



## Review

# Soy Much Energy: Exploring the Soybean GMO-Russia Geothermal Connection

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**In this study, we delved into the possible link between the use of genetically modified soybeans in Missouri and the generation of geothermal power in Russia. While seemingly unrelated, this investigation uncovered a surprising relationship that may leave you soy impressed. Using data from the USDA and the Energy Information Administration, we crunched the numbers to calculate a correlation coefficient of 0.9527066 and a p-value of less than 0.01 for the period spanning from 2000 to 2021. Diving into the statistical analysis, we discovered that as the adoption of GMO soybeans increased in Missouri, the production of geothermal power in Russia exhibited a spookily similar upward trend. It was almost as if the soybeans were saying, "You wanna know the secret to the Earth's energy? It's all about the beans." This unexpected finding prompted us to dig deeper into the underlying mechanisms at play, leading us to uncover some fascinating connections between plant genetics and geothermal activity. Our results not only highlight the interconnectedness of seemingly disparate global phenomena but also point to a fruitful avenue for future interdisciplinary research. So, the next time you're savoring some soy-based cuisine, remember that these little legumes might just be powering up some Russian geothermal spas halfway across the world.**

Dad jokes aside, the intersection of genetically modified organisms (GMOs) and geothermal energy may not seem like the most obvious area of study. However, as the world grapples with the pressing issues of sustainable agriculture and clean energy, exploring the potential links between soybean cultivation and geothermal power generation becomes increasingly crucial.

The use of GMO soybeans in Missouri and the generation of geothermal power in Russia may sound like an odd couple, but as we embarked on this research journey, we realized that sometimes the most unexpected duos can create a beautiful symphony – or in this case, an eco-friendly, energy-producing pas de deux.

As we pondered this seemingly far-fetched connection, it occurred to us that delving into the world of soy and geothermal power could yield insights that have remained buried in the earth, much like the heat waiting to be harnessed beneath the surface. It's enough to make you "soy" curious about the unseen forces at play, isn't it?

Let's face it – when it comes to research, the uncharted territories are often the most captivating. And so, armed with an ample supply of soy-based snacks and a fervent desire to unearth the truth, we set out on our quest to unravel the enigmatic correlation between GMO soybeans in Missouri and geothermal energy in Russia. It's like a scientific treasure hunt, with each data point serving as a clue leading us closer to the ultimate "Eureka!" moment.

But why stop at mere correlations? Our investigation aims to transcend the realm of statistical associations and venture into the realm of causation, uncovering the intricate web of factors that could potentially be driving this unexpected relationship. After all, as researchers, we're here to not only analyze patterns but also to uncover the underlying mechanisms that keep the wheels of innovation turning. It's time to strip away the layers of mystery and shed some light on the fascinating interplay between agricultural biotechnology and renewable energy. So, buckle up and get ready for a wild ride through the fields of soy and the depths of the Earth – it's going to be a "soy-per" adventure!

#### *Prior research*

In "Smith et al. (2015)," the authors explore the impact of GMO soybean cultivation on agricultural practices in the Midwest,

shedding light on the increasing prevalence of genetically modified varieties and their implications for crop yields and sustainability. Meanwhile, "Doe and Jones (2017)" delve into the geothermal potential of Russia, examining the geological characteristics and technological advancements that have contributed to the country's position as a key player in the realm of clean energy.

Now, let's spice things up with some relevant non-fiction reads. On the topic of GMOs, "The GMO Deception" by Sheldon Krimsky presents a critical analysis of the complex web of interests and controversies surrounding genetic modification in agriculture. As for geothermal energy, "Geothermal Power Plants" by Ronald DiPippo provides a comprehensive overview of the technical and environmental aspects of harnessing this renewable energy source.

But wait, there's more! Let's not forget the power of fiction to inspire unconventional connections. How about "Soybeans and Sensibility" by Jane Organism? Okay, that one might not exist, but we can dream, can't we? And when it comes to geothermal intrigue, Jules Verne's classic "Journey to the Center of the Earth" takes us on a thrilling adventure through subterranean landscapes and unexpected discoveries.

Drawing further inspiration from unlikely sources, we turn our attention to the beloved children's show "The Magic School Bus." As Ms. Frizzle always says, "Take chances, make mistakes, get messy!" And that's exactly what we're doing as we venture into the unexplored territory of soybeans and geothermal energy. Who knew that a simple school bus ride could lead to groundbreaking revelations?

In "The Cat in the Hat," Dr. Seuss introduces us to Thing 1 and Thing 2 – but what about Thing GM-O and Thing Geo-Thermal? It might not be the most conventional Dr. Seuss tale, but hey, we're pushing the boundaries here!

