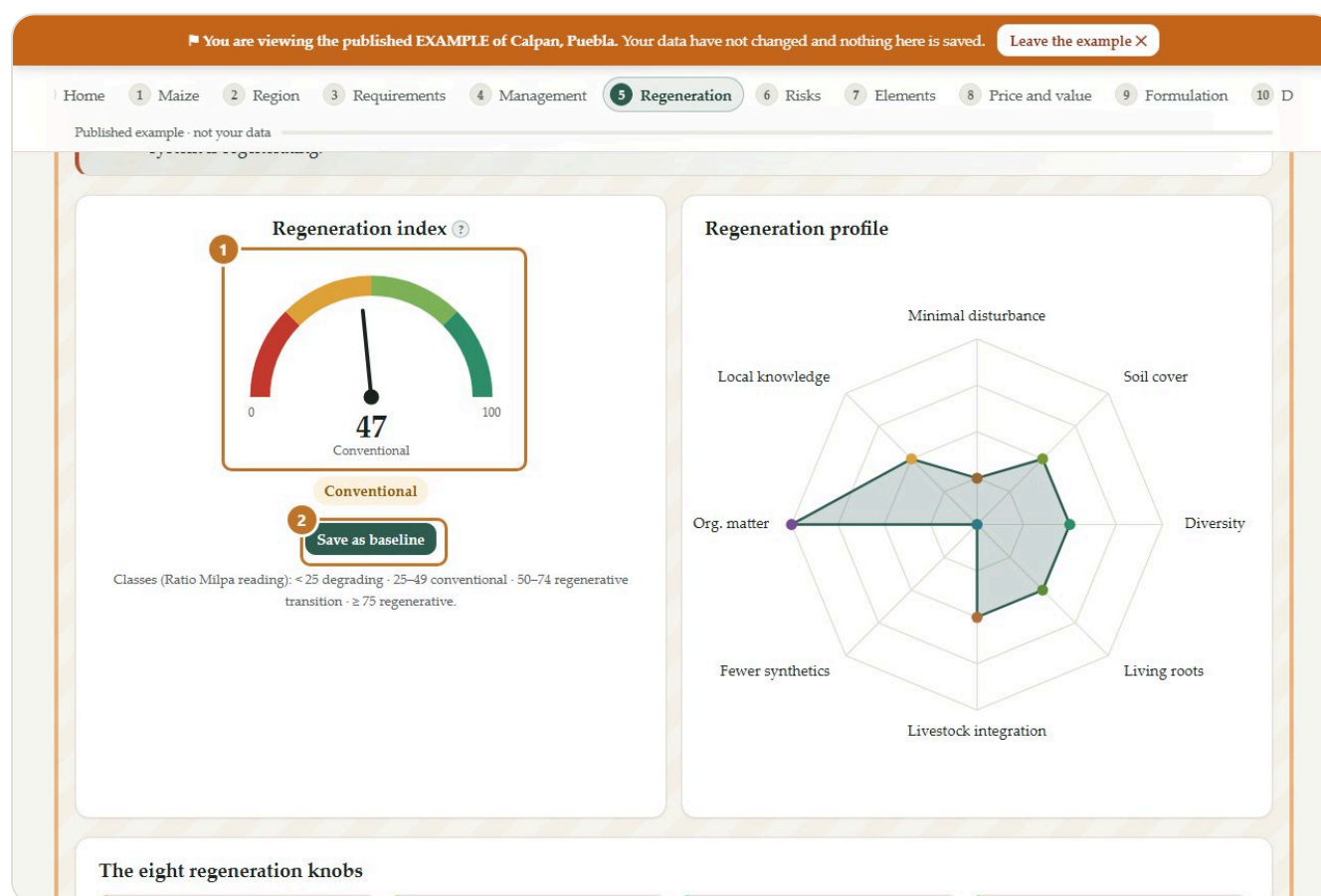


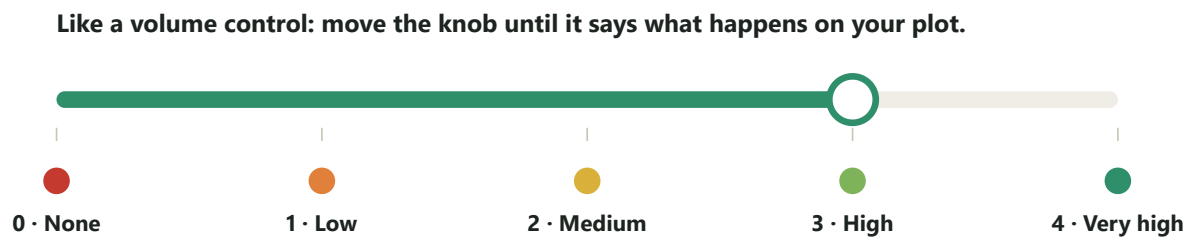
FIGURE 5.1 Regeneration index and profile.

1 0–100 gauge, with its class.

2 **Save as baseline**.

5.2 The eight knobs

Each knob answers one question and brings a **suggested value** computed from your Block 4 activities, with its reason (“4 tillage activities practised”). Until you confirm it, it looks **dashed and grey**, labelled “Suggested, not confirmed”. If the value fits your plot, tap **Accept suggestion**; if not, move it. It then reads “✓ Confirmed by you”. While knobs are missing, the index is flagged **provisional**. Without Block 4 activities there is no suggestion: the knob reads “no data”.



The app proposes a value from your activities; if you change it, the card is shaded and “back to suggested” appears.

FIGURE 5.2 The knob scale. Regeneration and value use ordinal scales: each point has a clear meaning, not a made-up number.

KNOB	QUESTION	CALPAN
Minimal tillage	How many operations move the soil each cycle?	1
Soil cover	How many months is it covered by crop, stubble or green manure?	2
Species diversity	How many species are grown or raised together?	2
Living roots	How many months are there living plants on the plot?	2
Animals integrated	Are there animals grazing stubble or providing manure?	2
Fewer agrochemicals	What share of inputs is synthetic versus bio-inputs?	0
Organic matter	Are residues returned to the soil and organic matter measured?	4
Local knowledge	How much does management rely on local knowledge and own seed?	2

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Home 1 Maize 2 Region 3 Requirements 4 Management 5 **Regeneration** 6 Risks 7 Elements 8 Price and value 9 Formulation 10 D

Published example - not your data

The eight regeneration knobs

1 Minimal tillage 1 · Low

✓ Confirmed by you

0 1 2 3 4

How many machinery or plough passes move the soil each cycle? Fewer passes, less erosion and more soil life.

Suggested: 1 - 4 tillage activities practised

[Clear my answer](#)

Soil covered all year 2 · Medium

✓ Confirmed by you

0 1 2 3 4

How many months a year is the soil covered by crop, stubble, mulch or green manure?

Suggested: 2 - stubble is left or incorporated; adjust to months of cover

[Clear my answer](#)

Species diversity 2 · Medium

✓ Confirmed by you

0 1 2 3 4

How many species are grown or raised together in the unit (including trees and animals)?

Suggested: 2 - 3 species according to the chosen system

[Clear my answer](#)

Living roots as long as possible 2 · Medium

✓ Confirmed by you

0 1 2 3 4

How many months a year are there living plants on the plot (crop, cover crop, trees, pasture)?

Suggested: 2 - single-cycle crop; adjust to months with living plants

[Clear my answer](#)

Animals integrated into the system 2 · Medium

✓ Confirmed by you

0 1 2 3 4

Are there animals grazing stubble, providing manure or living in the unit?

Suggested: 2 - fodder is produced for animals

[Clear my answer](#)

Fewer synthetic agrochemicals 0 · None

✓ Confirmed by you

0 1 2 3 4

What share of input activities uses synthetic agrochemicals versus bio-inputs?

Suggested: 0 - 16 activities with agrochemicals and 1 with bio-inputs

[Clear my answer](#)

Organic matter and residues 4 · Very high

✓ Confirmed by you

0 1 2 3 4

Are stubble, manure or compost incorporated, and is soil organic matter measured?

Suggested: 4 - 6 activities returning residues to soil; with soil testing

[Clear my answer](#)

Local knowledge and own seed 2 · Medium

✓ Confirmed by you

0 1 2 3 4

How much does management rely on tacit and cultural knowledge, own seed selection and the family?

Suggested: 2 - 19 % of activities use local knowledge or own seed

[Clear my answer](#)

FIGURE 5.3 The knobs. Each with its question and suggested value.

- Minimal tillage: 1 · Low, because four soil-moving operations are practised.

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Home 1 Maize 2 Region 3 Requirements 4 Management 5 **Regeneration** 6 Risks 7 Elements 8 Price and value 9 Formulation 10 D

Published example - not your data

The eight regeneration knobs

1 Minimal tillage 1 · Low

✓ Confirmed by you

0 1 2 3 4

How many machinery or plough passes move the soil each cycle? Fewer passes, less erosion and more soil life.

Suggested: 1 - 4 tillage activities practised

Clear my answer

Soil covered all year 2 · Medium

✓ Confirmed by you

0 1 2 3 4

How many months a year is the soil covered by crop, stubble, mulch or green manure?

Suggested: 2 - stubble is left or incorporated; adjust to months of cover

Clear my answer

Species diversity 2 · Medium

Suggested, not confirmed

0 1 2 3 4

How many species are grown or raised together in the unit (including trees and animals)?

Suggested: 2 - 3 species according to the open system

2 ✓ Accept suggestion

Living roots as long as possible 2 · Medium

Suggested, not confirmed

0 1 2 3 4

How many months a year are there living plants on the plot (crop, cover crop, trees, pasture)?

Suggested: 2 - single-cycle crop; adjust to months with living plants

✓ Accept suggestion

Animals integrated into the system 2 · Medium

Suggested, not confirmed

0 1 2 3 4

Are there animals grazing stubble, providing manure or living in the unit?

Suggested: 2 - fodder is produced for animals

✓ Accept suggestion

Fewer synthetic agrochemicals 0 · None

Suggested, not confirmed

0 1 2 3 4

What share of input activities uses synthetic agrochemicals versus bio-inputs?

Suggested: 0 - 16 activities with agrochemicals and 1 with bio-inputs

✓ Accept suggestion

Organic matter and residues 4 · Very high

Suggested, not confirmed

0 1 2 3 4

Are stubble, manure or compost incorporated, and is soil organic matter measured?

Suggested: 4 - 6 activities returning residues to soil, with soil testing

✓ Accept suggestion

Local knowledge and own seed 2 · Medium

Suggested, not confirmed

0 1 2 3 4

How much does management rely on tacit and cultural knowledge, own seed selection and the family?

Suggested: 2 - 19 % of activities use local knowledge or own seed

✓ Accept suggestion

FIGURE 5.4 Confirmed and suggested. The first two knobs are already confirmed; the others are still dashed, with their **Accept suggestion** button.

◆ IN CALPAN

Accepting the suggested values, the index is **47 · Conventional**. It is lowered by the four soil-moving operations (subsoiling, ploughing, harrowing and tilling) and by agrochemical use (16 activities with agrochemicals and 1 with bio-inputs). It is raised by the six activities returning residues to the soil and by soil testing. The most regenerating are tilling to incorporate organic matter and capture moisture, and visual inspection; the most wearing, those linked to herbicide.

5.3 Baseline and organic matter

Regeneration shows over time. Tap **Save as baseline** today and come back next cycle: the app says whether the index rose (“the system is regenerating”) or fell (“the system is wearing out”) and on which knobs. If you have two soil tests, enter the % organic matter before and now: it is the most direct proof.

