Data feminism and agriculture

# Abstract

Agricultural systems are a function of complex institutional structures that have historically had, and continue to have, power imbalances embedded within them. The XX (how many are there?) principles of data feminism were developed by data scientists to aid in identifying, examining, and addressing power inequities related to data generation, interpretation, and dissemination. We believe these principles provide an accessible, but under-utilized framework for helping agricultural researchers understand, acknowledge, and address power inequities prevalent in our discipline. Here we present three themes in which we interpret the tenets of data feminism specifically in the context of agricultural research: power, reciprocity, and framing. Many researchers already apply these principles in their work, but we hope that providing this explicit framework in an agricultural context will make the application of those principles more intentional, visible, and ubiquitous. We posit that applying these principles concomitantly fosters creativity, leading to better outcomes for sustainable agriculture as a whole.

# Introduction

## Issues and concerns with data and power in general

**In a broad sense, the intersection of data and power has become a focal point of global discourse and concern (CITE). Issues arise along the entire data lifecycle, from data provenance to utilization, and include a suite of complex interactions that require novel ethical, technical, and regulatory considerations (CITE). Without intentional examination of these issues, existing power differentials will likely be exacerbated, and new ones will be created (CITE). In a time when human ingenuity is arguably most needed (CITE), these consequences will deny vast numbers of people the ability to fully realize their contributions to society, and thus contribute to our survival (CITE).**

## Academic movements, pop culture

**The emergence of novel issues surrounding data and power has catalyzed the creation of innovative academic fields dedicated to understanding and addressing these complex dynamics. Fields such as data ethics (CITE), algorithmic accountability (CITE), and critical data studies (CITE) interrogate the ethics and power structures embedded within algorithms. Data justice (CITE) and techno-politics (CITE) explore how data and power intersect within socio-political contexts. These themes have not been isolated to academic realms; numerous books, films, series, and art pieces grapple with tensions between power distribution in data-driven societies. These cultural artifacts reflect both the urgency and importance of exploring these themes.**

## Researchers in general

**Researchers and scientists in technical fields have traditionally operated under the assumption of value-neutrality, relegating ethical considerations to separate domains while technical advancement is pursued independently from such considerations. However, researchers are increasingly having to contend with the potentially profound ethical and social implications of their work as it relates to data and power (I`CITE). Researchers must become adept at recognizing their role in either reinforcing or challenging existing power differentials.**

**This new awareness has been primarily discussed within the context of domains such as technology, health care, and criminal justice (CITE). We argue that despite power being a particularly salient theme within the agricultural sector, less awareness has been built within the agricultural research community concerning the intersection of agricultural research, data, and power.**

## Agricultural research

**Discussions about ‘big data’ and/or ‘data science’ in agriculture start to appear in the literature in XXXX. Many of the highly cited papers mention data privacy issues, but ethical or power-related implications are not discussed in depth, if at all, and to our knowledge little guidance is given regarding *how* to consider such implications (e.g., XXXX).**

**This gap has been acknowledged within the larger food studies community, and concerns about power distribution and fairness are becoming codified within the field of agroecology (the European principles, is there something from that big meeting that happened that I’m salty about not being accepted into?). An XX working group recently released XX that provide excellent examples of guiding principles, but they are framed in the context of social science…**

**The tenets of data feminism were developed in response to a need for tools that foster awareness about the interactions between power and data science. The principles provide guidance on how to approach data science with an explicit acknowledgement of the power imbalances the work is embedded within, and therefore foment reflection on the ethical implications of the work. The principles are designed to be domain-agnostic, and the book has been cited over 2,000 times by work from a range of disciplinary contexts. However, to our knowledge, it has had limited interpretation in the context of agriculture.**

**All aspects of agricultural research – something to convince everyone they need it. Laila is a great example.**

**Agricultural research depends on data, equally so in the fields of such topics as precision agriculture, remote-sensing, and data-analytics, as well as breeding, agronomy, soil science, clearly re**

As advancements in precision agriculture, remote sensing technologies, and data analytics

**A recent paper evaluated the United States Department of Agriculture’s National Agricultural Statistics Service data reporting practices through the lens of data feminism, demonstrating the utility of such approaches for fostering creative problem solving in agricultural institutions (Rissing).**

