

PURDUE UNIVERSITY EXTENSION

County Regulation of Confined Feeding Operations in Indiana: *2017 Progress Report*

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 **Center for Regional Development**
Advancing Collaboration : Energizing Regions

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BACKGROUND

Indiana counties often have jurisdiction in determining where new CFOs can locate (siting) within the county. These powers are delegated to legislative bodies, such as Boards of County Commissioners, if a county adopts planning and zoning. Traditionally, planning and zoning have been used by counties for various reasons from guiding development to protecting public health to preserving the character of a community. Ultimately, planning and zoning has to balance respecting property rights with preventing one accepted land use from overly interfering with other, often adjacent land uses.

The majority of Indiana counties (81 of 92) have adopted planning and zoning and 64 counties currently operate under zoning ordinances containing regulations or standards specifically for CFOs¹. In these same counties, the addition of a new CFO or expansion of an existing CFO can still be met with opposition. Reviews of the literature indicate that while numerous counties provide specific siting standards for CFOs, there is very little to no research identifying which standards are actually effective at reducing the likelihood of land use conflict.

We are currently using the data collected from our previous research on Indiana county zoning ordinances as they relate to CFOs in attempt to identify which CFO standards or provisions are effective at reducing conflict between CFOs and other land uses¹. The current analysis is in keeping with the broad objectives of our team: measuring the efficacy of policy, providing research to decision makers, and improving the quality of debate related to CFOs and zoning ordinances. In this process, we have cataloged and coded² CFO-related IDEM enforcements (2011 to 2016)³ and OISC manure-related violations (2013 to 2015)⁴ as a means of providing a proxy, quantifiable measurement of CFO-related land use conflict. We have also measured the “tone” of CFO siting discussions and the difficulty in CFO siting compared to other zoning issues according to Indiana plan directors and Extension educators. We then compared these different variables with characteristics of CFO ordinances to identify potential correlations using simple linear regression⁵.

Our analysis was conducted as a preliminary assessment of relationships between different measurements in the data set. At this stage, our analysis does not identify causal relationships. For example, we found a significant negative correlation between the number of different types of buffers named in a CFO ordinance and the number of OISC investigations arising from anonymous or resident complaints. These two measurements are related. While it would be tempting to conclude that increasing the types of buffers required for CFOs will decrease land use conflict, it would not be

¹ Ebner P, Ogle T, Hall T, DeBoer L, Henderson J. 2016. County regulations of confined feeding operations in Indiana: An overview. Purdue University Extension Publication. ID-466-W.

² Saldaña, J. 2009. An introduction to code and coding. In: The coding manual for qualitative researchers. London: SAGE Publications.

³ IDEM; <http://vfc.idem.in.gov/DocumentSearch.aspx>

⁴ OISC; <https://www.oisc.purdue.edu/oiscweb/#!/publicrecords/investigations/searchreports>

⁵ Saxton, A. 2009. Design and analysis of biological research. University of Tennessee. Knoxville, TN.

scientifically accurate to do so based on our analysis at this point. Our analysis does, however, serve as a first step in identifying aspects of CFOs ordinances, in a very broad sense, that may be helpful in reducing land use conflict.

BASELINE MEASUREMENTS

IDEM. In Indiana, confined feeding operations (CFO) are regulated at the state level primarily through the Indiana Department of Environmental Management (IDEM). The focus of IDEM regulation is protecting Indiana water ways from nutrients or contaminants that are commonly produced in livestock production.

Over a five-year period (2011 – 2016), we identified 263 IDEM enforcements⁶ to Indiana farms permitted through IDEM as CFOs. The enforcements were coded for dominant themes⁷ (e.g., “permit-related enforcements”) and sub-themes (e.g., “construction of CFO without prior IDEM approval”) identifying four major enforcement categories: permit-related; manure/waste system-related; record keeping/testing-related; and run-off events.

One hundred sixteen (116; 44.1%) of the 263 enforcements were permit-related (Table 1). These included:

- construction of a CFO without prior IDEM approval (53; 20.2%);
- operating a CFO without a permit (17; 6.5%);
- use of an unapproved facility⁸ (14; 5.3%);
- animal numbers exceeding permit (6; 2.3%); or
- unapproved building modifications or structure non-compliance (26; 9.9%).

Table 1. Number of Permit-related IDEM Enforcements¹ to CFOs from 2011 – 2016.