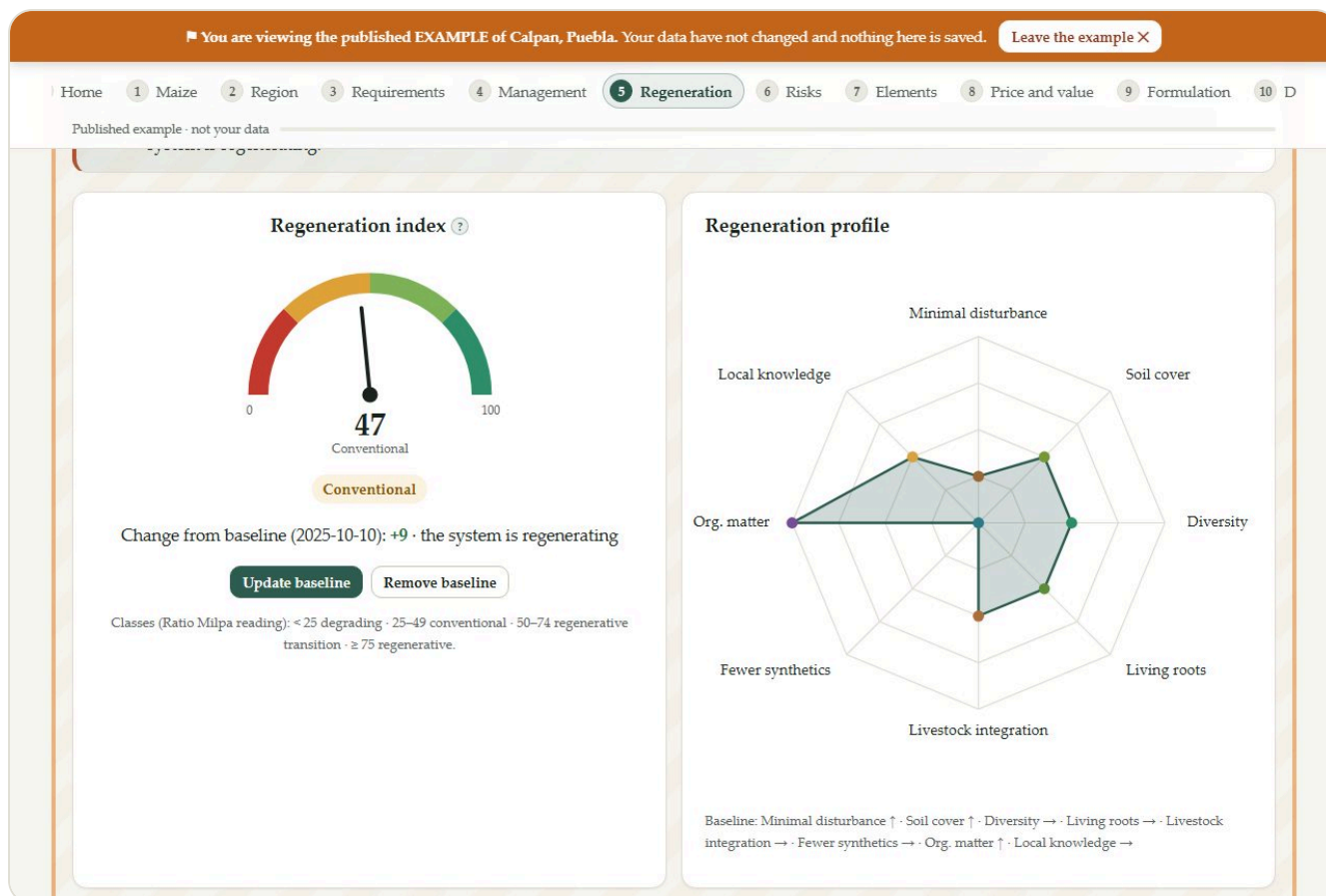


FIGURE 5.5 Comparison with a baseline (illustrative example: 2025 baseline of 38 and organic matter from 1.8 to 2.1 %).



DECISION RULE · WHERE DO I START?

Tillage at 0 or 1	Try dropping one operation or leaving stubble on the surface in a strip.
Fewer agrochemicals at 0 or 1	Replace one application with a bio-input and record it as an innovative activity.
Diversity or living roots at 0 or 1	A cover crop after harvest or intercropping (MIAF) raises both.



6

What could go wrong and how serious it would be

Nineteen risks in a likelihood-by-impact matrix, reduced by your system's adaptive capacity.

6.1 The index and the matrix

At the top you see the **risk index** (0 to 100), the **adaptive capacity** and what it is made of, how many risks are high or very high, and which is the highest. Below, the **risk matrix**: each circle shows how many risks fall in that cell.

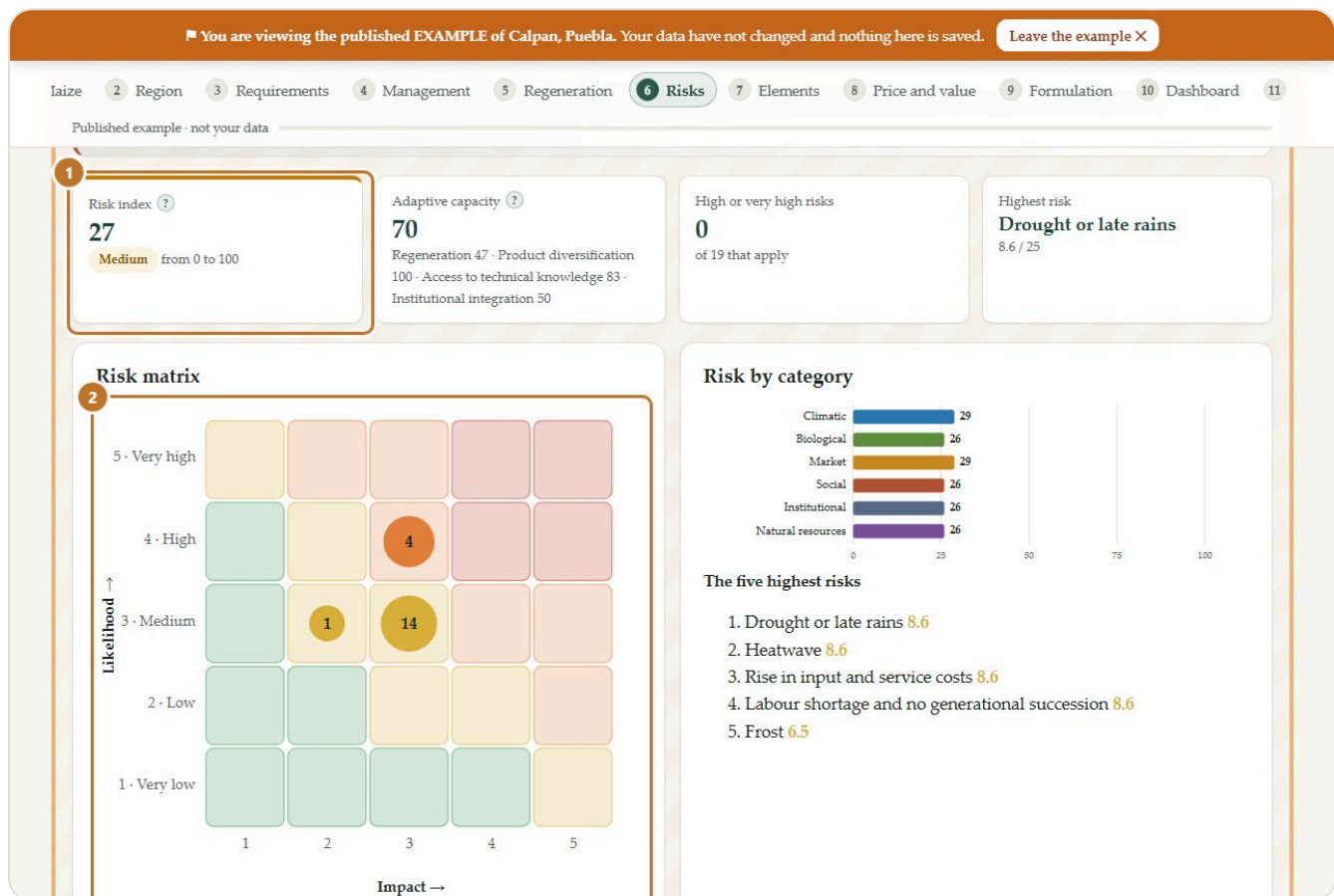


FIGURE 6.1 Block 6.

1 Risk index and its class.

2 Likelihood-by-impact matrix.

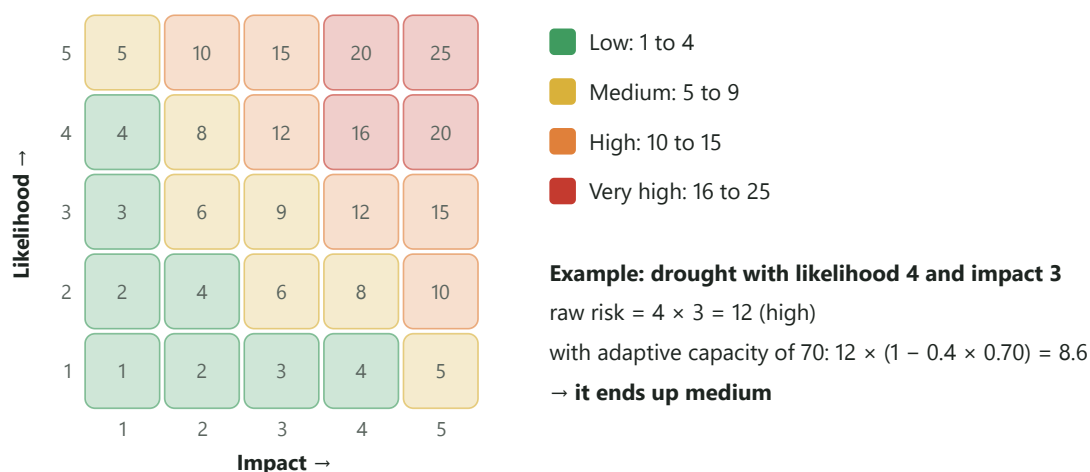


FIGURE 6.2 How to read the matrix. Each cell multiplies likelihood by impact. Your system's adaptive capacity and the controls you already have lower the risk. The example is drought in the Calpan case with the suggested values.

6.2 Each risk's knobs

Risks are grouped into **climatic** (drought, frost, hail, heavy rain, heatwave, cyclones), **biological** (pests, diseases, weeds), **market** (price fall, input cost rise, middlemen), **social** (labour shortage and succession, loss of local knowledge, insecurity), **institutional** (support withdrawal, land tenure) and **natural resources** (erosion, water scarcity). For each: untick it if it does not apply, and move **likelihood**, **impact** and the **control** you already have.

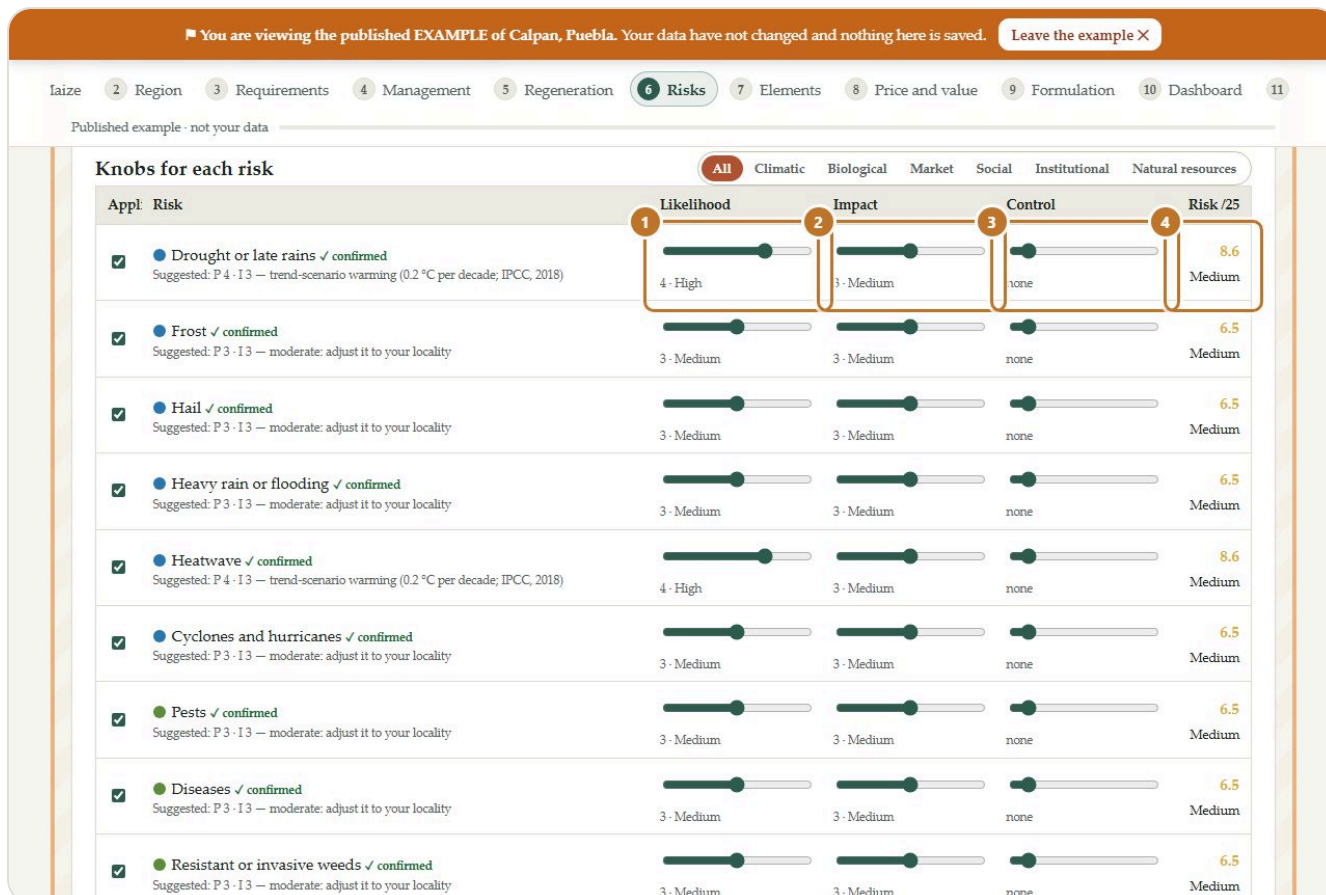


FIGURE 6.3 Knobs for each risk.

