

# EPA Paper Template and Author Guideline

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## 1 Abstract

2 The abstract is a single, unstructured paragraph  
3 (150–250 words) that can be read on its own. It  
4 should briefly state the problem and why it mat-  
5 ters (context and motivation), summarize what  
6 you did (approach, method, system, or study de-  
7 sign), and indicate the evaluation setting (e.g.,  
8 data source, crop/region/season, sensors, ex-  
9 perimental setup, or benchmark). Include the  
10 most important outcomes—preferably with con-  
11 crete quantitative results (e.g., accuracy, yield  
12 gain, cost reduction, runtime, or other relevant  
13 metrics)—so readers can understand the value  
14 of the work without reading the full paper. End  
15 by clearly stating the main contribution and  
16 the implications for research and/or practice.  
17 Avoid citations, equations, lengthy background,  
18 detailed implementation steps, and unexplained  
19 acronyms.

20 **Keywords:** Keyword 1, Keyword 2, Keyword 3,  
21 Keyword 4, Keyword 5

## 22 1 Introduction

23 The introduction should convince readers that  
24 the problem is important, that a clear gap ex-  
25 ists in current knowledge or practice, and that  
26 your paper offers a credible, valuable contribu-  
27 tion. Write for an informed but broad audience  
28 across the full spectrum of agriculture and food  
29 systems. A strong introduction is typically 3–6  
30 paragraphs and moves from broad motivation  
31 to a specific research objective, then to contri-  
32 butions and a roadmap.

33 Begin with the context and stakes. In a few sen-  
34 tences, describe the real-world setting and why  
35 it matters. Good openings anchor the work in  
36 a concrete challenge and its consequences: im-  
37 proving yield stability in rainfed crops, detect-  
38 ing disease in orchards before it spreads, acceler-

39 ating phenotyping for breeding programs, reduc-  
40 ing fertilizer losses to protect water quality, opti-  
41 mizing irrigation under scarcity, improving feed  
42 conversion in aquaculture, lowering greenhouse  
43 gas emissions, preventing post-harvest spoilage,  
44 or enabling credible traceability from farm to  
45 fork. State who is affected (growers, breeders,  
46 agronomists, aquaculture managers, processors,  
47 regulators, consumers) and what decisions or  
48 outcomes are at risk. Avoid overly generic state-  
49 ments (e.g., “agriculture is important”); instead,  
50 tie the motivation to a specific decision point  
51 and measurable impact.

52 Next, define the problem precisely. State the  
53 task you address and the conditions under  
54 which it must work. For example, your task  
55 might be yield prediction for a specific crop and  
56 region, genotype-to-phenotype prediction under  
57 multi-environment trials, segmentation of plant  
58 organs for phenotyping, early warning of dis-  
59 ease from leaf imagery, weed detection for site-  
60 specific spraying, biomass estimation from UAV  
61 imagery, drought stress mapping from satellite  
62 time series, water quality monitoring for aqua-  
63 culture ponds, or batch-level traceability infer-  
64 ence in a supply chain. Clarify the inputs and  
65 outputs, temporal requirements (real-time vs.  
66 seasonal), operational constraints (cost, connec-  
67 tivity, compute), and what success looks like  
68 (accuracy, timeliness, robustness, interpretabil-  
69 ity, or decision utility). Briefly explain what  
70 makes the problem hard: spatial and seasonal  
71 variability, confounding weather and manage-  
72 ment effects, noisy sensors, limited labels, do-  
73 main shift between farms or species, class im-  
74 balance in rare events (e.g., disease outbreaks),  
75 or the need for trusted decisions in high-stakes  
76 contexts.

77 Then establish the gap in prior work. Cite rele-

1 vant studies to show what exists and what is  
2 missing—the goal is not a full survey, but a  
3 clear justification for why your work is needed<sup>1</sup>.  
4 State limitations precisely and connect each one  
5 to the real agricultural decision or operational  
6 setting it affects. To make the gap easy to  
7 see, present concrete context for example: (i)  
8 crop models trained on a single season or region  
9 that fail under new weather regimes; (ii) breed-  
10 ing/genetics methods that assume dense pheno-  
11 types or high-quality labels that are unrealistic  
12 in multi-environment trials or smallholder con-  
13 texts, and that do not generalize across popula-  
14 tions; (iii) remote-sensing pipelines that report  
15 accuracy but omit uncertainty, making recom-  
16 mendations risky under different environmen-  
17 tal conditions; (iv) phenotyping systems val-  
18 idated in controlled environments that break  
19 in the field due to occlusion, lighting changes,  
20 canopy complexity, or sensor noise; (v) aqua-  
21 culture monitoring models that degrade with  
22 turbidity, biofouling, changing illumination, or  
23 sensor drift; (vi) sustainability assessments that  
24 are difficult to audit or reproduce because data  
25 and assumptions are opaque; and (vii) traceabil-  
26 ity methods that struggle with missing, inconsis-  
27 tent, or noisy records across supply-chain actors.  
28 When possible, translate the gap into its practical  
29 consequence—for example why stakeholders  
30 still rely on manual scouting, expensive assays,  
31 conservative management, or delayed interven-  
32 tions despite recent progress.

