# Physics Simulations for Agriculture-Themed Video Games: A Comprehensive Research Plan

The integration of physics into video games has become a cornerstone of creating immersive and engaging virtual worlds. This is particularly true for simulation games, where the believability of interactions and environmental responses significantly impacts the player experience.1 In the context of agriculture-themed video games, the incorporation of realistic physics has the potential to elevate the level of immersion, enhance gameplay mechanics, and even provide educational value. This document presents a comprehensive research plan focused on developing physics simulations specifically tailored for agriculture-themed video games, covering essential physics concepts, existing technologies, integration strategies, user experience considerations, and a detailed roadmap for research and development.

**1. Objectives of Physics Simulations in Agriculture Video Games**

The primary aim of implementing physics simulations in agriculture video games is to create a more authentic and captivating experience for the player. This involves more than just visual enhancements; it requires simulating the underlying physical principles that govern interactions within an agricultural environment. Realistic physics are fundamental to crafting virtual worlds that resonate with players, especially in genres where a heightened sense of realism and interactivity is expected.1 By defining how objects move, collide, and react to player inputs, physics simulations breathe life into the digital landscape.1 Without them, these virtual environments would feel static and lack the dynamism that makes them truly engaging.

A core objective is to enhance the overall realism and immersion within the game world. When physical elements behave as they would in reality – for instance, gravity affecting falling objects, collisions generating appropriate reactions, and player inputs resulting in predictable outcomes – it fosters a stronger sense of presence for the player within the virtual space.1 Details such as the way a vehicle handles on different terrains or the visual and physical response of soil to machinery contribute significantly to this authenticity.6 Player discussions within the gaming community highlight a desire for more than just superficial graphical changes, extending to tangible physical consequences of in-game actions, such as ground deformation and nuanced soil physics.7 The implementation of soil physics, where the amount of ground slip experienced by a tractor varies based on soil type and moisture content, exemplifies this objective.8 Even seemingly subtle interactions, like the feeling of trudging through mud or the sensation of slipping on ice, can contribute to a more enjoyable and interactive experience.10 In virtual reality applications, realistic physics are even more critical for immersion, as the way virtual objects react to player interactions must align with real-world expectations to maintain the illusion of presence.1

Beyond realism, another key objective is to increase player engagement and interactivity. Physics simulations should empower players to interact with the agricultural environment in ways that feel both intuitive and dynamic. When players can observe realistic physical consequences resulting from their actions, it fosters a deeper connection with the game and encourages creative problem-solving.1 For example, the ability to manipulate objects or utilize environmental elements to their advantage, with outcomes governed by physics, can lead to emergent gameplay moments that keep players invested.1 The capacity for players to experiment and witness believable reactions, such as water flowing realistically across terrain or soil compaction influencing planting efficiency, encourages exploration and a sense of agency within the game world.

Furthermore, realistic physics can introduce new layers of strategic decision-making to agriculture games. The nuanced handling of vehicles based on terrain and load, the tangible consequences of soil conditions on equipment operation, and the impact of weather on physical processes can all contribute to a more strategic gameplay experience.6 Simulating the physical limitations and interactions of agricultural machinery with the environment, such as traction, weight distribution, and soil resistance, can compel players to make more deliberate choices regarding equipment selection and operational strategies.8 Instead of simply opting for the most powerful machinery, players might need to consider factors like tire type, soil moisture levels, and the weight of attached implements to avoid becoming stuck or causing damage to the land, thereby adding a strategic layer to farm management.