- 1 Likelihood: how often it happens (1 very low to 5 very high).
- 2 Impact: how much damage it does.
- 3 Control you already have: none, low, medium or high.
- 4 Resulting risk, 0 to 25, with its level.

? WHERE DO THE SUGGESTED VALUES COME FROM?

From your data and the outlook. For example, drought likelihood rises to 4 because the trend scenario assumes 0.2 °C of warming per decade (IPCC, 2018); the impact of input cost rises depends on what share of your activities uses purchased inputs. What cannot be deduced stays at 3, “moderate: adjust it to your locality”.



IN CALPAN

Risk index **27 · Medium**, with adaptive capacity of **70** (regeneration 47, product diversification 100, access to technical knowledge 83, institutional integration 50). The four highest risks tie at 8.6 out of 25: drought or late rains, heatwave, input cost rise and labour shortage. The Stack records El Niño and La Niña, Atlantic cyclones and the Madden-Julian and Arctic oscillations as disturbances, but publishes no probabilities: so they stay as editable suggestions.



7

Who and what takes part

The loom's threads: actors, institutions, inputs, equipment, natural and financial resources, knowledge, policies, disturbances and products.

7.1 Ten categories

Each element belongs to one of ten categories and takes part in one or more activities. The bar next to each shows how many activities it appears in. In Calpan there are **63 elements** taken from the paper: for example, landrace maize farmers, input suppliers, technical advisers, local academia (CBTA 255), CIMMYT, landrace seed, stubble, soil moisture, El Niño and La Niña, grain and fodder.

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gion 3 Requirements 4 Management 5 Regeneration 6 Risks 7 Elements 8 Price and value 9 Formulation 10 Dashboard 11 Sustainability

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Add an element from your locality

Name

Category [+ Add](#)

Regeneration and risk in the elements

Regeneration (Block 5)

47

Conventional

Risk (Block 6)

27

Medium

Adaptive capacity

70

0-100

Most exposed elements: the highest risk among the hazards that affect them (Block 6).

Soil moisture and rain	8.6
Temperature and rainfall	8.6
El Niño and La Niña	8.6
Production costs	8.6
Granular fertilizer	8.6
Input suppliers	8.6
Landrace maize farmers	8.6

FIGURE 7.1 Adding a local element. Name and category; then choose it in a Block 4 activity.

! AN ELEMENT WITH NO ACTIVITY STAYS OUT OF THE NETWORK

If you add “Community savings fund”, then choose it in the activity where it takes part (Block 4, “+ Innovative activity” or the step detail). Otherwise it stays in the catalogue but is not woven in.

7.2 Elements exposed to risk

At the end of the block, the **Regeneration and risk in the elements** card shows which elements are most exposed: the highest risk among the hazards affecting them (Block 6).

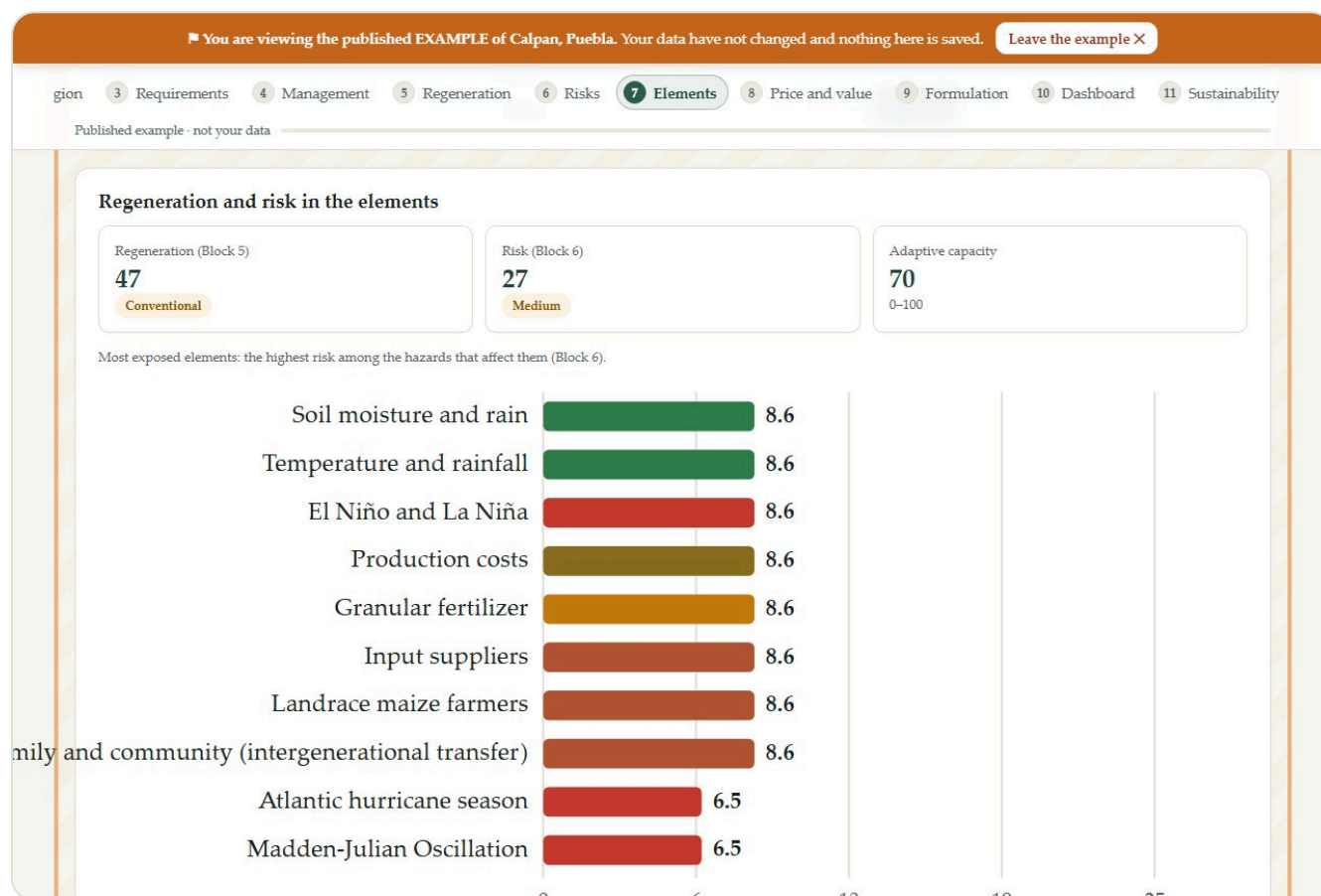


FIGURE 7.2 Most exposed elements. In Calpan, soil moisture, temperature and El Niño top the list.

8

What it costs and what it is worth



Price is what the market charges; value is the element's importance to the system. They are not the same.

8.1 Price per hectare

Choose a category with the tabs. For each element enter the **unit price**, the **unit** (kg, L, day's labour, ha) and the **quantity per hectare**; the app computes \$/ha. **Financial resources** holds production cost, net income and sale price: they feed the margin in Sarandón's index and net income in the outlook.

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ments 4 Management 5 Regeneration 6 Risks 7 Elements 8 Price and value 9 Formulation 10 Dashboard 11 Sustainability 12 Outlook 13

Published example - not your data

◆ Actors ▲ Institutions ◆ Inputs ■ Equipment and infrastructure ☆ Natural resources 1 \$ Financial resources ◆ Knowledge § Policies and programmes

◆ Environmental disturbances ★ Products

Element	Unit price (\$) ?	Unit	Quantity per ha	\$/ha	Economic ?	Use ?	Cultural ?	Ecological ?	Value
2 Production costs		kg, L, jorn		—	★ ★ ★ ★ ★	★ ★ ★ ★ ★	★ ★ ★ ★ ★	★ ★ ★ ★ ★	0.06 structural
Net income		kg, L, jorn		—	★ ★ ★ ★ ★	★ ★ ★ ★ ★	★ ★ ★ ★ ★	★ ★ ★ ★ ★	0.01 structural
Price and sale date		kg, L, jorn		—	★ ★ ★ ★ ★	★ ★ ★ ★ ★	★ ★ ★ ★ ★	★ ★ ★ ★ ★	0.01 structural

+ Add to «Financial resources»

Name Description (optional) Unit

e.g., Working-capital loan

Unit price (\$) Quantity per ha [+ Add to catalogue](#)

For a new element to enter the network and sustainability, choose it in an activity (Block 4, “+ Innovative activity”).

There are no published regional prices for these elements in Ratio Milpa sources: the database is fed with your quotes and saved in your browser.

My catalogue [Download catalogue \(CSV\)](#) [Load catalogue \(CSV\)](#)

FIGURE 8.1 Financial resources.

- 1 Category tab.
- 2 Price, unit, quantity per hectare and the four value dimensions.

8.2 Value in four dimensions

Rate each element from 0 to 5 on **economic**, **use**, **cultural** and **ecological** value. At the top, the **weight** knobs say how much each dimension counts. If you do not rate, the app uses the **structural value**: how

much the element takes part in the activities.



AN EXAMPLE OF PRICE VERSUS VALUE

Home-selected landrace seed has almost no market price, yet high cultural and ecological value; a herbicide may cost more and be worth less to the system. It is a Ratio Milpa reading: rate it as your locality lives it.

8.3 Your catalogue as CSV

With **Download catalogue (CSV)** you save your elements, prices and values to a spreadsheet; with **Load catalogue (CSV)** you bring them into another project.



IN CALPAN

The paper publishes no prices or costs; it reports a yield of 5–6 t/ha. So the case uses structural value and net income shows as “no data” until you enter your figures.

9

Weaving the system



Elements become nodes, shared activities become links and value sets each thread's thickness.

9.1 The “Weave the system” button

Tap **Weave the system**. The app builds the network and takes you to the Dashboard. Next to the button you see how many nodes, links and activities your system has and its density. Below, the **system model**: the environment (climate and disturbances), agents, knowledge Stack, management, inputs, resources, institutions, policies and products, with their arrows.

— BLOCK 9 OF 14

Complex adaptive system formulation

Formulating the system is weaving it: elements become nodes, shared activities become links and value sets each thread's thickness. Here is the complex adaptive system model of your farm.

Published example · these data are from the Calpan, Puebla case; they are not yours

1 Weave the system 61 nodes · 209 links · 85 activities · density 0.114 ?

System model

ENVIRONMENT: climate and disturbances (4)

- Natural resources: 7 elements
- Inputs and equipment: 22 elements
- Agents: actors: 7 groups · decide and learn
- Knowledge stack: tacit · cultural · technical · environmental
- Institutions: 8 linked
- Policies and programmes: 0 programmes

FIGURE 9.1 Block 9. In Calpan: 61 nodes, 209 links, 85 activities, density 0.114.

1 **Weave the system**; once woven it reads “Re-weave the system”.



RE-WEAVE WHENEVER YOU CHANGE SOMETHING

If you add activities, elements or values, come back to this block and re-weave. The Dashboard warns with an amber box if you have not woven yet.

Reading the whole system



10

Who holds the system together, which threads weigh most, which groups form, who is close to whom and when each thing happens.

10.1 The summary at the top

The top indicators give the network size (nodes and links), its density, clustering and mean path, modularity Q and mean sustainability. Below, the **System regeneration and risk** card brings the indices from blocks 5 and 6, the radar and the matrix.