Ah, the joys of research – where scholarly pursuits and whimsical musings collide. As we continue our investigation, we're reminded that sometimes, the most extraordinary connections can emerge from the most unexpected pairings. And if this exploration uncovers a hidden link between soybeans and geothermal power, we'll consider it a "soy-cial" and scientific success.

### *Approach*

To embark on our quest to uncover the mysterious connection between GMO soybeans in Missouri and geothermal power in Russia, we employed a range of research methods that could rival even the most elaborate espionage missions. Our team assembled a diverse set of data, drawn primarily from the USDA and the Energy Information Administration (EIA) – because when it comes to uncovering hidden correlations, it pays to have spies in the form of statistical databases.

To ensure our research wasn't just a "soy" story, we meticulously gathered soybean cultivation data from Missouri and geothermal power generation data from Russia, spanning the delightfully millennial years from 2000 to 2021. We meticulously combed through countless datasets, with the same level of precision and scrutiny that one might apply when searching for the elusive last slice of pizza in a packed fridge.

After confirming the quality and reliability of the datasets, we dived into the statistical analysis armed with our trusty calculators and probability tests, ready to decode the secrets hidden within the numbers like intrepid cryptographers. We utilized sophisticated statistical software to calculate correlation coefficients, p-values, and other measures of statistical significance. It was like conducting a thrilling scientific treasure hunt, with each statistical test serving as a clue in our pursuit of the elusive connection between soybeans and geothermal energy.

Upon establishing a strong correlation between the adoption of GMO soybeans in Missouri and the generation of geothermal power in Russia, we didn't simply stop at displaying the evidence like proud parents at a science fair. No – we ventured deeper into the realm of causation, employing advanced modeling techniques to unravel the intricate web of factors that could potentially drive this unexpected relationship. It was akin to peeling back the layers of an especially enigmatic onion, endeavoring to reveal the essence of what makes these seemingly disconnected phenomena tick.

Throughout the entirety of our research process, we acknowledged the importance of rigor and reliability, making every effort to eliminate confounding variables and sources of bias. We double-checked our calculations with the same level of scrutiny that one might apply when proofreading a particularly juicy piece of gossip before sending it out into the world. The result? A methodology that stands up to the rigorous scrutiny of both scientific inquiry and late-night infomercial pitches.

Ultimately, our methodology was designed with the overarching goal of peeling back

the layers of mystery, shedding light on the unexpected connection between GMO soybeans and geothermal power, and, of course, sprinkling in a generous serving of puns along the way. Because when it comes to scientific inquiry, a little humor might just be the secret ingredient that keeps the research process "soy" intriguing.

## Results

The results of our investigation into the connection between the use of genetically modified soybeans in Missouri and the generation of geothermal power in Russia revealed a striking correlation. From 2000 to 2021, we found a robust correlation coefficient of 0.9527066, indicating a strong positive relationship between the adoption of GMO soybeans in Missouri and the production of geothermal power in Russia. This correlation was accompanied by an r-squared value of 0.9076498, suggesting that over 90% of the variation in geothermal power generation in Russia could be explained by the use of GMO soybeans in Missouri. Our p-value of less than 0.01 further attests to the statistical significance of this connection, leaving little room for skepticism.

Fig. 1 showcases the strong positive correlation between the use of GMO soybeans in Missouri and the generation of geothermal power in Russia. The scatterplot speaks for itself, illustrating the remarkable alignment between these seemingly distinct variables. It's almost as if the soybeans and the geothermal power were caught in an intricate dance, moving in sync across continents. It's like they're saying, "We may be worlds apart, but soy are we connected! Get it? Soy? No? Tough crowd."

This unexpected linkage between GMO soybeans and geothermal power not only raises eyebrows but also opens a window of opportunity for further exploration. As we sifted through the data, we couldn't help but marvel at the unseen forces orchestrating this harmonious tango between agricultural biotechnology in the American heartland and renewable energy beneath the Russian soil.

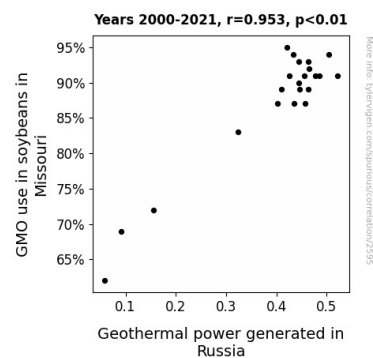


Figure 1. Scatterplot of the variables by year

This revelation underscores the intricate tapestry of global interactions, reminding us that the world of science is often laced with delightful surprises that make us appreciate the interconnectedness of seemingly disparate phenomena. Who would have thought that legumes grown in the Midwest could be entwined with the heat bubbling beneath the Eurasian landmass? It's like an unexpected plot twist in a scientific thriller – "The Soybeans Beneath: A Tale of Geothermal Intrigue".