33 After the gap, state your approach and objec-  
34 tive. In one short paragraph, summarize your  
35 central idea at a high level—what you do and  
36 how it addresses the gap—without implemen-  
37 tation details. Include a clear research ques-  
38 tion, hypothesis, or objective statement so re-  
39 viewers can evaluate whether the rest of the pa-  
40 per delivers on it. If you introduce a system,  
41 explain its intended users and decisions it sup-  
42 ports (e.g., variable-rate nitrogen recommenda-  
43 tions, genotype selection, pond aeration schedul-  
44 ing, quality grading, sustainability reporting,  
45 or supply-chain verification). If you propose a  
46 method, state what it improves (e.g., general-  
47 ization across regions, interpretability for agro-  
48 nomic decision-making, uncertainty-aware pre-

49 dictions, robustness to sensor noise, or scalable  
50 deployment).

51 Conclude the introduction with contributions  
52 and a brief preview of evidence. Provide a con-  
53 cise list of main contributions. Each contri-  
54 bution should be specific and verifiable, such  
55 as: a new dataset or benchmark spanning  
56 multiple crops, varieties, or environments; a  
57 method for fusing genomics with phenomics  
58 and weather; a remote-sensing model validated  
59 across satellites/seasons; a field-ready phenotyp-  
60 ing pipeline; an aquaculture monitoring study  
61 with operational outcomes; an interpretable sus-  
62 tainability model linking management to emis-  
63 sions or nutrient losses; or a traceability ap-  
64 proach that detects anomalies and quantifies  
65 confidence. Where appropriate, summarize a  
66 headline result (with a number) to communicate  
67 significance (e.g., fewer false alarms, lower input  
68 use, faster phenotyping throughput), but avoid  
69 over-claiming and keep the wording aligned  
70 with the evidence presented later.

71 Optionally, include a paper roadmap (1–2 sen-  
72 tences) describing how the remainder is or-  
73 ganized. Throughout the introduction, keep  
74 the narrative focused, avoid long lists of cita-  
75 tions, and ensure that every claim is either sup-  
76 ported by a citation, justified by logic, or clearly  
77 marked as your contribution. Prefer plain lan-  
78 guage over jargon, expand acronyms at first use,  
79 and maintain consistency between the stated  
80 problem, the method, and the evaluation that  
81 follows.

## 82 **2 Materials and Methods**

83 The Materials and Methods section should ex-  
84 plain, in sufficient detail, how the study was  
85 conducted so that an informed reader can re-  
86 produce the work or implement a comparable  
87 approach. This section must describe not only  
88 the analytical or computational method, but  
89 also the biological system, production context,  
90 and measurement protocols that generate the  
91 evidence. Write in past tense for what you  
92 did, define key terms and variables, and report  
93 the specific settings that affect outcomes (e.g.,  
94 species/variety or breed/strain, production en-  
95 vironment, time period, and management condi-

1 tions). Avoid reporting results or interpretation  
2 here; reserve those for the Results and Discus-  
3 sion sections.

4 Start by stating the study context and ob-  
5 jective. Specify the agricultural domain and  
6 unit of analysis (for example, individual plants,  
7 plots, herds, ponds, genotypes, harvested lots,  
8 or supply-chain batches) and define the primary  
9 outcome(s) you model or measure (such as yield,  
10 quality, disease incidence, growth and survival,  
11 a genetic trait, environmental impact, or trace-  
12 ability accuracy). Clearly describe the system  
13 boundary relevant to your claim (e.g., on-farm  
14 management decisions, breeding program selec-  
15 tion, post-harvest handling, sustainability as-  
16 sessment, or end-to-end provenance).