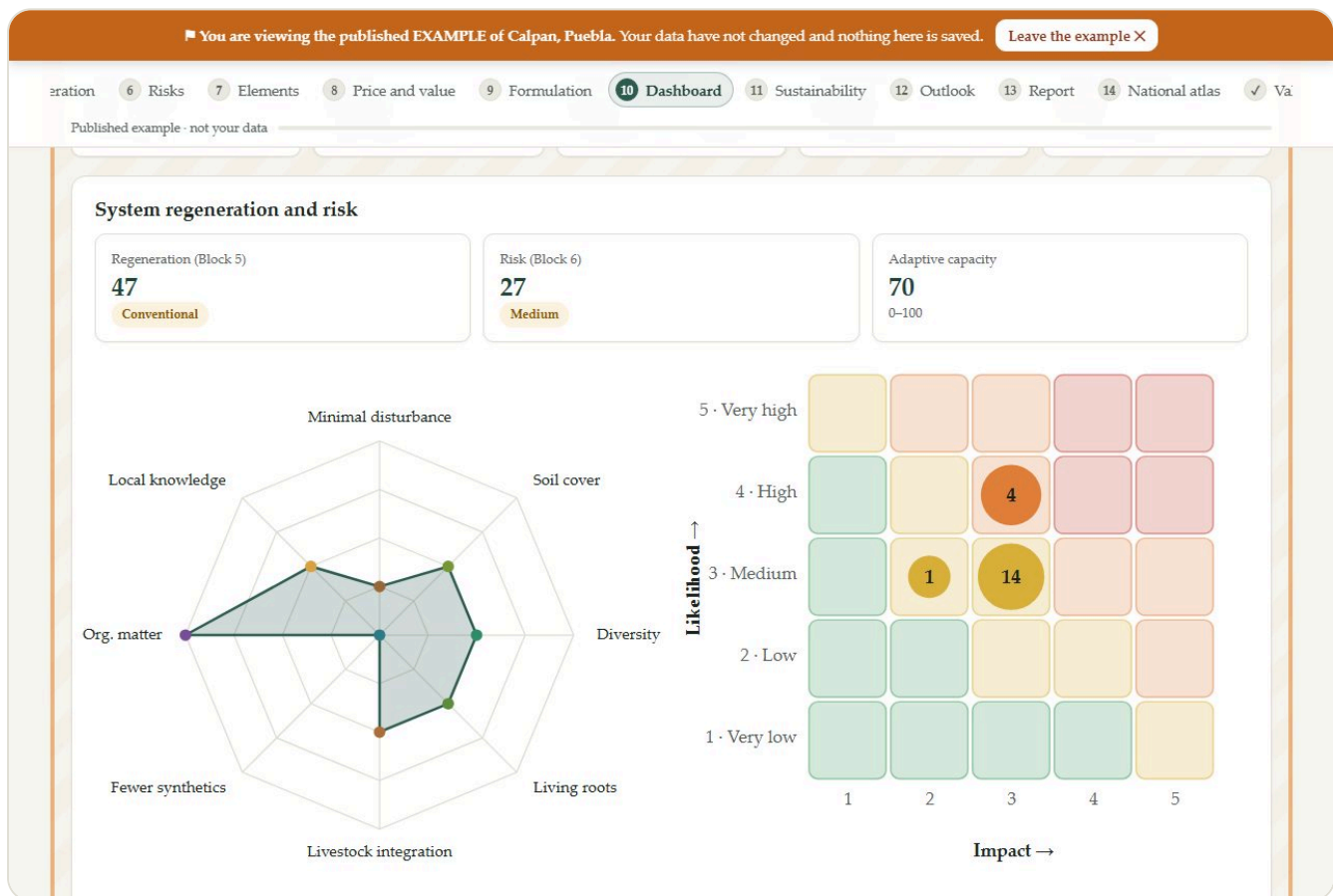


FIGURE 10.1 Regeneration and risk on the Dashboard.

10.2 The system network

Each dot is an element, coloured by category; its size depends on the measure you choose at the top: **weighted degree** (how related it is), **betweenness** (how much it bridges), **eigenvector** (whether it relates

to the important ones) or **closeness**. Tap a node to see only its relations. Since farmers take part in almost everything, the **Hide the omnipresent node** box reveals the inner structure.

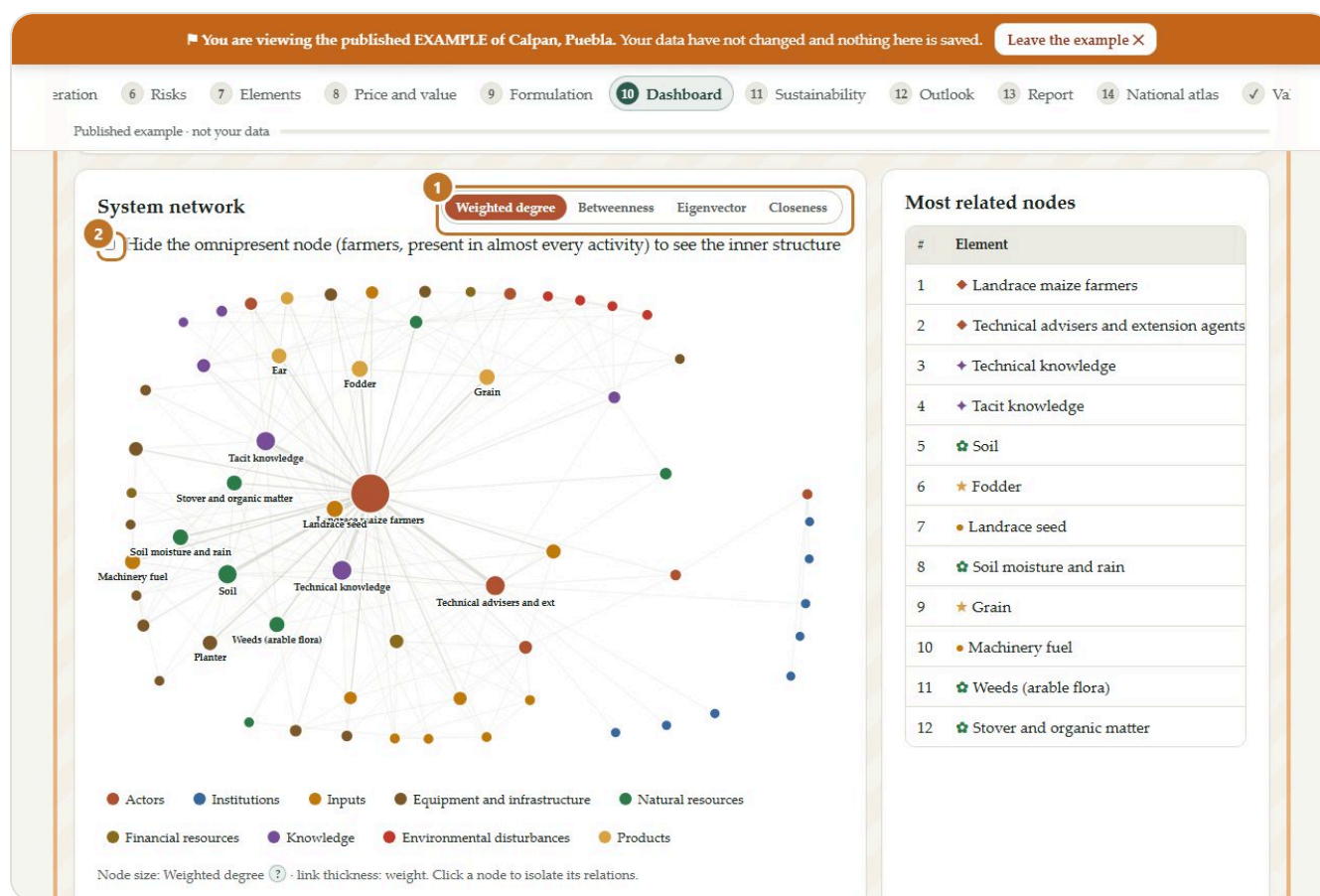


FIGURE 10.2 System network.

- 1 Measure that sets node size.
- 2 Hide farmers to see the inner structure.



IN CALPAN

With farmers, the network has 61 elements and 209 links, and its groups barely show ($Q = 0.04$). Hiding them reveals **seven clear communities** ($Q = 0.45$): technical advice and plant health; inputs and costs; machinery, soil and moisture; farming memory (family, landrace seed, tacit and cultural knowledge, lunar calendar); market; climate; and academia and institutions. Technical advisers, technical and tacit knowledge are the biggest bridges.

10.3 One element's correlations

Choose an element in the list to see which ones appear together with it in the same activities (green bars) and which hardly ever coincide (red bars).

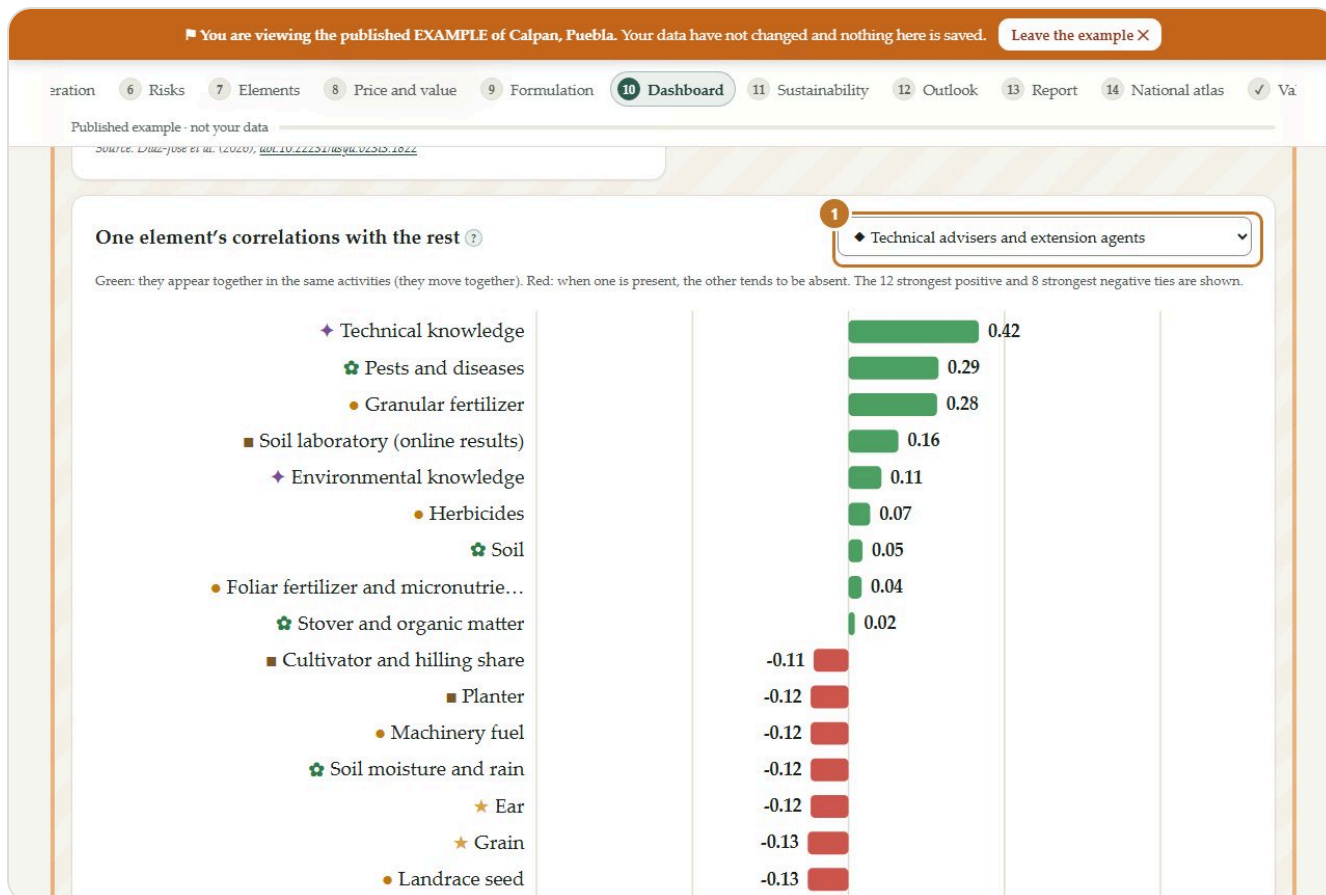


FIGURE 10.3 Technical advisers' correlations. They move with technical knowledge ($\varphi = 0.42$), pests and diseases and granular fertiliser.