Construction w/o prior IDEM approval	Operating w/o Permit	Use of Unapproved facility	Animal # Above Permit	Unapproved Modification, Structure Non-compliance
53	17	14	6	26
¹ 116 of 263 total IDEM enforcements				

⁶ IDEM uses the term “enforcements”, while OISC uses the term “violations”. We have kept their respective terminology here.

⁷ Saldaña, J. 2009. An introduction to code and coding. In: The coding manual for qualitative researchers. London: SAGE Publications.

⁸ E.g., using a building not included in the CFO permit for livestock production purposes.

Sixty-nine (69; 26.2%) of the 263 enforcements were manure/waste system-related (Table 2). These included:

- improper staging/storage of manure (27; 10.3%);
- failure to maintain waste management system (17; 6.5%);
- improper manure application (15; 5.7%); or
- inadequate run-off protection (13; 4.9%).

Table 2. Number of Manure/waste system-related IDEM Enforcements¹ to CFOs from 2011 – 2016.

Improper Staging/Storage of Manure	Failure to Maintain Waste Management System	Improper Manure Application	Inadequate Run-off Protection
24	17	15	13

¹ 69 of 263 total IDEM enforcements

Forty-four (44; 16.7%) of the 263 enforcements were record-keeping/testing related (Table 3). These included:

- inadequate soil tests (11; 4.1%);
- inadequate manure tests (8; 3.0%);
- inadequate application records (8; 3.0%);
- no nutrient management plan (5; 1.9%); or
- inadequate miscellaneous records⁹ (12; 4.6%).

Table 3. Number of Testing- or Record-keeping-related IDEM Enforcements¹ to CFOs from 2011 – 2016.¹

Incomplete Manure Testing	Incomplete Soil Testing	Incomplete Application Records	Other Record Errors	No NMP
11	8	8	12	5

¹ 44 of 263 total IDEM enforcements; NMP = nutrient management plan.

Thirty-four (34; 12.9%) of the 263 enforcements were related to a run-off event where manure had entered an identified Indiana water.

OISC. Livestock manure is very often used as fertilizer and in 2013, the Office of the Indiana State Chemist (OISC) implemented the “Fertilizer Material Use, Distribution, and Record Keeping Rule” that provides regulations for storage and application of manure as fertilizer, with some specific standards for manure generated from CFOs.

⁹ E.g., employee training records, adequate spill documentation, etc.

Over a 2.5-year period (2013 to 2015), the OISC conducted 212 manure-related investigations. Of those investigations, 127 (59.9%) investigations resulted in violations (204 total violations) producing 1203 citations¹⁰ (Table 4). In the remaining investigations, the respondent was found to be compliant.

Table 4. Manure-related OISC Investigations and Violations from 2013 to 2015.

Year	No. of Investigations	No. of Investigations Resulting in Violations	No. of Violations ¹	No. of Citations ²
2015	116	64	93	1064
2014	60	36	73	58
2013	36	27	38	81
Totals	212	127	204	1203

¹ Single investigations can result in more than one violation; ² single violations can result in more than one citation.

Of the 212 OISC investigations, 154 (70.1%) were generated from an anonymous or resident complaint. Of the 154 investigations resulting from anonymous or resident complaints, 86 (55.8%) resulted in violations (Table 5). In the remaining investigations, the respondent was found to be compliant.

Table 5. OISC Investigations/Violations Resulting from Anonymous or “Resident”¹ Complaints

Year	Anon/Res Complaints	Anon/Res Complaints Resulting in Violations
2015	91	47
2014	44	27
2013	19	12
Totals	154	86

¹ Investigations where complainant is named or otherwise described as “resident”.

OISC violations were coded for dominant themes¹¹ (e.g., “staging violations”) identifying four main violation categories (Table 6). The violation categories and numbers of violations per category included:

- staging¹² (104);
- application¹³ (14);
- license requirements (84); or

¹⁰ Single investigations can result in multiple violations and single violations can result in multiple citations.

¹¹ Saldaña, J. 2009. An introduction to code and coding. In: The coding manual for qualitative researchers. London: SAGE Publications.

¹² E.g., not covering or providing a gradient barrier for staged manure after seventy-two hours; not applying staged manure within ninety (90) days, staging manure within a setback, etc.

¹³ E.g., applying manure within setback, not documenting application rates, etc.

- other (2)¹⁴.

Table 6. OISC Manure-related Violations from 2013 to 2015 by Category.