17 Next, describe the data and materials. Iden-  
18 tify all data sources, how they were obtained,  
19 and the sampling or collection protocol. Report  
20 where and when the study took place (location,  
21 season/year, facility type, or production sys-  
22 tem), what biological materials were involved,  
23 and how measurements were taken (field obser-  
24 vations, lab assays, operational records, or ex-  
25 pert annotations). Provide sample sizes and  
26 any inclusion or exclusion criteria. If you use  
27 external datasets, name the dataset and ver-  
28 sion/date accessed; if data are restricted, ex-  
29 plain constraints and provide enough metadata  
30 for others to replicate with comparable data.

31 Then explain preparation steps that transform  
32 raw observations into analysis-ready inputs. De-  
33 scribe cleaning and quality-control rules, how  
34 missing values and outliers were handled, and  
35 how variables were standardized or normalized.  
36 Define how labels or ground truth were created,  
37 including any aggregation across time or space.  
38 If relevant, explain how you accounted for ma-  
39 jor sources of variability or confounding that are  
40 common (for example, differences across envi-  
41 ronments, management practices, genetics, or  
42 production cycles) and how those factors were  
43 measured or controlled.

44 After that, present the method in reproducible  
45 terms. Describe the model, algorithm, protocol,  
46 or system you used, including inputs, outputs,  
47 assumptions, and key parameters. Include base-

48 lines or reference methods used for comparison  
49 and justify why they are appropriate for your  
50 agricultural context. Provide implementation  
51 details that affect reproducibility (software, ver-  
52 sions, and any critical settings). If the approach  
53 is complex, a brief workflow description can help  
54 readers understand the pipeline from data col-  
55 lection to final outputs, but keep it focused on  
56 what is necessary to replicate.

57 Finally, describe the evaluation protocol. For  
58 example, any grouping used to prevent informa-  
59 tion leakage for an AI model (e.g., separation  
60 by farm, year, genotype, facility, or batch) and  
61 the performance metrics, including their defini-  
62 tions.

63 As a practical check, a reader should be able  
64 to answer the following from this section alone:  
65 what system was studied, what was measured  
66 and how, what method was applied, how the  
67 evaluation was performed, and what steps  
68 would be required to reproduce the work under  
69 comparable conditions.

## 70 **2.1 Figures**

71 Use figures to clarify the study design, workflow,  
72 and key methodological components (e.g., ex-  
73 perimental layout, pipeline overview, system ar-  
74 chitecture, or measurement setup). Each figure  
75 should be referenced in the text and include a  
76 caption that is understandable on its own, stat-  
77 ing what is shown, what the reader should learn  
78 from it, and any essential context (units, scales,  
79 abbreviations). Ensure axes, legends, and labels  
80 are readable at the final publication size. Avoid  
81 decorative graphics; include figures only when  
82 they improve understanding or reproducibility.

83 Figures 1, 2, and 3 illustrate a single-column fig-  
84 ure, a full-width two-column figure, and a 2×2  
85 multi-panel layout, respectively.

## 86 **2.2 Tables**

87 Use tables for precise, compact reporting of ma-  
88 terials and methods details that readers may  
89 need to reproduce the work, such as dataset  
90 summaries, treatment descriptions, variable def-  
91 initions, model settings, or evaluation configu-  
92 rations. Give each table a clear title/caption  
93 and define all abbreviations, units, and symbols.



**Figure 1:** Single-column example. Use a clear, self-contained caption that explains what the figure shows and why it matters.

1 Use consistent formatting and align numbers by  
 2 decimal where appropriate. Each table should  
 3 be cited in the text and should not duplicate  
 4 information already conveyed clearly elsewhere.  
 5 If you are not comfortable writing  $\LaTeX$  tables  
 6 by hand, consider using an online  $\LaTeX$  table  
 7 generator: these tools let you design the table vi-  
 8 sually and then export the corresponding  $\LaTeX$   
 code.

**Table 1:** Sample  $3 \times 4$  table. Replace placeholders with your data and include units where applicable.

Item	Col 1	Col 2	Col 3
Row 1	Value 1	Value 2	Value 3
Row 2	Value 4	Value 5	Value 6
Row 3	Value 7	Value 8	Value 9

9  
 10 Table 1 shows a simple example of how to  
 11 present compact, structured information with  
 12 clear headers; ensure that all quantities are re-  
 13 ported with appropriate units and consistent  
 14 formatting.

### 15 2.3 Equations

16 Use equations when they provide an unambigu-  
 17 ous definition of a model, objective function, sta-  
 18 tistical estimator, or mechanistic relationship.  
 19 Define every symbol at first use in the surround-  
 20 ing text, specify domains/units where relevant,  
 21 and keep notation consistent throughout the pa-  
 22 per. Number only the equations that are ref-  
 23 erenced later. If equations depend on assump-  
 24 tions (e.g., independence, steady state, linear-  
 25 ity), state those assumptions explicitly in the  
 26 text. Avoid introducing complex notation if a  
 27 short verbal definition would be clearer for the  
 28 target audience.