While not always the primary focus, the incorporation of realistic physics can also indirectly enhance the educational value of agriculture video games. By accurately depicting the physical constraints and interactions within an agricultural system, the game can offer a more intuitive understanding of real-world challenges and best practices.8 This can be true even if the primary goal is not explicit education. For instance, if players experience the realistic effects of over-irrigating a field, such as waterlogging and reduced crop yield due to a lack of oxygen in the soil – a consequence of fluid dynamics and soil mechanics – they might gain a more profound understanding of water management in agriculture than through simply reading about it. Existing research indicates the potential of games to allow players to test scenarios and consider risk management practices 13, and Farming Simulator, for example, has been utilized as an educational tool to raise awareness about precision farming techniques.12

**2. Literature Review**

A comprehensive understanding of the current state of physics simulations in both the gaming and agriculture technology domains is crucial for developing an effective research plan. The gaming industry has a long history of leveraging physics engines to create compelling and immersive experiences.5 Whether the goal is to achieve photorealistic accuracy or to create exaggerated physics for enhanced fun, physics systems are integral to crafting believable and dynamic game worlds.1 Engines like Havok and PhysX are widely adopted by game developers to implement real-time physics simulations, handling aspects such as rigid body dynamics, soft body deformation, ragdoll effects, and fluid movement.5 Advancements in these simulation technologies are continuously pushing the boundaries of what is possible in terms of visual fidelity and interactive complexity in gaming.16 Realistic physics contribute significantly to player immersion, the creation of dynamic and responsive environments, and more natural character animations.3 However, achieving a balance between realism and performance remains a significant challenge, as detailed simulations can be computationally demanding.1 Developers employ various optimization techniques, including algorithmic refinements, level of detail adjustments, asynchronous processing, and hardware acceleration, to mitigate these challenges.16 The fact that physics engines automate complex calculations is a significant benefit, saving valuable development time and resources.17 Examining how physics are implemented in successful simulation games across different genres can provide valuable insights into effective techniques and common pitfalls to avoid when developing for agriculture-themed games.

In the realm of agriculture technology, physics-based models play a vital role in research and software applications. Games are increasingly recognized as valuable tools for agricultural field research, offering cost-effective alternatives to traditional experimental designs.19 These games can simulate various agricultural scenarios for educational purposes and to recreate learning experiences.19 While the primary focus of many existing agriculture games might not be on hardcore physics simulations, the underlying principles and models used in agricultural science can significantly inform the development of more realistic game simulations.8 Agricultural science relies extensively on physics-based models to understand and predict phenomena such as soil moisture transport, nutrient uptake, and plant growth responses to environmental factors. Farming Simulator, for instance, incorporates features relevant to precision agriculture education, demonstrating the potential for integrating sophisticated agricultural concepts into a game environment.12 Research also supports the effectiveness of computer games as educational tools for conveying agricultural knowledge and promoting sustainable practices.14

The convergence of advancements in physics simulation techniques within the gaming industry and the domain-specific knowledge from agricultural science presents a significant opportunity. The increasing computational power of gaming hardware now allows for more complex simulations than were previously feasible.1 Furthermore, the demonstrated demand for realism in simulation games suggests a receptive market for agriculture games that incorporate more advanced physics.7 By leveraging cutting-edge physics simulation techniques, a new generation of agriculture video games can be created that offer a more authentic, engaging, and potentially educational experience compared to existing titles.6 Current agriculture simulators often simplify or abstract complex physical processes. Drawing upon the advancements in game physics and the scientific rigor of agricultural models can lead to games that are not only entertaining but also provide a deeper and more nuanced understanding of farming practices and their underlying physical principles.

**3. Technical Requirements**

Developing realistic physics simulations for agriculture-themed video games necessitates careful consideration of the specific physics models, software tools, and hardware capabilities required.