Year	Staging	Application	License Requirements	Other
2015	45	10	37	1
2014	32	1	40	0
2013	27	3	7	1
Totals	104	14	84	2

Of the 204 OISC violations and 1203 OISC citations, 37 violations (18.2%) and 158 (13.1% of total OISC citations) citations were issued to CFO owners or operators¹⁵ (Table 7).

Table 7. Manure-related OISC Violations involving CFO Owners

Year	Total no. of Violations ¹	Total no. of Citations ²	Violations to CFO Owner	Citations to CFO Owner
2015	93	1064	13	138
2014	73	58	21	18
2013	38	81	3	2
Totals	204	1203	37	158

¹ Total violations related to manure regardless of respondent characteristics; ² Total citations related to manure regardless of respondent characteristics.

DEFINITIONS OF VARIABLES

The following list describes the variables we used in our comparative analysis. Our goal was to determine if one variable was related to another variable. For example, are there more, less, or the same amount of resident complaints (variable 1) in counties that have CFO ordinances vs. counties that do not have CFO ordinances (variable 2)? The values for these variables were based on the baseline measurements described above and data collected from our previous research^{16,17}.

¹⁴ Claiming manure was incorporated when it was not incorporated; failure to properly train employees.

¹⁵ A higher number of violations/citations were indirectly related to CFOs, but the CFO was not cited (e.g., manure was acquired from a CFO, but was mishandled by the person acquiring the manure).

¹⁶ Ebner P, Ogle T, Hall T, DeBoer L, Henderson J. 2016. County regulations of confined feeding operations in Indiana: An overview. Purdue University Extension Publication. ID-466-W.

¹⁷ Ebner P, Ogle T, Hall T, DeBoer L, Henderson J. 2016. County regulations of confined feeding operations in Indiana: County factsheets. Research for the Indiana State Legislature. Purdue University Extension Publication. ID-467-W

Planning and Zoning: *Whether a county has adopted planning and zoning.* This is a yes/no variable.

CFO Ordinance: *Whether a county with planning and zoning provides standards and provisions specifically for CFOs in their zoning ordinance.* This is a yes/no variable.

Number of Permitted Farms: *The number of farms permitted through IDEM as CFOs (including those permitted as CAFOs) as of 2015.*

Enforcements: *IDEM enforcements made to farms permitted as CFOs (including those permitted as CAFOs).* Numerically, there are likely more enforcements in a county with 100 permitted farms vs. a county with one permitted farm. This would introduce a significant bias in comparisons. Thus, for comparisons we have used enforcements per permitted farm in the county (total number of IDEM enforcements/total number of permitted farms).

Violations: *Manure-related violations recorded by the OISC.* Similar to enforcements, for comparison we have used violations per permitted farm in the county. Note, that we used all OISC violations in the county and not only those where the respondent was a CFO owner-operator.

Anonymous/Resident or Resident Complaints: *OISC manure related investigations stemming from an anonymous (anon) or resident (res) complaint.* OISC describes how investigations were initiated. In many cases, the complainant is another state agency or OISC itself. In other cases, the complainant is listed as “anonymous” or otherwise unknown. In some cases, the complainant is a named resident. We have assumed a great likelihood that “anonymous” complaints are also mostly residents. We have, however, analyzed the data two ways: anonymous and resident complaints together and (named) resident complaints alone.

Agriculture Clause: *Agriculture clauses, in general, notify potential developers in a given zoning district “that they may experience noise, dust, and odor associated with generally accepted farming practices”¹⁸.* Several Indiana county zoning ordinances contain such clauses in effort to minimize land use conflict in rural areas. This is a yes/no variable.

Reciprocal Buffers: *Buffer distances (from an established CFO) required of new residential construction or uses in defined zoning districts.¹⁹* This is a yes/no variable.

Residential Setback Distances: *Whether a county required a residential use setback (distance between a new CFO and nearest residence) beyond the 400 ft. required by IDEM.* Thirty-seven (37) Indiana county zoning ordinances require additional setback distances between CFOs and the nearest residential use. This is a yes/no variable.

¹⁸ Indiana Land Resource Council. 2014. A Guide for Local Land Use Planning: Model Agricultural Zoning Ordinances. Available at: https://www.in.gov/isda/files/ILRC_Model_Ordinances_-_Updated_2014.pdf

¹⁹ Ibid.

Buffer Categories: *Categories of additional buffers required of CFOs in Indiana county zoning ordinances (e.g., public buildings, recreation areas, religious institutions, etc.).* We grouped all non-residential use setback requirements into five categories: municipalities, residential uses or zones, institutional uses, commercial uses or zones, and recreational areas.