**The goal of this paper is not to reiterate the principles laid out by D’Ignazio and XX. Nor do we intend to suggest one set of guiding principles is superior to another. Rather, our aim is to offer our interpretation of the principles of data feminism specifically in the context of agricultural research, and provide what we feel is evidence that their application lays the foundation for more transformative research.**

# Theme 1: Examining and challenging power disparities

## Historical perspective

**Power inequities have been fundamental features of agriculture since its inception (Isett and miller, diamond, against the grain). Adam Smith’s classical economic theories regarding wealth creation through land, labor, and capital provide a lens through which we can simply characterize how power inequities were built: unequal access to these resources. Gender, race, ethnicity, and class have all provided delineating marks for determining who participates in agriculture and in what way. Modern day patterns in agricultural systems did not arise by chance, nor through merit. Historical foundations of inequity in agricultural activities have created modern systems where oppression in agricultural systems is real, nuanced, and prevalent. While it is not reasonable to expect an agricultural scientist to be an expert in these topics, conceptual tools have been developed to aid in dissecting where and how power inequities may manifest (Table x).**

**TABLE**

## Legacies and modern times

**contemporary power dynamics in agriculture. Smith emphasized the importance of the aforementioned factors in driving wealth creation, and in modern agricultural systems, and by adopting an expanded definition of capital (the flora’s stuff?) we can see how power imbalances arise due to unequal access to these resources. Therefore, the enduring relevance of the distribution of land, labor, and capital serves as a starting point for examining power inequities in XXXXXx. Who owns land? Who has access to capital? Who manages land? Who works the land?**

Adam Smith's classical economic theories regarding land, labor, and capital provide a lens through which we can understand contemporary power dynamics in agriculture. Smith emphasized the importance of these factors of production in driving economic growth and wealth creation. However, in modern agricultural systems, power imbalances often arise due to unequal access to these resources.

Large agribusiness corporations, with substantial capital and land holdings, wield significant influence over the agricultural sector, exerting control over production processes, market prices, and regulatory policies. Meanwhile, small-scale farmers and agricultural laborers, who possess limited capital and often lease land, find themselves at a disadvantage, facing challenges such as exploitation, low wages, and barriers to market access. This concentration of power in the hands of a few entities not only perpetuates inequities within the agricultural supply chain but also impacts broader socio-economic dynamics, including rural livelihoods and food security. Thus, Smith's insights shed light on the enduring relevance of understanding the distribution of land, labor, and capital in shaping power dynamics and inequalities within contemporary agriculture.

**Land and, labor, and capital have been expounded as the foundations of wealth (adam smith), and as such any accumulationthey are likewise the foundations of agriculture.**

### Table x. Domains through which power is expressed and experienced (adapted from XX)

|  |  |  |
| --- | --- | --- |
| **Domains** | **Description** | **Select agricultural example** |
| **Structural domain** | Organizes distribution of power through laws and policies | XX Land Grant law granting land to xxx,  XX law restricting land ownership to XX |
| **Disciplinary domain** | Administers and manages distributions of power by implementing and enforcing (or not enforcing) laws and policies | Pisgah suit about usda resources |
| **Hegemonic domain** | Circulates ideas related to power | Land Grant Universities extension systems staffed by white men to help white men  Techno-focused solutions |
| **Interpersonal domain** | Individual experiences, expression, and awareness of power | Being a woman doing ag field work paper? |
|  |  |  |

## Example

For myriad reasons, researchers may not have the ability, resources, or power to do research that aligns with their desires to directly challenge power. However, the way you do research can also present an opportunity to redistribute power more equitably. The next two sections present guidance relating to the way in which research is done.

**NRCS staff are. Impacting their education while also understanding women’s conservation needs.**

**Shifting the power to the farmers to collect data that is meaningful to them.**

**Listening to minoritized farmers.**

**When working on an agricultural problem, it is imperative to understand the relations of power Who owns land, who manages land, who works the land**

**Identifying who is being minoritized, and amplifying their challenges, their perspectives, and their needs is a baller thing to do. For example, the national narrative in the United States is that land is owned by white men. Technical audits are useful tools for separating power narratives being . The Midwestern United States contributes XX of the world’s maize and soybean production on a yearly basis, and contains some of the most productive and expensive arable land in the US. A recent estimate showed XX% of this land is owned (and an additional xx% co-owned) by women (CITE). In XX NASS allowed for more than one person to identify as a farmer-operator, data suggested XX% of farm operators were male, Women were not permitted to own land until XX, and culturally are often not seen as capable of making farming decisions**