29 Use equations when they provide an unambigu-  
 30 ous definition of a model, objective function, sta-  
 31 tistical estimator, or mechanistic relationship.  
 32 Define every symbol at first use in the surround-  
 33 ing text, specify domains/units where relevant,  
 34 and keep notation consistent throughout the pa-  
 35 per. Number only the equations that are ref-  
 36 erenced later. If equations depend on assump-  
 37 tions (e.g., independence, steady state, linear-  
 38 ity), state those assumptions explicitly in the  
 39 text. Avoid introducing complex notation if a  
 40 short verbal definition would be clearer for the  
 41 target audience.

42 A simple relationship can be written inline when  
 43 it does not need to be referenced later (e.g.,  
 44  $y = \beta_0 + \beta_1 x$ ). If you want the same content  
 45 displayed on its own line for readability but still  
 46 do not need to reference it, use an unnumbered  
 47 display equation as below:

$$y = \beta_0 + \beta_1 x$$

48 In contrast, numbered display equations should  
 49 be used when you will refer back to them. Equa-  
 50 tions (1), (2) and (3) are examples of numbered  
 51 equations.

$$\hat{y}_i = f(\mathbf{x}_i; \theta) \tag{1}$$

52

$$\mathcal{L}(\theta) = \frac{1}{N} \sum_{i=1}^N (\hat{y}_i - y_i)^2 \tag{2}$$

$$\theta^* = \arg \min_{\theta} \mathcal{L}(\theta) \tag{3}$$

53

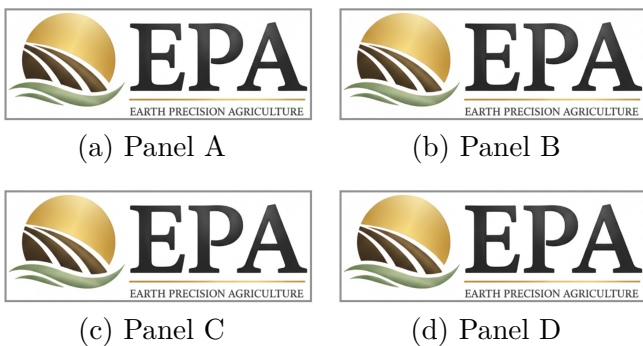
$$z = \begin{cases} 1, & \text{if } \hat{y} \geq \tau, \\ 0, & \text{otherwise,} \end{cases} \tag{4}$$

### 54 2.4 References and citations

55 This journal uses a numeric citation style in  
 56 which references are numbered in the order they  
 57 first appear in the text and cited using Arabic  
 58 numerals in square brackets (e.g., [1], [2], [3]).  
 59 The reference list should be ordered by citation  
 60 sequence rather than alphabetically. All refer-  
 61 ences cited in the text must appear in the refer-  
 62 ence list, and all listed references must be cited.  
 63 DOIs should be included where available.



**Figure 2:** Two-column example. A full-width figure for complex workflows, system diagrams, or multi-panel summaries that require additional horizontal space.



**Figure 3:** 2×2 grid example. The caption should explain what varies across panels and define any shared notation or conditions.

### 3 Results

The Results section reports what you found, not what it means. Present outcomes in a clear, structured order that matches your research questions and Methods, using text to highlight the key patterns and figures/tables to provide the evidence. Start with a short paragraph that reminds the reader what was evaluated (without repeating the Methods) and then report results from primary to secondary analyses.

Focus first on the primary outcomes and comparisons. Report the main endpoint(s) with appropriate units. Use consistent baselines and avoid selective reporting: include the comparisons needed for fair assessment and clearly state sample sizes for each result.

Organize results to reflect agricultural variability and real-world conditions. When relevant, report performance or responses across different contexts such as species or varieties, management regimes, environments (field, greenhouse, controlled facilities), seasons/years, production stages (growth, harvest, post-harvest), or supply-chain segments. For example, you may show how outcomes differ across Species 1–3, across treatment levels, across genotypes, across farms or facilities, or across batches/lots. If your study spans different agricultural domains (e.g., crops, breeding, livestock, aquaculture, post-harvest quality, sustainability assessment, or traceability), keep a consistent reporting structure so readers can compare results across settings.