CFO Siting Process: *Level of process required in CFO siting as established in the zoning ordinance.* We have assign numerical values (1 – 5) to each CFO ordinance based on the level of process required for siting approval (1= permitted use; 2 = permitted use with additional provisions; 3 = special exception; 4 = rezone [permitted use]; and 5 = rezone [special exception]).

“Tone” of Public Discussions Regarding CFO Siting: *Plan Director/Extension Educators’ characterization of discourse in the county regarding CFO siting.* These data are from our previous research asking plan directors and Extension educators to gauge the “tone” of discourse surrounding CFOs in the county (1 = little disagreement and civil; 2 = some disagreement, but civil; 3 = regular disagreement, but civil; 4 = regular disagreement, sometimes with conflict; 5 = regular disagreement, regular conflict)²⁰.

Difficulty in CFO Siting Compared to other Zoning Issues: *Plan Director/Extension Educators’ assessment of CFO siting difficulty compared to other zoning issues.* These data are from our previous research asking plan directors and Extension educators to make this comparison using a 1 – 5 scale (1 = much easier; 2 = somewhat easier; 3 = about the same; 4 = somewhat more difficult; 5 = much more difficult)²¹.

CORRELATIONS

Potential correlations were identified using simple linear regression. Correlations were considered statistically significant at $P < 0.05$. Correlations were considered statistical trends at $P = 0.05 - 0.10$. Significance levels are measures of confidence that the correlations between measured variables are not the result of random variation, but represent true relationships.

Number of Permitted Farms. There was a significant ($P < 0.05$) negative correlation between the number of permitted farms in a county and the average number of enforcements/violations²² per farm. Thus, as the the number of permitted farms increased, the number of enforcements/violations per permitted farm decreased. A similar negative correlation ($P < 0.05$) was found between the number of permitted farms and the number of OISC investigations resulting from anonymous/residential complaints (per permitted farm in the county). No other significant correlations were found identified. There were negative trends ($P < 0.10$) between the number of permitted farms and: 1) the number of

²⁰ Ebner P, Ogle T, Hall T, DeBoer L, Henderson J. 2016. County regulations of confined feeding operations in Indiana: An overview. Purdue University Extension Publication. ID-466-W.

²¹ Ebner P, Ogle T, Hall T, DeBoer L, Henderson J. 2016. County regulations of confined feeding operations in Indiana: An overview. Purdue University Extension Publication. ID-466-W.

²² This is total IDEM/OISC enforcements/violations together.

OISC violations per permitted farm; and 2) the number of OISC investigations resulting from named residents per permitted farm.

Planning and Zoning. There were no significant correlations between adoption of planning and zoning and any other variables. There was trend ($P < 0.10$) for counties with planning and zoning to have fewer OISC violations.

CFO Ordinance. There was a significant ($P < 0.05$) negative correlation between having a CFO ordinance and the number of OISC investigations resulting from anonymous/resident complaints. Thus, there was a decreased number of OISC investigations initiated by anonymous/residential complaints in counties that had CFO ordinances. There were no other significant correlations. There were trends ($P < 0.10$) for counties having a CFO ordinance to have more IDEM enforcements, but fewer OISC violations.

Ag Clause and/or Reciprocal Buffer. There were no significant correlations between agriculture clauses and other variables or reciprocal buffers and other variables. There was a trend ($P < 0.10$) for counties with zoning ordinances requiring reciprocal buffers to have fewer OISC investigations resulting from anonymous/resident complaints.

Number of Buffer Categories. There was a significant ($P < 0.05$) negative correlation between the number of buffer categories in the CFO ordinance and the number of OISC investigations resulting from anonymous/resident complaints. Thus, counties with CFO ordinances that required more types of buffers had lower numbers of OISC investigations resulting from anonymous/resident complaints. No other significant correlations were identified. There was a trend ($P < 0.10$) for counties with zoning ordinances with more buffer categories to have fewer OISC violations.

Residential Use Setback. There was a significant ($P < 0.05$) negative correlation between the residential use setback distance and the number of OISC investigations resulting from anonymous/resident complaints. Thus, counties that required a residential setback distance beyond that required by IDEM had fewer OISC investigations resulting from anonymous/resident complaint. No other significant correlations were identified. There was a trend ($P < 0.10$) for counties with increased residential use setback distance requirements to have fewer OISC violations.