1 Element to analyse.

10.4 The cladogram: who is close to whom?

The cladogram groups elements by closeness in the network: each first joins its **nearest neighbour**. Read the tree left to right: short branches are tightly linked elements, best looked after together. Choose to see actors only, actors and institutions, or all elements. Below, the table gives each one's nearest neighbour; ↔ marks mutual neighbours.

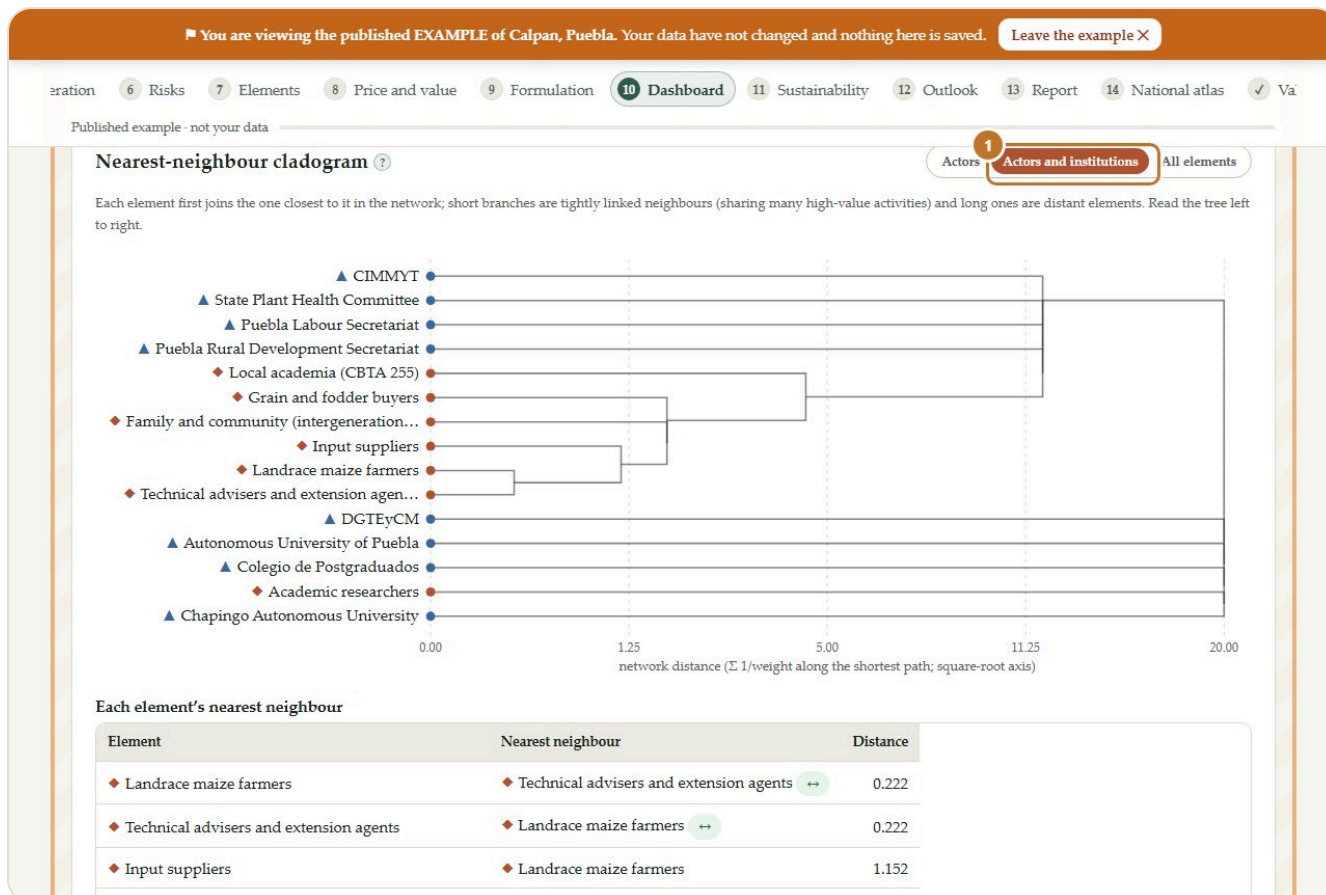


FIGURE 10.4 Calpan actors and institutions cladogram. Farmers and technical advisers are mutual neighbours (0.22).

1 Which elements to group.

! JOINS AT DISTANCE 20

These are elements that take part in no recorded activity: only a structural tie from the paper links them. In Calpan they are the universities and researchers; if they work with your locality, add them to the activities they take part in.

10.5 The circular calendar

The year is a circle; each ring is an activity type and each arc a step with its dates. The needle marks today and the centre announces the next activity. Tap an arc to open its step in Block 4; tap the legend to filter.



FIGURE 10.5 Calpan circular calendar. From land preparation in December to harvest in November.

Soil, water, SDGs and footprint



11

Every activity leaves a mark. Here you see which add, which subtract, Sarandón's index, the 17 SDGs and the carbon footprint.

11.1 Sustainability index and Sarandón

The **sustainability index (IS)** goes from 0 to 1: 0.5 is neutral, above it the activity adds and below it subtracts. **Sarandón's general sustainability index (ISGen)** averages three dimensions on a 0–4 scale: economic (IK), ecological (IE) and socio-cultural (ISC). The system is sustainable if ISGen is above 2 and no dimension falls below 2.

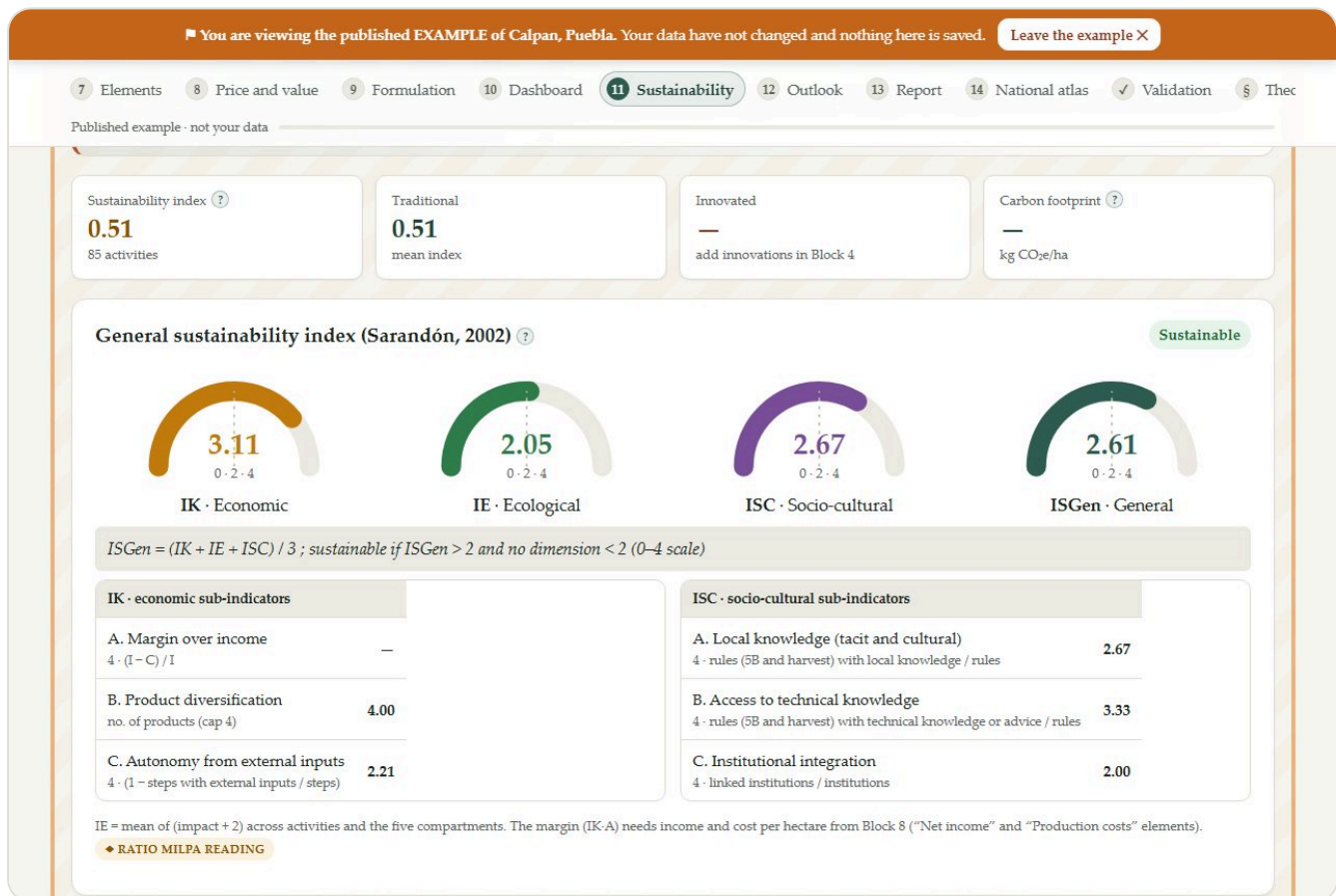


FIGURE 11.1 Calpan general sustainability index. IK 3.11, IE 2.05, ISC 2.67 and ISGen 2.61: sustainable.

11.2 The 17 SDGs

The wheel and cards show how far each Sustainable Development Goal is met with evidence from your system. “No data” is not failure: it means your data says nothing about that goal.

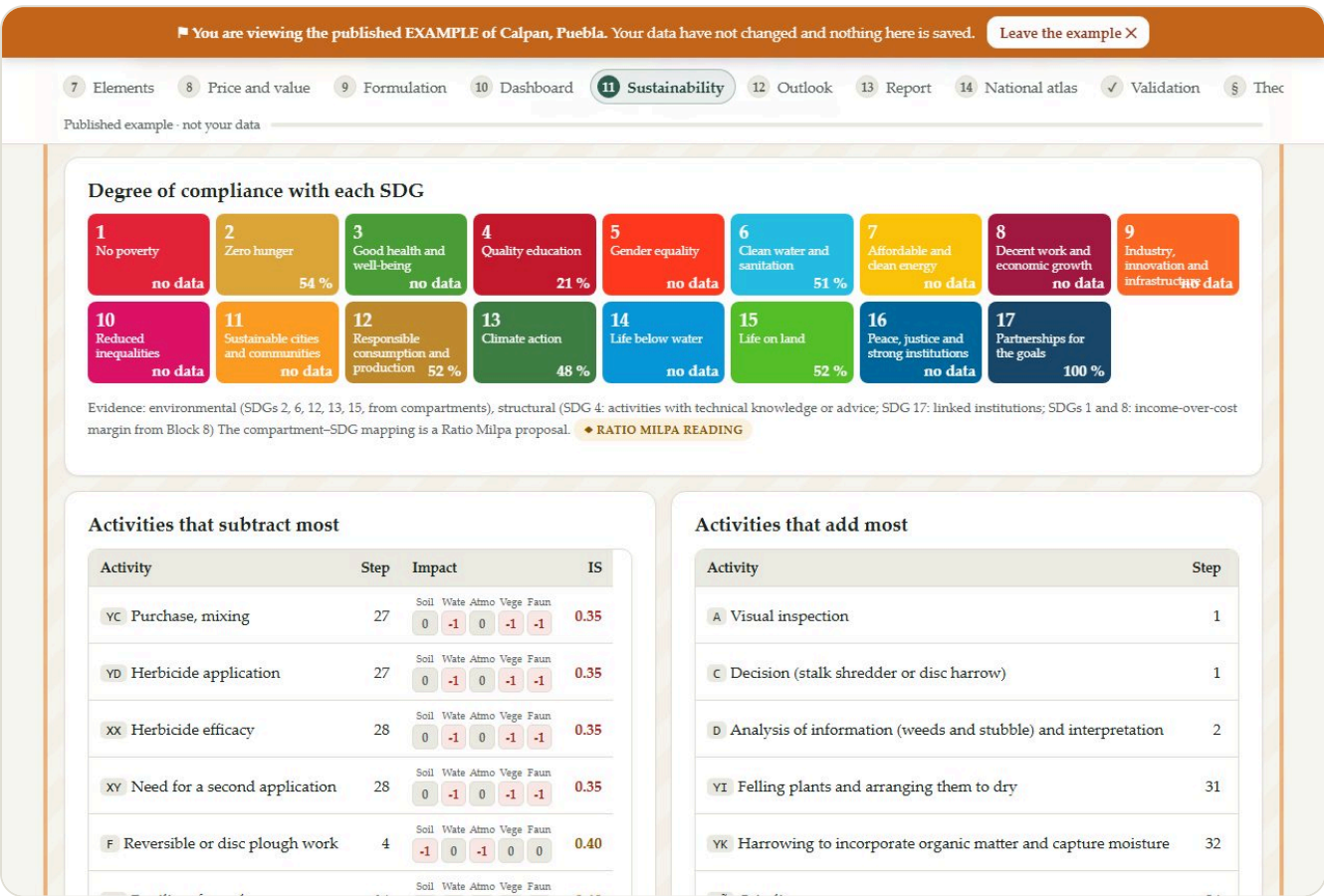


FIGURE 11.2 SDGs in Calpan. Seven of the 17 have evidence; SDG 17 reaches 100 % and SDG 4 21 %.