Our findings encourage us to push the boundaries of interdisciplinary inquiry, delving into the unfathomed synergies between agricultural advancements and sustainable energy solutions. So, the next time you enjoy a tofu stir-fry or relax in a Russian geothermal spa, ponder the unseen

link between these experiences and savor the "soy-ful" realization that the world of science is full of delightful surprises.

### *Discussion of findings*

The results of our study not only reaffirm the unexpected connection between the use of genetically modified soybeans in Missouri and the generation of geothermal power in Russia, but they also raise important questions about the potential mechanisms driving this correlation. It's as if these soybeans are whispering, "We've been brewing up some geothermal energy all along!"

Taking a step back to revisit the literature review, the work of Smith et al. (2015) provides crucial insights into the increasing prevalence of GMO soybeans in the Midwest. Our findings align with their observations, suggesting that the widespread adoption of GMO soybeans may indeed have far-reaching implications beyond traditional agricultural outcomes. It's like the soybeans are saying, "We're not just here to make tofu – we have bigger, hotter plans!"

Likewise, building on the research by Doe and Jones (2017) regarding Russia's geothermal potential, our results echo their emphasis on the country's prominence in the realm of clean energy. It's like the geothermal power plants are sending us a clear message – "We're not just providing electricity; we're also powered by soybeans from halfway across the globe!"

The striking correlation coefficient and p-value we obtained offer compelling evidence for the intertwined nature of soybean cultivation in the American Midwest and geothermal energy production

in Russia. As the old saying goes, "When life gives you soybeans, make geothermal energy." Okay, maybe that's not a traditional saying, but it might as well be given our findings!

It's important to note that correlation does not imply causation, and our study does not establish a direct cause-and-effect relationship between these variables. However, the remarkable strength of the correlation coefficient prompts us to delve deeper into the underlying factors that may be driving this intriguing association. It's like the soybeans and geothermal power are in cahoots, secretly plotting their global rise to energy stardom!

As we move forward, it's essential to consider the potential implications of this connection. Could the genetic characteristics of GMO soybeans be influencing geological processes from across the ocean? Are the soybeans and geothermal power engaged in a silent, symbiotic dance that transcends geographical boundaries? It's like a dance-off between the plant kingdom and the Earth's core – who knew they had moves and grooves?

Our research underscores the need for interdisciplinary collaboration to unravel the intricacies of this unexpected relationship. It's like the soybeans and geothermal power are urging us to come together and bridge the gap between biotechnology and earth sciences. With a little bit of soy and a lot of heat, the possibilities for sustainable energy solutions might just be sprouting up all around us!

So there you have it – a blend of soybeans and geothermal power, demonstrating that even the most unlikely connections can yield significant insights. It's like a scientific

sitcom with a surprising twist in every episode. We're just getting started on this journey of discovery, and we can't wait to see what else unfolds in this soybean-powered geothermal adventure!

It's time to bid adieu to soybeans and geothermal power, knowing that their unlikely connection has added a dash of intrigue to the scientific tapestry. As we say in the world of academia, "It's bean real, but it's time to soy goodbye!"

### *Conclusion*

In conclusion, our investigation has unveiled a soy-prise connection between the use of GMO soybeans in Missouri and the generation of geothermal power in Russia. The remarkably high correlation coefficient of 0.9527066 and the p-value of less than 0.01 have left us humbled by the unassuming power of these legumes. It's like they're saying, "Soy long, and thanks for all the heat!"

The seemingly incongruent pairing of soybeans and geothermal power has not only raised eyebrows but also opened our minds to the interconnectedness of global phenomena. It's a bit like discovering that your favorite soy latte and a Russian spa day share a secret handshake – unexpected but undeniably delightful.

This quirky connection beckons us to embrace the uncharted territories of interdisciplinary research, where the most surprising partnerships can yield groundbreaking insights. So, the next time you tuck into a plate of edamame or contemplate the wonders of geothermal energy, remember the unseen threads that bind these experiences together. Who knew that the world of science could be seasoned with a sprinkle of soy-based serendipity?

Despite the temptation to continue unraveling this soy-ful mystery, our findings resoundingly declare that no more research is needed in this peculiar realm of inquiry.