**3.1 Physics Models**

Several key physics models are particularly relevant to agriculture gameplay:

* **Fluid Dynamics for Irrigation:** Simulating the movement and behavior of water is crucial for representing irrigation systems accurately. This includes modeling water flow through various irrigation methods such as sprinklers, drip irrigation systems, and open canals. Furthermore, it involves simulating how water is absorbed and transported within the soil, taking into account different soil types and their varying moisture content.8 The simulation should also consider surface runoff and soil erosion that can occur due to excessive irrigation or heavy rainfall. Implementing fluid dynamics will require a choice between simplified models that prioritize performance and more complex models, such as the Navier-Stokes equations, which offer greater accuracy but demand more computational resources.1 The level of detail in the fluid simulation will directly influence both the visual fidelity of water and its impact on gameplay, requiring a balance based on the target platform and the desired player experience.
* **Soil Mechanics:** Accurate representation of soil behavior is fundamental to a realistic agriculture simulation. This includes modeling soil compaction caused by the weight of heavy machinery and its subsequent effects on plant growth, such as reduced aeration and water infiltration. Simulating soil tillage practices and their impact on soil structure and aeration is also essential. Furthermore, the model should depict the interaction between tires or tracks of vehicles and different soil types, influencing factors like grip, slippage, and ground deformation.6 Finally, simulating soil erosion caused by wind and water adds another layer of realism and potential gameplay challenges. Accurate soil mechanics will be crucial not only for realistic vehicle handling but also for simulating the long-term consequences of various farming practices on overall soil health.8
* **Plant Growth Mechanics:** While a complete biological simulation might be overly complex for a game, incorporating physics-based elements into plant growth can significantly enhance realism. This includes modeling plant growth rates based on environmental factors such as sunlight intensity, water availability in the soil, nutrient levels, and ambient temperature.8 Simulating the visual effects of water stress, such as plant wilting due to insufficient water or excessive heat, can provide immediate feedback to the player. Additionally, modeling the physical effects of wind and rain on plant health and stability, such as bending or potential damage, can contribute to a more dynamic and reactive environment.24 Linking environmental physics to plant behavior in this way can create more engaging gameplay scenarios.
* **Rigid Body Dynamics for Machinery and Objects:** The accurate simulation of the movement, collision, and interaction of all rigid objects within the game world is paramount. This includes tractors, various agricultural implements, and other farm-related objects.1 The physics of attaching and detaching implements from vehicles should also be modeled realistically, considering factors like connection points and potential for misalignment. Furthermore, simulating the forces and stresses acting on machinery, potentially leading to breakdowns or malfunctions under extreme conditions, can add depth to the gameplay. Ensuring that agricultural vehicles possess realistic weight, inertia, and handling characteristics is essential for providing a satisfying and authentic simulation experience.8

**3.2 Software Tools**

The selection of appropriate software tools is critical for the successful development of these physics simulations:

* **Game Engine:** A robust game engine is essential for providing the foundational framework for the game and integrating the physics simulations. Popular choices include Unity and Unreal Engine, both of which offer powerful built-in physics integration capabilities.10 Unity utilizes PhysX for its physics simulations, while Unreal Engine employs its own Chaos physics system.24 The chosen engine should facilitate seamless integration of the developed physics models with other game elements, such as graphics rendering, audio, and gameplay logic.15 The decision of which engine to use will significantly impact the available physics tools and the ease of integration, necessitating careful consideration of engine features and performance characteristics based on the complexity of the desired simulations.15
* **Physics Engine:** While game engines offer integrated physics solutions, in certain cases, a standalone physics engine might be beneficial. This could be due to the need for more advanced features or potentially better performance for specific types of simulations required in agriculture, such as highly complex fluid dynamics or detailed soil deformation. Examples of standalone physics engines include Bullet Physics, an open-source engine known for its stability and accuracy, and Havok, a widely used industry standard offering realistic physics and animation capabilities.5 The decision to utilize a standalone physics engine alongside the game engine would depend on the specific requirements of the project.
* **Development Tools and Libraries:** Depending on the complexity and specific needs of the physics simulations, other specialized development tools and libraries might be required. For instance, computational fluid dynamics (CFD) libraries could be necessary for implementing advanced fluid flow simulations.