11.3 Carbon footprint

Enter litres of diesel, kilos of nitrogen and urea per hectare and the yield: the app computes kilos of CO₂ equivalent per hectare and per tonne with IPCC factors. If you leave the fields empty, the footprint shows as “—”.

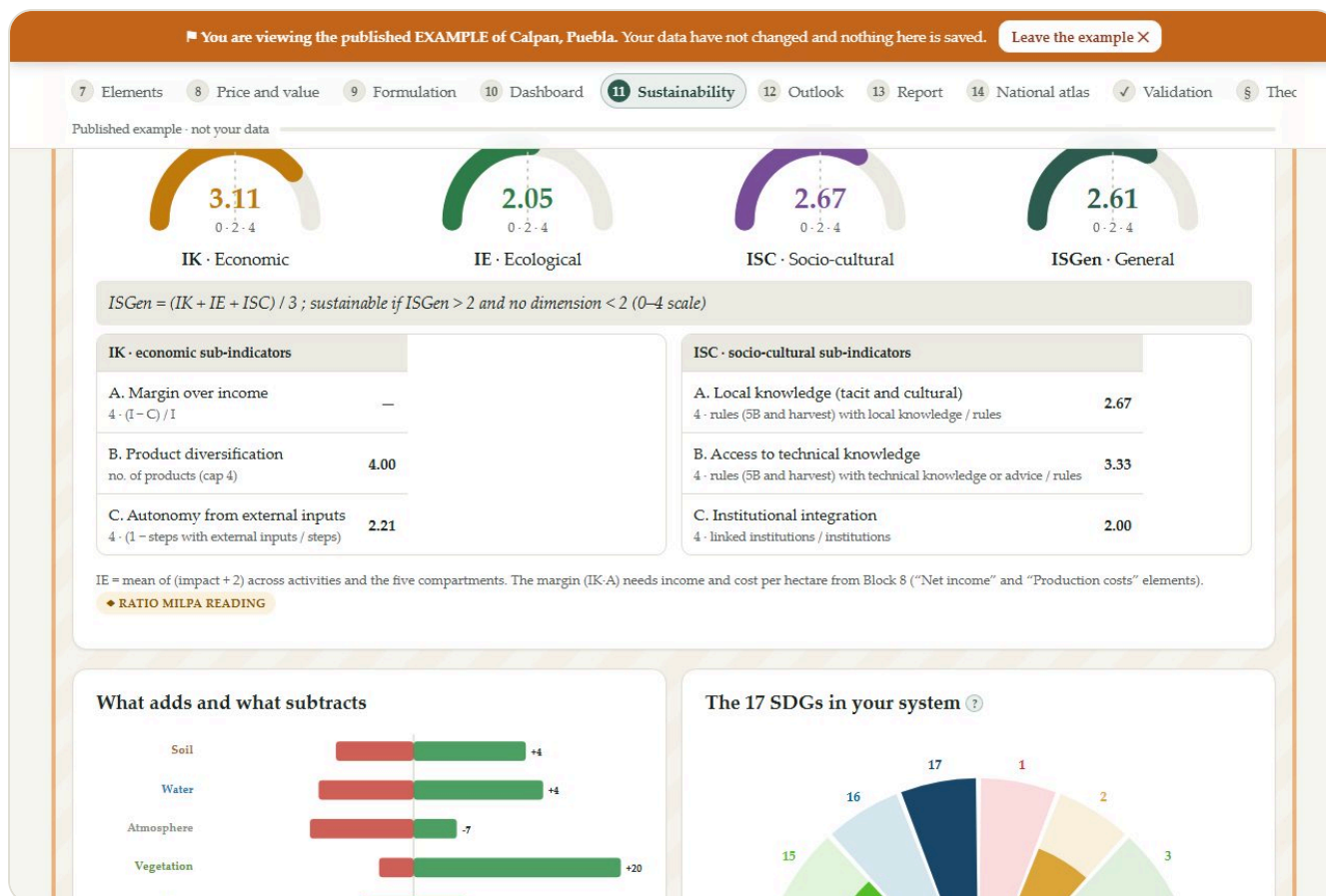


FIGURE 11.3 What adds and what subtracts by compartment, and the activities that subtract and add most.

◆ IN CALPAN

The activities' mean IS is **0.51**, almost neutral. Those subtracting most are linked to herbicide and agrochemical mixing; those adding most, to inspection, tilling to incorporate organic matter and informed decisions. The sources publish no diesel or nitrogen per hectare for Calpan, so the footprint awaits your data.

12

Three futures at 2, 5 and 10 years



They are not forecasts: they are scenarios to discuss with the family, advisers and community what to do today.

12.1 Desirable, trend and undesired

Each scenario combines product price, input cost, warming, frequency of extreme years, available family labour and adoption of your innovated activities. The app plots ten indicators marked at years 2, 5 and 10: yield, price, cost, gross income ÷ cost, net income, labour, adoption, sustainability, regeneration and risk. Below, the **potentials** and **undesired prospects** are written from your results.

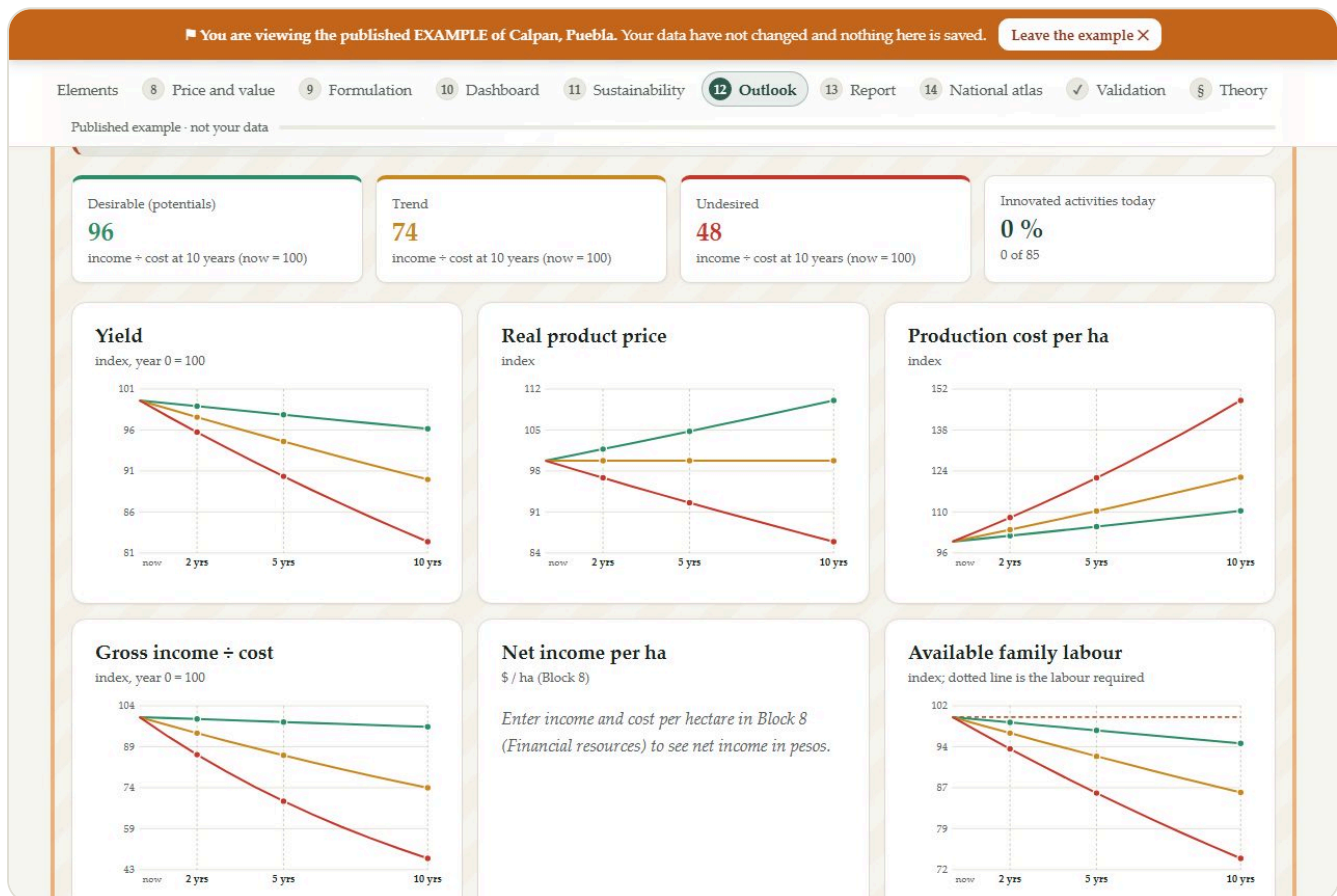


FIGURE 12.1 Block 12. Gross income ÷ cost at 10 years in the three scenarios.

◆ IN CALPAN

With the default assumptions and today = 100, at 10 years the gross income ÷ cost ratio is **96** (desirable), **74** (trend) and **48** (undesired); yield, 96, 90 and 82; available family labour, 95, 86 and 74. Since the case has no innovated activities yet, adoption does not change the results: add them in Block 4 to see their potential.

12.2 The assumptions

The assumptions table is editable. What has a published basis carries its source (warming, IPCC 2018; yield loss per degree, Zhao and colleagues 2017; adoption curve, Rogers 2003); the rest is flagged ◆ as an assumption. Check prices and labour against INEGI's Agricultural Census and ENOE and SIAP prices for your municipality.

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Elements 8 Price and value 9 Formulation 10 Dashboard 11 Sustainability 12 Outlook 13 Report 14 National atlas ✓ Validation § Theory

Published example - not your data

Assumptions per scenario

2 [Reset to defaults](#)

Variable	Desirable (potentials)	Trend	Undesired	Basis
1 Real product price (% per year)	1	0	-1.5	◆ RATIO MILPA READING
Real input and service cost (% per year)	1	2	4	◆ RATIO MILPA READING
Warming (°C per decade)	0.1	0.2	0.3	◆ IPCC (2018)
Probability of an extreme year by year 10 (drought, frost, cyclone)	0.12	0.18	0.25	◆ RATIO MILPA READING
Available family labour (% per year)	-0.5	-1.5	-3	◆ RATIO MILPA READING
Maximum innovation adoption (0-1)	0.9	0.5	0.15	◆ RATIO MILPA READING
Year half of adoption is reached	4	6	9	◆ ROGERS (2003)

Common assumptions

Yield change per +1 °C (%)	Current probability of an extreme year	Yield loss in an extreme year (%)
-7.4	0.1	30
◆ Zhao et al. (2017), Maize	◆ Assumption	◆ Assumption
Extra yield with full innovation adoption (%)	Cost saving with full adoption (%)	Labour saving with full adoption (%)
10	5	15
◆ Assumption	◆ Assumption	◆ Assumption

Labour and prices vary by region: check the assumptions against INEGI's Agricultural Census and ENOE, and SIAP prices for your municipality.

FIGURE 12.2 Assumptions for each scenario.

1 Each row is an assumption; each column, a scenario.

2 [Reset to defaults](#)

Your whole system in one document



13

Written summary, territory, calendar, key elements, cladogram, regeneration, risks, outlook and SDGs, ready to print.

13.1 Print, export and save

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RatioMilpa

EXAMPLE · Landrace maize · Calpan ES EN [Producer](#) [Scientist](#) * ?

Elements 8 Price and value 9 Formulation 10 Dashboard 11 Sustainability 12 Outlook 13 Report 14 National atlas ✓ Validation § Theory

Published example · not your data

BLOCK 13 OF 14

General report and export

Your whole system in one document: written summary, territory, key elements, sustainability and SDGs. Print or save as PDF, download the tables as CSV or save the project to continue later.