Include robustness and quality checks that support the credibility of the findings. Report sensitivity analyses, ablations, or stress tests as results (without interpretation), and disclose failure modes or conditions where performance degrades. If the work is decision-support oriented, present results in a way that reflects decision needs (e.g., ranked recommendations, threshold-based alerts, or cost-sensitive outcomes) while still reporting standard scientific metrics.

Write with precision and restraint: refer to each figure/table explicitly, avoid repeating every number already shown in tables, and do not introduce new methods in Results. Save

1 explanations, implications, and broader claims  
2 for the Discussion; in Results, your goal is to  
3 provide a transparent, complete account of the  
4 empirical evidence.

## 5 **4 Discussion**

6 The Discussion explains what the results mean  
7 and why they matter in an agricultural con-  
8 text. Begin by answering the main research  
9 question in 2–3 sentences and restating the key  
10 findings at a high level (do not re-list all num-  
11 bers). Then interpret the results—for exam-  
12 ple, in terms of mechanisms, agronomic rele-  
13 vance, and decision implications: explain what  
14 the findings suggest for management, breeding,  
15 production performance, product quality, sus-  
16 tainability outcomes, or traceability practices,  
17 and so on as appropriate to your study.

18 Connect your findings to prior work. Com-  
19 pare against the most relevant literature and  
20 clarify what is consistent, what differs, and  
21 why. When results vary across conditions (e.g.,  
22 species/varieties, environments, seasons/years,  
23 facilities, production stages, or supply-chain seg-  
24 ments), discuss plausible drivers such as man-  
25 agement differences, environmental variability,  
26 biological constraints, data limitations, or oper-  
27 ational factors.

28 Be explicit about limitations and scope. State  
29 where the evidence is strong and where it may  
30 not generalize (e.g., limited sites/years, narrow  
31 genetic diversity, specific production systems,  
32 measurement noise, potential confounding, or  
33 incomplete records). Distinguish practical con-  
34 straints from methodological limitations, and  
35 avoid over-claiming beyond the evaluated set-  
36 tings. If relevant, note ethical, welfare, privacy,  
37 or governance considerations that affect adop-  
38 tion.

39 Conclude with implications and next steps.  
40 Summarize the actionable takeaway for the  
41 target stakeholders and propose concrete fu-  
42 ture work (e.g., broader validation, additional  
43 species or environments, stronger baselines, de-  
44 ployment trials, or improved data collection).  
45 The Discussion should leave the reader with a  
46 balanced view of impact, credibility, and what  
47 remains to be done.

48 The Conclusion section should briefly summa-  
49 rize the main findings of the study, highlight  
50 their significance, and state the primary contri-  
51 butions of the work. This section should not in-  
52 troduce new data, results, or citations. Authors  
53 may also include a short statement on limita-  
54 tions or future directions where appropriate.

## 55 **Acknowledgments**

56 Use the Acknowledgments section to recognize  
57 funding and support that contributed to this  
58 work. List funding agencies, programs, and  
59 grant/award numbers, and include any required  
60 wording specified by the funder. Acknowledge  
61 institutional, field, laboratory, or operational  
62 support that enabled the study (e.g., farms  
63 and producers, research stations, greenhouses,  
64 hatcheries, processing facilities, extension ser-  
65 vices, breeding programs, or data providers),  
66 and note any in-kind contributions such as seed,  
67 feed, chemicals, equipment, or access to facili-  
68 ties. You may also thank individuals who as-  
69 sisted with study coordination, sampling, ani-  
70 mal/plant care, fieldwork, laboratory assays,  
71 data curation, software support, or manuscript  
72 feedback but do not meet authorship criteria.  
73 Keep acknowledgments concise, factual, and  
74 professional, and avoid including confidential  
75 details or statements that belong in the Results  
76 or Discussion.

## 77 **Conflict of Interest**

78 Include a Conflict of Interest statement for  
79 transparency. Declare any financial or non-  
80 financial relationships that could reasonably be  
81 perceived to influence the work (e.g., indus-  
82 try funding, employment, consulting/advisory  
83 roles, equity ownership, patents, or in-kind con-  
84 tributions). If no conflicts exist, explicitly state  
85 this.

## 86 **5 Author Contributions**

87 Use this section to briefly describe each au-  
88 thor’s role in the work (e.g., conceptualization,  
89 methodology, data collection, analysis, software,  
90 writing, supervision, funding acquisition). Keep  
91 statements concise and factual. For single-  
92 author papers, this section may be omitted.

1

## 2 **References**

- 3 [1] Joshua Schimel. *Writing Science: How to Write Pa-*  
4 *pers That Get Cited and Proposals That Get Funded.*  
5 OUP USA, 2012.