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Landowner Experiences with Natural Gas Pipeline Installations in Ohio

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INTRODUCTION

Numerous natural gas pipelines have been installed in Ohio over the past decade to transport fracked petroleum from Eastern Ohio to other regions of the state for refinement or redistribution. These pipelines are essential components of Ohio's energy infrastructure and bring economic growth to the region. However, the installation process creates a large amount of disturbance that can have lasting impacts on soil and crops.

Here we report our findings from a landowner survey intended to capture the collective experiences of Ohio residents having pipelines installed on their land. We targeted three recently installed, independently operated pipelines in Ohio that varied in size. All three pipelines used best management practices for installation and remediation, including double lift excavation and deep ripping of subsoils. We believe this report provides a robust reflection of typical landowner experiences with current pipeline installation practices.

The Pipelines. The Rover, Utopia and Nexus pipelines are all three independently operated pipelines that were installed in 2016-2017, with installation completed in 2018 (Table 1). The Rover and Nexus pipelines were subject to eminent domain laws, while the Utopia pipeline was not federally regulated. All three pipelines had documents (Environmental Impact Agreements or Agricultural Impact Mitigation Agreements) that outlined double-lift installation techniques and site remediation practices post-installation, that would generally be considered 'best management practices'. These pipelines were installed in the northern part of Ohio, crossing over 20 counties throughout the state and had limited activities with feeder lines and compression stations in additional counties.

Table 1: Description of Rover, Utopia and Nexus pipelines.

Pipeline Name	Parent Company	Number of Lines	Diameter (inch)	Length in Ohio (mile)	Capacity (MCuM per day)	Ohio Counties Crossed	Year Construction Began	Year Construction Completed
Rover	Energy Transfer Partners	Dual	42	210	92.0	18	2016	2018
Utopia	Kinder Morgan	Single	12	264	6.0	13	2016	2018
Nexus	DTE Energy and Enbridge, Inc.	Single	36	209	42.5	13	2017	2018

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Survey Methods. In the summer of 2021, Ohio State University sent 600 surveys total to landowners (200 for each pipeline). The landowners were randomly selected by dividing each pipeline into 200 equal distances, and then identifying landowners at each point using Landgrid, a subscription-service database that utilizes publicly available county auditor data. Landowners were mailed a 6-page survey with return postage and those that did not respond were mailed another survey two additional times over the next 6 months. 149 survey sample points were disqualified due to undeliverable addresses or responses from landowners that their property did not have a pipeline. Our total response rate was 31.5% (142 responses out of the remaining 451 addresses). These were distributed across the Rover (33.1%), Utopia (26.1%) and Nexus (40.8%) pipelines. This response rate gives us confidence that the experiences and opinions represented here are a reasonable reflection of the entire population of affected landowners. There were 22 Ohio counties with responses total (Figure 1). The average easement length was 2390 linear feet, but varied from landowners of 54 ft to 10,800 ft.

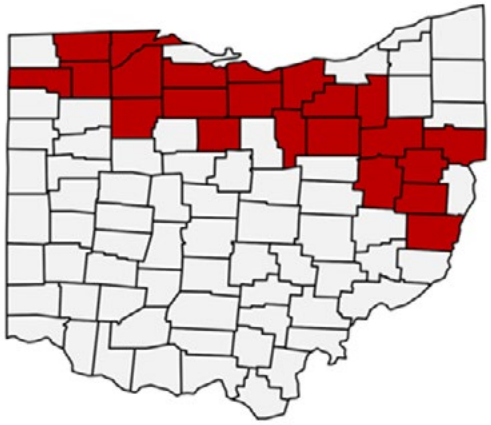

Figure 1. Ohio counties (red shaded) where landowners responded to survey.

Landowner Respondents. Nearly all of the survey respondents indicated they were *"Very familiar"* with what happened to their land over the past 5 years (87.9%) or were *"Somewhat familiar"* (9.9%). The majority of survey respondents both owned and operated the land (72.3%), while the remainder either owned but did not operate (24.1%) or did not own, but operated the land (2.1%).