**Women land-owners represent a minoritized group. By using a technical audit to examine power**

**Work**

**is an agriculturally productive region**

**Listening to the margins**

**Understanding power relations is needed in order to understand who is being minoritized.**

* 1. Who owns land, who manages land, who works the land,
     1. Power matrix, applied in agriculture
        1. Women
        2. Workable field days

# Theme 2: Reciprocity in farmer relations

**On-farm research collaborations are a part ….Advances in the ability to communicate, organize, streamlineIncreasingly. Ignacio’s paper, Laila’s, mother-daughter situation, participatory breeding... The types of questions and activities that are best suited for research versus farm scale plots has become more nuanced, suggesting significant opportunities for performing better, more statistically powerful, and more relevant public research (e.g., Iowa Nitrogen Project, etc). However, these arrangements require careful consideration to support equitable and fair power relations.**

## Pay them

**Laila’s paper showing they need to pay them.**

**This section needs a figure.**

**In many on-farm research arrangements, farmers are not compensated monetarily but are compensated by ‘the experience and knowledge gained from the activities.’ This practice is elitist, extractive, and disrespectful. It also further exacerbates historical biases, favoring well-resourced farmers in access to on-farm research activities. Participating in research projects requires farmers to allocate significant time, resources, and land for experimentation and coordination of data collection. Providing monetary compensation acknowledges the farmer’s investments and sacrifices, ensuring fair renumeration for their contributions to the research process. It also fosters mutual respect, and builds more equitable partnerships that are more likely to be sustained in the long-term. Public funding sources, and private sources committed to fair and equitable research activities, should explicitly provide funding for monetary compensation of farmers and require renumeration of farmers for their participation in research projects, xxxx**

Additionally, participating in research projects often requires farmers to allocate significant time, resources, and land for experimentation and data collection, which can detract from their primary farming activities and livelihoods. Providing monetary compensation acknowledges the farmers' investments and sacrifices, ensuring fair remuneration for their contributions to the research process. Moreover, compensating farmers fosters more equitable partnerships between academia and agriculture, promoting mutual respect, collaboration, and long-term sustainability in agricultural research endeavors.

* + 1. **Compensation- deserves its own section**
       1. **Perpetuates an extractive mentality. The ‘gift’ of ‘knowledge’ is XXXX.**
       2. **Grants should require any on-farm collaboration to be monetarily compensated**

## Two-way sharing of results

## Metrics for success

Common metrics for projects include

Common objectives for projects working with stakeholders include increasing knowledge, creating new relationships

Trust was builtpower and resources were shared, learning happened in both directions, transformation happened in both directions, inspiration in both directions

* + 1. **Metrics for the relationship**

# Theme 3: Framing

* + 1. **Wizard and the Prophet, they are both demographically very similar, but have very different values and histories that are expressed in their world framing**
       1. **No such thing as an objective scientist**
    2. **Embrace your framing, it is there whether you acknowledge it or not**
       1. **Example? Need to think of a good one.** 
          1. **Do cover crops reduce weeds?**
          2. **Are cover crops as effective at reducing weeds as herbicides?**
          3. **Different framing, could have same figure, your figure should say why you are including it, what your take-away is. Maybe use PFI?**

## Contextualize (don’t be a big dick data ninja)

There are numerous initiatives that advocate for free and open sharing of data generated by governments, industries, and research institutions ((CITE). The open science movement champions the ethos of transparency, collaboration, and accessibility in scientific research; as a corollary the movement promotes the unrestricted sharing of data (CITE). Additionally, there are similar efforts surrounding open government data . Indeed, the sharing of data has facilitated more efficient use of resources for research through data re-use (Piwowar), and in some countries freely available governmental data XXX both public and private entities leverage governmental data that is freely available (Piwowar). However, the open sharing of data also introduces risks regarding data misinterpretation or misuse. Data shared openly may be used out of context.

FAIR data principles (findable, accessible, Interoperable, Reusable)

Narratives should be included in the meta data.

Data should be treated within the gift culture of scholarship, in which goods are bartered between trusted colleagues rather than treated as commodities (Wallis).