Published example · these data are from the Calpan, Puebla case; they are not yours

1 [Print or save PDF](#) [Activities CSV](#) [Cladogram CSV](#) [Nodes CSV](#) [Links CSV](#) [Calendar CSV](#) [SDG CSV](#)

2 [Save project](#) 3 [Open project](#) [Start over](#)

Printing follows the active view: Producer (summary) or Scientist (with full statistics).

RATIO MILPA REPORT · 2026-01-01

Published example: landrace maize, Calpan, Puebla

Díaz-José et al. (2026)

The maize system (Milpa (maize-bean-squash and other species)) of San Andrés Calpan, Calpan, Puebla, was woven from 85 active activities. The resulting network has 61 elements and 209 links (density 0.114, modularity 0.04, 4 communities). The most related elements are Landrace maize farmers, Technical advisers and extension agents, Technical knowledge. Mean activity sustainability index is 0.51 (0.5 = neutral). SDGs with high progress: 17. SDGs with low progress: 4.

FIGURE 13.1 Block 13.

- 1 [Print or save PDF](#): in the print dialog choose “Save as PDF”. Printing follows the active view.
- 2 [Save project](#): a .json file with everything you entered.
- 3 [Open project](#): loads a saved file.

The CSV buttons download the activities, nodes, links, calendar, SDG and cladogram tables for use in a spreadsheet. [Start over](#) erases the project from this browser: save it first.



PRINTING IS ALREADY LOOKED AFTER

When printing, the app always uses the light theme, expands the theory, drops animations and fits tables to the page width, even in night mode.

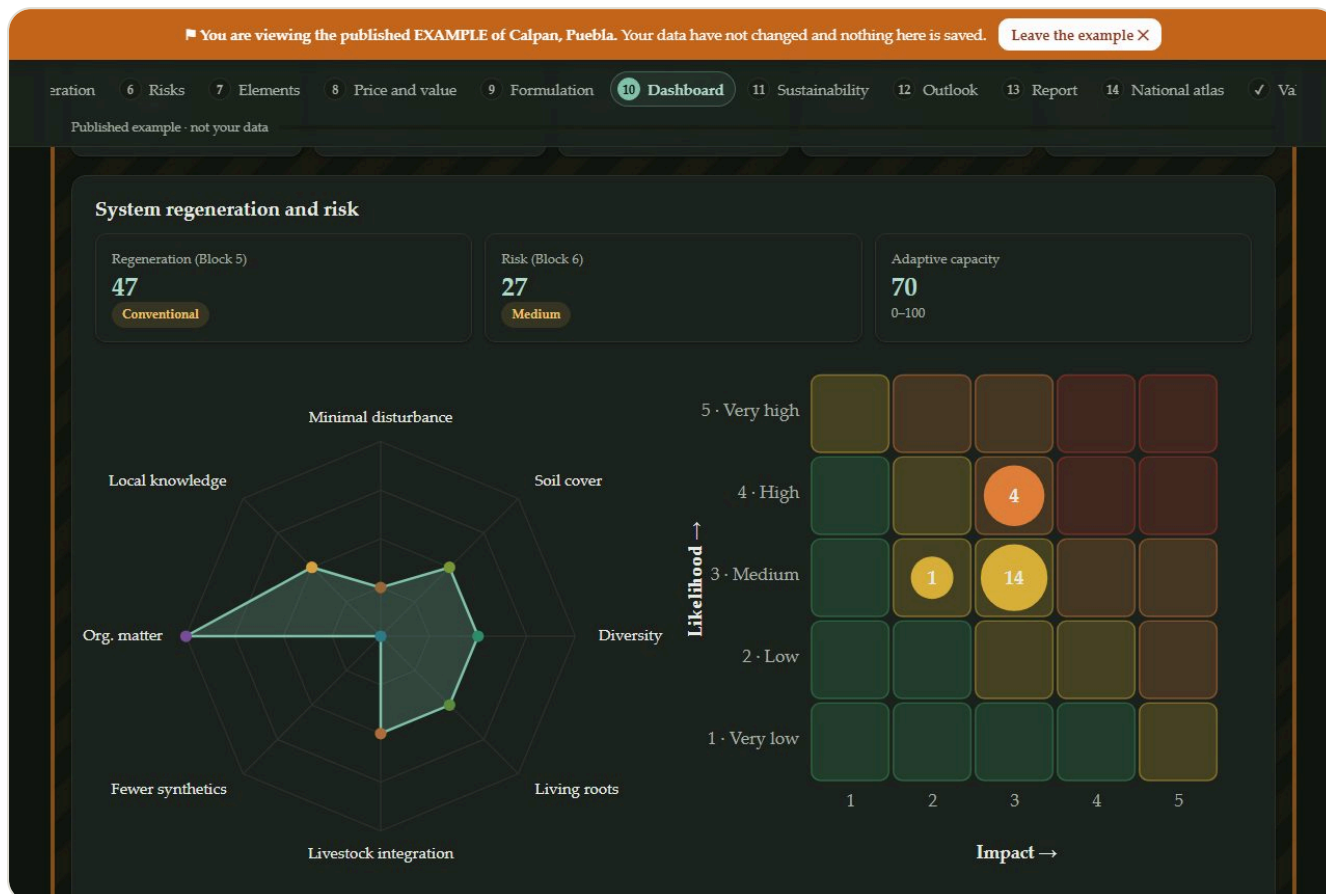


FIGURE 13.2 Night mode. On screen you can work at night; the printed report comes out light.

14

Many localities, one atlas



The atlas combines the files of the documented localities to read local maize knowledge at national scale, without a server.

14.1 How the national study is put together

1. Each **surveyor** fills in one locality, ideally with several farmers, and saves it in Block 13 with **↓ Save project**; the result is a `.milpa.json` file named after the locality.
2. The **coordinator** gathers the files (USB stick, e-mail, shared folder) and in Block 14 taps **+ Add locality files**; many can be chosen at once.
3. With **↓ Export atlas** everything is saved in a single `.atlas.json` file that can be shared or extended; the localities and practices CSVs open in a spreadsheet.



WHAT ABOUT PRIVACY?

No data goes to a server: the atlas lives in the coordinator's browser and in the files you choose to share. Ask farmers' permission before writing their names; the atlas only needs the locality and its answers.

14.2 What the atlas shows

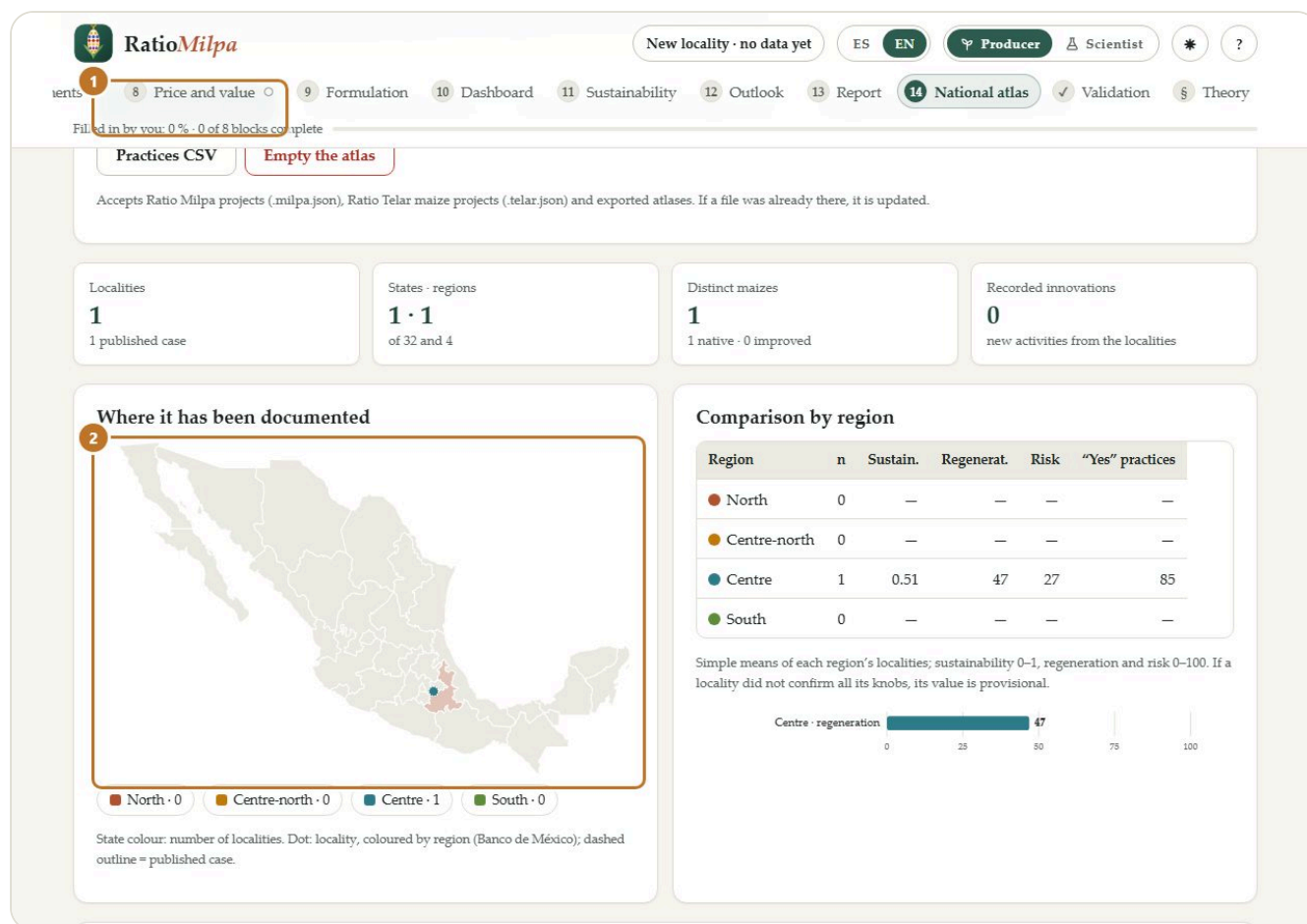


FIGURE 14.1 National atlas. Localities on the map and comparison by region.

- 1 Buttons to add files, add your project and export.
 - 2 Map: the state colour shows how many localities there are; each dot is a locality.
- **Comparison by region** (North, North-central, Central and South): number of localities and means of sustainability, regeneration, risk and practices answered “yes”.
 - **Baseline questionnaire practices**: for each activity, the share of localities that practise it, nationally and by region. Sort them by step, most practised or least practised.
 - **Maizes sown** (races and improved), localities’ **innovations** and the **national network** of maize knowledge.