Ecosystems Impacted. The vast majority of landowners who responded had land in agricultural production (95.7%) with only a small percentage not in agriculture (4.3%). Landowners commonly had a pipeline running through multiple fields or ecosystems. The majority of landowners (88.0%) had a pipeline installed in row-cropped fields (corn, soybean, small grain, hay), followed by forest (20.4%), grazed pasture (19.0%), wetlands (10.4%), and horticultural crops (1.4%).

INSTALLATION PROCESS

Previous pipeline studies have reported high rates of soil compaction following pipeline installations. We asked respondents if, *"During the installation process, were there times when soil conditions were not optimal, but pipeline installation continued?"*. The majority of respondents answered *"Yes"* to this question (71.8%, Figure 2). These responses were similar across all three pipelines (Figure 3).

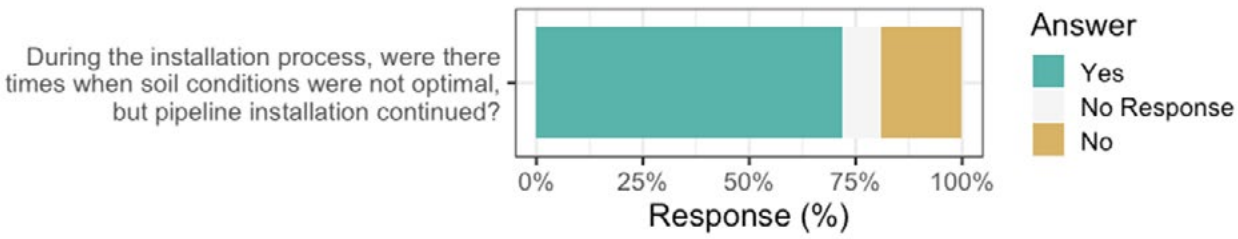

Figure 2. Percent of respondents indicating that soil conditions were not optimal during installation.

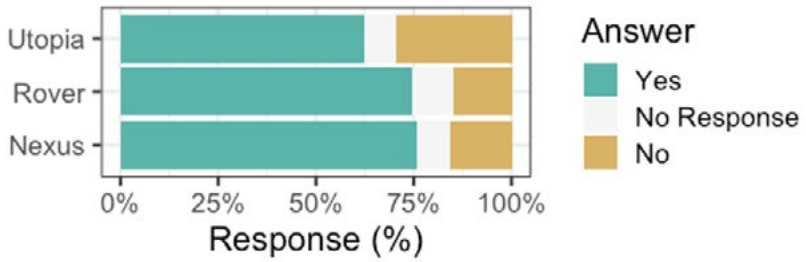

Figure 3. Percent of respondents indicating that soil conditions were not optimal during installation, by pipeline company.

Those who indicated that soil conditions were not optimal during installation were asked to rate how sub-optimal the conditions were (Table 2). Over half of the respondents (55.7%) said the soil conditions during installation were extremely sub-optimal (soil completely saturated). Again, these responses were similar across pipelines with most respondents ranking the conditions as *"Extremely sub-optimal"*: Nexus (48.8%), Rover (65.6%) and Utopia (54.5%).

Table 2. Ranking of the how sub-optimal soil conditions were during installation.

Slightly sub-optimal (Soils were still wet, and I would only drive on them if tasks were very important and time sensitive)	14.4%
Moderately sub-optimal (Soils were not fully saturated, but still tacky and too wet to drive on)	29.9%
Extremely sub-optimal (Soils were completely saturated, worked during or immediately after large rain events)	55.7%

Soils are highly susceptible to compaction when wet, and once compacted can take decades to recover. Compacted soils have impaired function as reduced water and gas exchange, restricted plant root growth and overall reduced productivity.

CROP YIELDS AFTER INSTALLATION AND REMEDIATION

Respondents were asked to report yields they had measured in areas over the pipeline relative to an adjacent, unaffected area. We received 52 paired yield measurements in corn, popcorn, soybean and wheat. All but one response indicated yield reductions over the pipeline right of way compared to an adjacent area (Figure 4). Yield reductions across crops ranged from 22% more yield to 100% less yield (total crop failure), with average declines across crops approximately 40 – 60% (Table 3). Across all reports, yields over pipelines were reduced 93 bushel/acre in corn, 2667 pound/acre in popcorn, 22.5 bushel/acre in soybean and 55.2 bushel/acre in wheat (Table 3).