Practices of releasing, sharing, and reusing of data in CENS reaffirm the gift culture of scholarship, in which goods are bartered between trusted colleagues rather than treated as commodities.

The open science movement champions the ethos of transparency, collaboration, and accessibility in scientific research, advocating for the unrestricted sharing of research findings, methodologies, and data. Embracing principles of open access and open data, this movement seeks to democratize knowledge production, accelerate scientific progress, and foster innovation by removing barriers to information. Indeed, the sharing of data has facilitated unprecedented opportunities for collaboration, reproducibility, and interdisciplinary research, enabling scientists worldwide to build upon each other's work and address complex global challenges more effectively. However, while the open sharing of data holds immense promise, it also introduces risks, particularly concerning the potential for data misuse or misinterpretation. Data shared openly may be used out of context, leading to misrepresentations, erroneous conclusions, or even harm if not properly understood or interpreted. Therefore, while promoting data sharing, it is crucial for researchers to uphold ethical standards, provide context and metadata for shared data, and actively engage in transparent and responsible data stewardship practices to mitigate the risks associated with data misuse in the open science ecosystem.

Top of Form

* + 1. **Why is this helpful?**
       1. **Cropscape data article (double cropping)**
       2. **NASS data increase in women producers**
       3. **Andrea R’s work**
    2. **Fill out the ‘what is this data’ card**
    3. **Present your results to people connected with the data before publishing them**

**Option 2**

1. **What research you do**

Data feminism is acutely tuned to the interactions between data and power, and the first two tenets relate directly to it. As an agricultural researcher, understanding the matrices of power within which you are working can help you identify research that is, at least directionally, working to dismantle configurations of unearned structural privilege and oppression. Power as related to agricultural research has

While the examples we provide are broadly specific to the US agricultural power context, the themes are applicable at any scale and location.

When thinking about a given system, one may ask ‘is someone being minoritized?’ Once that has been identified, research can be designed that amplifies, validates, XX their experiences. Angie’s work, Tom Kaspar, Matt Liebman.

Even seemingly technical research questions are embedded within a power matrix. If you are, for example, trying to understand

For researchers who are concerned with the power context of their work, examining how a research question fits into the domains of power (Table X) can be helpful. At a high level, agricultural researchers can think about how their research can help to address legacies of power imbalances, more evenly distribute power, expose problematic power imbalances, or simply challenge common thought patterns.

Who is your research serving?

Dismantling configurations of structural privilege.

Is your research working to address legacies of power imbalances, more evenly distribute power, or

* 1. **Power matrix, applied in agriculture**
     1. **Women**
     2. **Workable field days**
  2. **Listen to the margins, who is being minoritized in your system?**

1. **How you do it**

For myriad reasons, researchers may not have the ability, resources, or power to do research that aligns with their desires to directly challenge the power matrix. However, the way you do research can also present an opportunity to redistribute power more equitably. Practicing reciprocity, utilizing metrics for measuring the success of exchanges, and putting in the effort to contextualize data are XX.

* 1. **Reciproprocity in farmer relations**
     1. **Compensation- deserves its own section**
        1. **Perpetuates an extractive mentality. The ‘gift’ of ‘knowledge’ is XXXX.**
        2. **Grants should require any on-farm collaboration to be monetarily compensated**
  2. **Establish metrics for collaborative relationship**
     1. **On/farm collaboration**
     2. **Other organizations**
  3. **Contextualize (don’t be a big dick data ninja)**
     1. **Why is this helpful?**
        1. **Cropscape data article (double cropping)**
        2. **NASS data increase in women producers**
        3. **Andrea R’s work**
     2. **Fill out the ‘what is this data’ card**
     3. **Present your results to people connected with the data before publishing them**

1. **How you relay it**

The way you relay data

* 1. **Framing**
     1. **Wizard and the Prophet, they are both demographically very similar, but have very different values and histories that are expressed in their world framing**
        1. **No such thing as an objective scientist**
     2. **Embrace your framing, it is there whether you acknowledge it or not**
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1. **Supplemental material with our ‘who I am’ statements**

**Agricultural research data, its interaction with power**

**Current efforts, why data feminism (big data mentions social issues but not in depth, the agroecology folks’ stuff which has a fair amount of overlap but is ‘clubby’ and ‘exclusive’, we don’t want to follow the environmentalists’ problem of insult you then ask you to join us)**