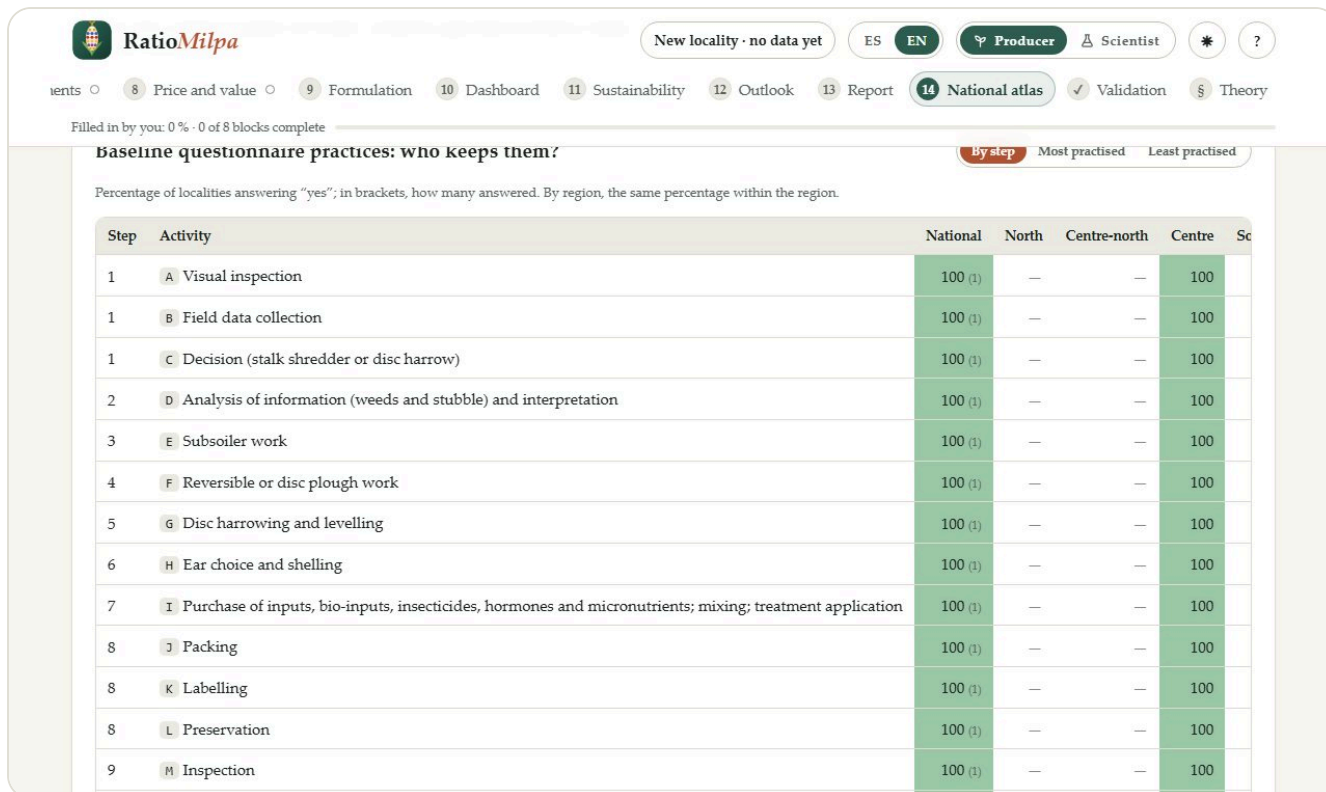


FIGURE 14.2 Who keeps each practice? Share of localities answering "yes", nationally and by region.



READING RULE

A percentage only counts localities that **answered** that activity: unanswered items are left out, not taken as "no". That is why each percentage shows, in brackets, how many localities answered. With fewer than five, read it as a hint, not a trend.



TO TRY IT OUT

The **Include the published Calpan case** button adds the paper's case, flagged as "published case", to see what the atlas looks like before you have your own data. The same button removes it.

Documenting a locality for the national study

D

The full route to document a locality's maize so that its file can join the national atlas.

D.1 Ten steps

1. **Bring people together.** Experienced farmers, whoever will inherit the plot, the technical adviser. Calpan's Stack was built with 100 informants over three cycles.
2. **Block 1.** State whether the maize is native (and its race) or improved, the system and the area.
3. **Block 2.** Locate the locality.
4. **Block 3.** Check with people whether the 5B are met and record the requirements the locality has innovated.
5. **Block 4.** Answer "yes" or "no" to each baseline activity, set the main dates and add the locality's own activities.
6. **Blocks 5 and 6.** Adjust the regeneration and risk knobs to what the locality lives; save the baseline.
7. **Block 7.** Check all elements are there; add the missing ones and choose them in their activities.
8. **Block 8.** Enter prices, costs and income per hectare and rate value.
9. **Block 9.** Weave the system and read it in blocks 10–12 with the people who live it.
10. **Block 13.** Print the report and save the project: the `.milpa.json` file is the one sent to the atlas coordinator (Block 14).



YOUR RECORD IS KNOWLEDGE

A well-documented project from a locality is the first step to publishing its Stack, as was done in Calpan. Keep the sources of every figure.

D.2 Interview guide, block by block

Open questions for a conversation with farmers. The order is not important; what matters is that every answer is written down with who said it and when.

- 1 What do you grow or raise? Which variety or breed, and where do the seed or breeding stock come from? Sole crop or intercropped? How many hectares, hives or head?
- 2 In which locality and municipality is the plot? Irrigated or rainfed?
- 3 What does this crop need to do well? What must never be done? What have you changed in recent years and why?
- 4 What are the cycle's steps, first to last? What is done in each, with which tools and by whom? In which months?
- 5 How many times is the soil worked? Is it covered all year? Is stubble left? Manure or compost? Animals on the plot? Has the soil been tested?
- 6 What was the worst thing that happened in the last ten years? How often does it happen? How much was lost? What do you do to prevent it?
- 7 Who else takes part: family, day labourers, advisers, buyers, programmes, institutions?
- 8 How much does a hectare cost to produce and what are you paid? What is this element worth to you, beyond money?
- 12 Who will be farming in ten years? What would you like to change and what not?

**CONSENT**

Explain what the data will be used for and ask permission before writing down names. In the report the locality and the number of informants are enough.

D.3 Field sheet 1: steps and activities

Print this page and fill it in by hand on the plot; then transfer it to Block 4.

Crop or species: _____ Locality: _____ Date: _____

#	STEP	ACTIVITY	WHO · WITH WHAT	MONTH	T / I
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					

T = traditional, I = innovated.

D.4 Field sheet 2: regeneration

Mark a number from 0 to 4 on each row with the people and write why; then transfer it to the Block 5 knobs.

INDICATOR	0	1	2	3	4	WHY?
Minimal tillage	☐	☐	☐	☐	☐	
Soil cover	☐	☐	☐	☐	☐	
Diversity	☐	☐	☐	☐	☐	
Living roots	☐	☐	☐	☐	☐	
Livestock integration	☐	☐	☐	☐	☐	
Fewer synthetic inputs	☐	☐	☐	☐	☐	
Organic matter	☐	☐	☐	☐	☐	
Local knowledge	☐	☐	☐	☐	☐	

Sum: _____ ÷ 32 = IR _____ Organic matter from soil test: _____ % Year: _____

D.5 Field sheet 3: risks

For each hazard: likelihood (1 rarely ... 5 almost every year), impact (1 almost nothing ... 5 everything lost) and control (0 none ... 3 well controlled). Cross out those that do not apply.

HAZARD	LIK.	IMPACT	CONTROL	WHAT WE DO
Drought or late rains				
Frost				
Hail				
Heavy rain or flooding				
Heatwave				
Cyclones and hurricanes				
Pests				
Diseases				
Resistant or invasive weeds				
Fall in sale price				
Rise in input and service costs				
Middlemen or no buyer				
Labour shortage and no succession				
Loss of local knowledge				
Insecurity or theft				
Withdrawal of programmes and support				
Land tenure conflicts				
Erosion and fertility loss				
Water scarcity				

D.6 Field sheet 4: costs, price and value

Per hectare (or per hive, or per head) and per cycle. Then transfer it to Block 8.

ITEM	QUANTITY	UNIT PRICE	\$
Seed or breeding stock			
Fertilisers and manure			
Pesticides and herbicides			
Machinery and diesel (litres)			
Labour days (family and paid)			
Water, rent, freight, other			
Total cost			
Production sold			
Own use and by-products (stubble, husks...)			
Total income			

Value of the main elements, from 0 to 5:

ELEMENT	ECONOMIC	USE	CULTURAL	ECOLOGICAL

E

Troubleshooting

If something does not look as you expect, look here.

I SEE THIS	DO THIS
The Dashboard says “You have not woven the system yet”.	Go to Block 9 and tap Weave the system .
My new crop has no network.	Add steps and activities in Block 4 and choose their elements; no activities, no links.
An element I added is not in the network.	Choose it in at least one activity.
Net income says “no data”.	Enter income and cost per hectare in Block 8 > Financial resources .
The carbon footprint says “—”.	Enter diesel, nitrogen, urea and yield in Block 11.
Innovation adoption stays at 0 %.	Add innovative activities in Block 4.
I changed computer and my data is gone.	Data lives in each browser: use Report > Save project and Open project .
I do not see a new version’s changes.	Reload with Ctrl + F5 .

F

Glossary

The app's words, in plain language.

5B <i>5B</i>	The five basic rules of local maize knowledge in Calpan: good soil, good seed, good sowing, good nutrition and good watchfulness.
Activity <i>Actividad</i>	What is done within a management step (for example, “reversible plough work”). Each activity links the elements taking part in it.
Innovative activity <i>Actividad innovadora</i>	A new practice the locality added to traditional management; in the app it is added with “+ Innovative activity”.
Adaptive capacity <i>Capacidad adaptativa</i>	How well the system can absorb a shock and reorganise. Ratio Milpa measures it with regeneration, diversification, technical knowledge and institutions.
Cladogram <i>Cladograma</i>	Tree that groups elements by how close they are in the network: short branches are tightly linked neighbours.
Community <i>Comunidad</i>	Group of elements more related to each other than to the rest of the network.
φ correlation <i>Correlación φ</i>	How much two elements appear together in the same activities, from -1 (never together) to 1 (always together).
Element <i>Elemento</i>	Everything taking part in the system: actors, institutions, inputs, equipment, natural and financial resources, knowledge, policies, disturbances and products.
Scenario <i>Escenario</i>	A possible future built on explicit assumptions. It is not a forecast.
Carbon footprint <i>Huella de carbono</i>	Greenhouse gases emitted per hectare (diesel, nitrogen and urea), in kg of CO ₂ equivalent.
Regeneration index <i>Índice de regeneración</i>	Average of the eight regeneration knobs, from 0 to 100. Tells whether the system gives back more than it takes.

Risk index <i>Índice de riesgo</i>	Average risk of all applicable hazards, from 0 to 100.
Sustainability index (IS) <i>Índice de sostenibilidad (IS)</i>	How much each activity adds to or subtracts from soil, water, atmosphere, vegetation and fauna, from 0 to 1 (0.5 is neutral).
Betweenness <i>Intermediación</i>	How many short network paths pass through an element: it measures who acts as a bridge.
ISGen <i>ISGen</i>	Sarandón's general sustainability index: average of the economic, ecological and socio-cultural dimensions, from 0 to 4.
Baseline <i>Línea base</i>	A snapshot of the system on a date, to compare later and see whether it improves.
Ratio Milpa reading <i>Lectura de Ratio Milpa</i>	A value or grouping proposed by the app, not published in the source. It is always flagged and can be changed.
Risk matrix <i>Matriz de riesgos</i>	A 5 × 5 table crossing how likely a risk is with how much damage it would do.
MIAF <i>MIAF</i>	Maize intercropped with fruit trees.
Modularity (Q) <i>Modularidad (Q)</i>	How marked the network's groups (communities) are. Above 0.3, groups are clear.
SDG <i>ODS</i>	Sustainable Development Goals of the United Nations 2030 Agenda.
Management step <i>Paso de manejo</i>	A stage of the production cycle (for example, "seed selection"). Thirty-eight were documented in Calpan.
Knob <i>Perilla</i>	A slider you move like a volume control, from a low value to a high one.
Foresight <i>Prospectiva</i>	Discipline that explores possible futures to decide better today.
Weighted network <i>Red ponderada</i>	Network in which each link has a thickness: thicker if the elements share many valuable activities.

Regeneration <i>Regeneración</i>	The system improving, each cycle, the soil, water and biodiversity it depends on.
Complex adaptive system <i>Sistema complejo adaptativo</i>	A set of interacting agents and resources that learn and adapt; behaviours nobody designed emerge from their relationships.
Sustainability <i>Sostenibilidad</i>	Producing today without compromising the capacity to produce tomorrow, environmentally, economically and socially.
Local knowledge stack <i>Stack de conocimiento local</i>	Layered organisation of a locality's knowledge of a crop: rules, steps and activities (Díaz-José et al., 2026).
Value <i>Valor</i>	An element's importance to the system in four dimensions: economic, use, cultural and ecological. Not the same as price.

REFERENCE

G

Ratio Milpa on one page

Cut it out and take it to the field.

1

MaizeState whether your maize is native (and its race) or improved, and its system.

2

RegionLocate your plot down to the INEGI locality.

3

RequirementsReview the 5B and add what your locality has innovated.

4

ManagementTick what you practise, add innovations and set dates.

5

RegenerationAdjust the eight knobs and save a baseline.

6

RisksMove likelihood, impact and control for each risk.

7

ElementsReview actors, inputs and resources; add the missing ones.

8

Price and valueEnter prices per hectare and rate value from 0 to 5.

9

Formulation☼ Formulate: the app weaves the system network.

10

DashboardRead who holds the system together and who is close to whom.

11

SustainabilitySee what adds, what subtracts and Sarandón's index.

12

OutlookCompare the three futures and adjust the assumptions.

13

ReportPrint, export and save your locality's file.

14

AtlasCombine locality files and read the country.



Scan to open Ratio Milpa:
hectortecumshe-ai.github.io/RatioMilpa



How to cite, sources and credits

How to cite

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Legal page

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