Figure 4. Farmer-reported percent differences in crop yields between the pipeline and an adjacent, non-impacted area. Values on the left side of the red dotted line indicate a yield reduction over the pipeline when compared with adjacent areas, while values on the right side indicate an increase in yield.

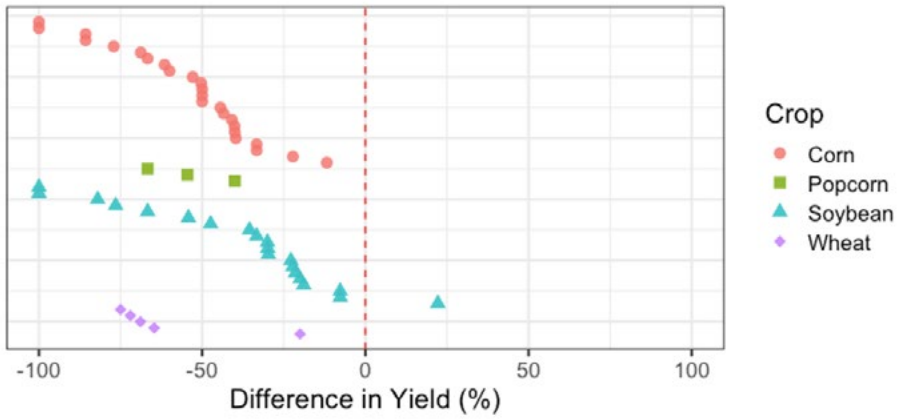

Table 3. Difference in farmer-reported grain yields by crop. The first row reports the average percent difference and the second row reports average actual yield difference.

	Corn (n = 24)	Popcorn (n = 3)	Soybean (n = 20)	Wheat (n = 5)
Average percent difference	-54.5%	-53.7%	-38.3%	-60.1%
Average total difference	-93.2 bu/acre	-2667 lbs/acre	-22.5 bu/acre	-55.2 bu/acre

In addition, twenty-seven respondents commented that they did not measure yields over the pipeline but noted stunted crop growth, reduced plant vigor and/or yield reductions over the pipeline relative to the non-impacted areas of the same field. Ten respondents indicated they had not cropped some fields yet due to ongoing site remediation. Four respondents commented that there were no differences in yield, while two said yields over pipelines were reduced in the first few years, but that yields were improving over the pipeline area.

IMPACT OF REMEDIATION

All three pipeline companies were expected to implement installation and remediation practices to minimize soil and plant disturbance. Three years after site remediation was complete, we asked, *"Do you feel that your land is generally back to the condition it was prior to pipeline installation?"* Only 17.6% of respondents indicated that things had returned to normal (Figure 5). By contrast, 82.4% of the respondents answered no to this question and indicated the following as reasons for making this statement: decreased crop yields or plant vigor (92%), increased soil compaction (82%), decreased rainfall infiltration (61%), increased soil erosion (52%), increased rock fragments (42%) and increased weeds (30%). Responses were similar across the three pipelines (Figure 6).

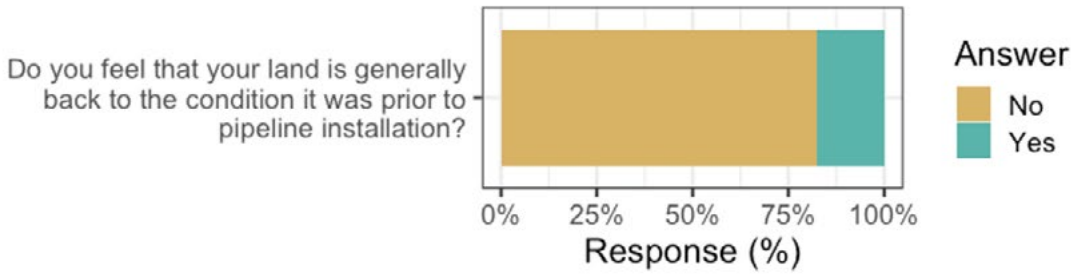

Figure 5. Percent of respondents indicating their land had generally returned to condition prior to installation.