Approval Process. There was a significant ($P < 0.05$) negative correlation between the level of process required in CFO siting in a county and the number of OISC violations in the county. No other significant correlations were identified. There were trends ($P < 0.10$) for counties with increased process requirements to have fewer OISC investigations resulting from anonymous/resident complaints. There were trends ($P < 0.10$) for counties with increased CFO siting process requirements to have more IDEM enforcements and more OISC investigations resulting from named resident complaints

“Tone” of Discourse. No significant correlations were identified. There were trends ($P < 0.10$) for counties with high levels of disagreement/conflict to have: 1) more OISC investigations resulting from anonymous/resident complaints; or 2) more OISC investigations resulting from a named resident complaint.

Difficulty of CFO Siting. There was a significant ($P < 0.05$) positive correlation between the difficulty of CFO siting issues compared to other zoning issues with the “tone” of discourse in the county. Thus, counties where plan directors or Extension educators felt CFO siting issues were more difficult also had higher levels of conflict. There were trends ($P < 0.10$) for counties where plan directors or Extension educators felt CFO siting issues were more difficult than other zoning issues to have; 1) more OISC investigations resulting from anonymous/resident complaints; and 2) more OISC investigations resulting from named resident complaints.

A summary of all identified correlations and trends is provided in Table 8.

Table 8. Summary of Identified Correlations or Trends			
Independent Variable	Dependent Variable	Relationship	Correlation or Trend
Number of permitted farms	• Average enforcements/violations per permitted farm	Negative	Correlation
	• OISC investigations resulting from anonymous/residential complaints per farm	Negative	Correlation
	• OISC investigations resulting from named resident complaints per farm	Negative	Trend
	• Number of OISC violation per farm	Negative	Trend
Planning and zoning adoption	• OISC violations per farm	Negative	Trend
CFO Ordinance	• OISC investigations resulting from anonymous/residential complaints per farm	Negative	Correlation
	• IDEM enforcements per farm	Positive	Trend
	• OISC violations per farm	Negative	Trend
Reciprocal Buffer	• OISC investigations resulting from anonymous/residential complaints per farm	Negative	Trend
Number of Buffer Categories	• OISC investigations resulting from anonymous/residential complaints per farm	Negative	Correlation
	• OISC Violations per farm	Negative	Trend
Residential Use Setback	• OISC investigations resulting from anonymous/residential complaints per farm	Negative	Correlation
	• IDEM Violations per farm	Negative	Trend
Approval Process	• OISC Violations per farm	Negative	Correlation
	• OISC investigations resulting from anonymous/residential complaints per farm	Negative	Trend

	• IDEM Violations per farm	Positive	Trend
	• OISC investigation resulting from named residential complaints per farm	Positive	Trend
“Tone” of Discourse	• OISC investigations resulting from anonymous/residential complaints per farm	Positive	Trend
	• OISC investigations resulting from named resident complaints per farm	Positive	Trend
Difficulty of CFO Siting	• “Tone” of Discourse	Positive	Correlation
	• OISC investigations resulting from anonymous/residential complaints per farm	Positive	Trend
	• OISC investigations resulting from named residential complaints per farm	Positive	Trend

IMPLICATIONS AND LIMIT OF CURRENT ANALYSIS

This report describes research in progress. The analysis describes numerical relationships between different measurements, but does not establish causal relationships. However, a significant correlation does not reject a causal relationship, while an insignificant correlation does. Where there are significant correlations, causal relationships are possible. Our ability to find clearer relationships will likely always be limited by the size of our data set, which in many cases cannot be improved (e.g., we cannot add more counties to Indiana). Larger sample sizes can reduce the impact of variation and improve our ability to identify correlations if they truly exist. Similarly, we are using, in most cases, proxy measurements of land use conflict (e.g., IDEM enforcement, OISC violations, etc.).

There are numerous factors we not yet measured that may contribute to the correlations found here. For example, we have yet to look at county characteristics (% rural, population, etc.) and hypothesize that such factors would also influence many of our measurements, especially investigations arising from resident complaints. Likewise, we have not yet made any measurements over time and have not taken into account any amendments that were made to CFO ordinances or whether a county adopted a new CFO ordinance over the five-year period. It is highly possible that ordinance amendments or ordinance adoption could be in reaction to events in the county and potential effects of these changes (positive or negative) have not yet been measured and could influence our data and results. We aim to address each of the above mentioned areas, as well as others, in effort to produce more robust and conclusive results. Nevertheless, this analysis serves as a first step and identifies several factors that may, in a broad sense, reduce land use conflict associated with CFOs.