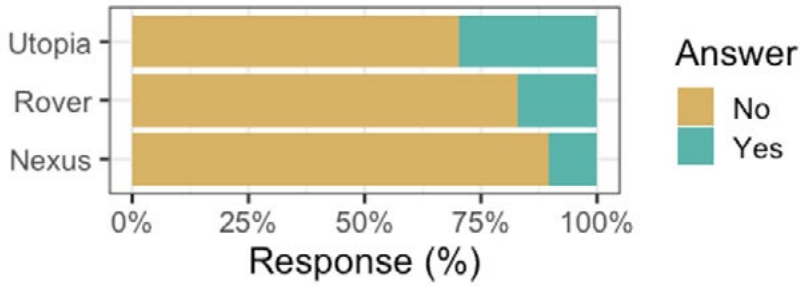

Figure 6. Percent of respondents indicating their land had generally returned to condition prior to installation, by pipeline company.

LANDOWNER PERSONAL EXPERIENCES

We asked landowners several questions about their personal experiences having pipelines installed on their land. Responses showed mixed experiences with landowners overall (Figures 7 and 8). The responses were roughly split when asked if they were treated fairly during the negotiation process: 46.2% agreed (strongly agreed or agreed) vs. 39.4% disagree (strongly disagreed or disagreed). The majority of respondents felt they were treated with respect by the installation crews, and that clear points of contact were established throughout the installation process. However, less than one-third (27.2%) agreed that the contract agreements outlining best management practices were followed properly on their land, compared to those who disagreed (37.6%; Figure 7). Interestingly, 3 out of 142 respondents from 2 different pipelines said they could sometimes smell gas over the installed pipeline.

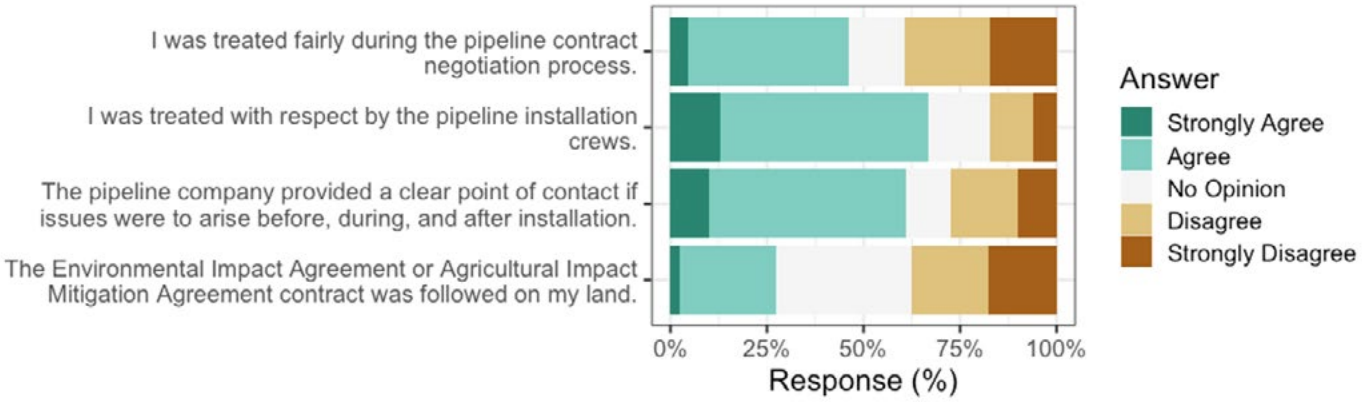

Figure 7. Percent of respondents who agree or disagree with statements about the negotiation and pipeline installation process.

When asked about their overall experience with having a pipeline installed on their land, the responses were mixed but mostly reflected negative experiences (Figure 8). Roughly half of the respondents (56.3%) were not satisfied with the experience compared to satisfied (31.9%) and a similar proportion felt they had a choice in signing the easement (30.1% agreed vs. 54.1% disagreed). About one-third of respondents (36.1%) felt that they were fairly compensated for the easement, while 46.6% did not feel fairly compensated. Finally, only a quarter (26.7%) would be open to negotiating a future easement compared with 55.6% who said they would not be open to another pipeline easement (Figure 8).

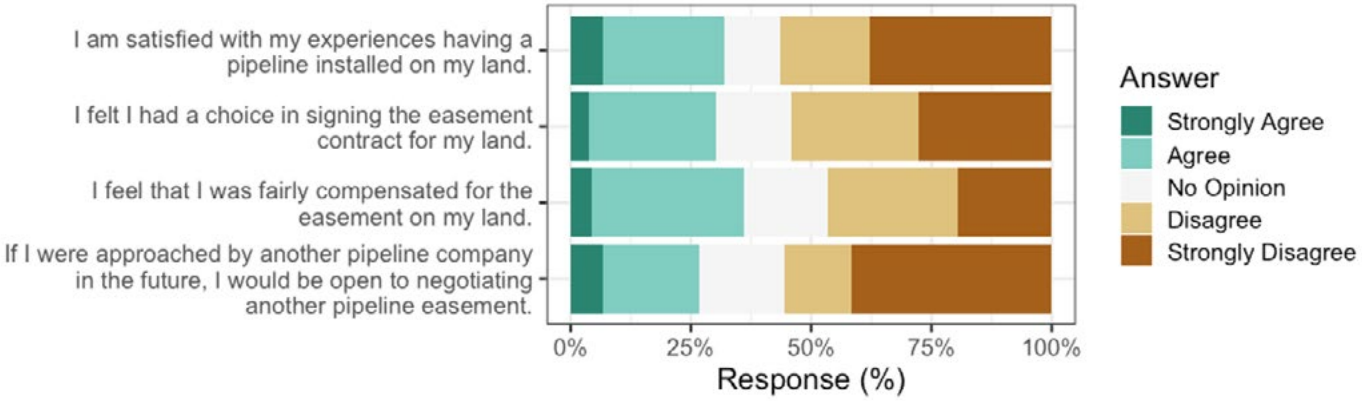

Figure 8. Overall landowner perceptions about the pipeline installation experience.

CONCLUSIONS

This survey responses here tell an important story of landowner experience and reflect what might be considered typical with contemporary pipeline installation. Despite the outlined best management practices, landowner responses suggest that these were not always followed and that many fields were worked when they were far too wet. This likely resulted in soil compaction and degradation in many fields and may be a primary reason crop yields have been reduced in most of the fields reported here. Three years after remediation was complete, 82% of respondents do not believe their land has been remediated back to the original condition, prior to pipeline installation. Additionally, less than half of respondents are satisfied with their overall experience of having a pipeline installed on their land.

This survey of farmer experiences largely reflects what our team measured on 29 farms across 8 Ohio counties in 2020 and 2021. We observed widespread soil degradation including increased compaction, increased subsoil mixing, decreased aggregate stability and decreased organic matter. This soil degradation reduced corn yields over pipeline right-of-way areas around 20% and soybean yields around 10%. Overall pipeline installation and remediation best management practices were insufficient to prevent soil degradation in the farms we sampled (Brehm, 2022).

Underground pipelines are an important aspect of Ohio's energy portfolio with more pipelines projected to be installed in the coming years. But farmers should be appropriately compensated for soil degradation and sustained crop yield losses from these activities. Current easement payments should likely be revisited, as all available evidence from Ohio suggests that degradation often persists for more than 3 or 4 years after installation and remediation is complete. Crop loss monitoring and soil remediation practices should be the focus of research efforts moving forward.

More information on this study can be found here, including reports as they become available: https://go.osu.edu/pipeline-study

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Reference

- Brehm, T. L. (2022). *Evaluating the effects of underground pipeline installation on soil and crop characteristics throughout Ohio, USA* [Master's thesis, Ohio State University]. OhioLINK Electronic Theses and Dissertations Center. http://rave.ohiolink.edu/etdc/view?acc_num=osu1650551091519984

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