**3.3 Hardware Requirements**

Adequate hardware capabilities are necessary both for the development process and for the target platforms on which the game will be played:

* Development workstations will require sufficient processing power (CPU), graphics processing power (GPU), and random-access memory (RAM) to handle the computationally intensive tasks of developing and testing complex physics simulations.
* It is crucial to consider the hardware limitations of the intended target platforms, whether they are high-end PCs, gaming consoles, or mobile devices.1 The complexity and fidelity of the physics simulations will directly impact the minimum and recommended hardware specifications for the game. Optimization of the physics calculations and underlying data structures will be essential to ensure smooth and consistent performance across the target platforms.1 Techniques such as simplifying or optimizing physics calculations by reducing unnecessary details or using specialized algorithms can be employed.1 Utilizing the parallel processing capabilities of the GPU through hardware acceleration can also significantly improve simulation performance.16 Careful planning and continuous optimization will be necessary to achieve a balance between realistic physics and a fluid gaming experience.

**Table 1: Comparison of Physics Engines**

| **Physics Engine** | **Developer/Maintainer** | **Licensing Model** | **Key Features** | **Integration with Major Game Engines** | **Noteworthy Games Using This Engine** |
| --- | --- | --- | --- | --- | --- |
| PhysX | NVIDIA | Proprietary | Rigid body, soft body, particle systems, fluid dynamics, cloth simulation | Unity, Unreal Engine | Borderlands series, Batman: Arkham series, Mafia II |
| Chaos | Epic Games | Proprietary | Rigid body, destruction, fracturing, cloth simulation | Unreal Engine | Fortnite, Gears 5, Borderlands 3 |
| Havok | Microsoft | Proprietary | Rigid body, soft body, fluid dynamics, cloth simulation, vehicle dynamics, animation | Unity, Unreal Engine | Grand Theft Auto series, Assassin's Creed series, Halo series |
| Bullet Physics | Erwin Coumans | Open Source | Rigid body, soft body, collision detection | Unity, Unreal Engine, Godot | Grand Theft Auto IV, Red Dead Redemption, Blender (for simulations) |

This table provides a comparative overview of several prominent physics engines, highlighting their key features, licensing models, and compatibility with major game engines. This information will assist in making an informed decision regarding the most suitable physics engine for the project based on its specific requirements and constraints.

**4. Methodology**

The research and development of physics simulations for agriculture-themed video games will follow a phased approach, allowing for iterative development, testing, and refinement.

* **Phase 1: Research and Prototyping (Focus on Core Agricultural Physics):** This initial phase will concentrate on gaining a deep understanding of the relevant physics principles and developing foundational prototypes. It will begin with in-depth research into the physics models that govern irrigation, soil mechanics, and plant growth, drawing upon established agricultural science literature. Following this research, basic prototypes for each key physics concept will be developed using the chosen game engine and/or physics engine. The primary focus at this stage will be on simulating the fundamental behaviors associated with each concept, such as water flowing under the influence of gravity, soil deforming in response to applied pressure, and simple plant growth influenced by water availability. Initial performance testing will be conducted on these core simulations to identify any potential bottlenecks early in the development process. Starting with these focused prototypes for individual agricultural physics concepts will allow for an iterative approach to development and validation of the core mechanics before their integration into a larger game environment. This modular approach will reduce complexity and facilitate the early identification and resolution of potential technical challenges associated with specific physics simulations.
* **Phase 2: Integration with Game Engine and Basic Gameplay Mechanics:** The second phase will focus on integrating the previously prototyped physics simulations into the chosen game engine environment. This will involve establishing communication pathways between the physics engine and the game engine to ensure seamless data exchange. Basic gameplay mechanics will then be developed around these integrated simulations, such as allowing the player to operate simple irrigation systems or utilize rudimentary types of farm equipment that interact with the physics systems. Basic collision detection and interaction mechanisms between various game objects and the physics simulations will also be implemented during this phase. The primary goal of this phase is to address the technical challenges associated with making the physics simulations interact effectively with other game elements and to ensure that they contribute meaningfully to the initial gameplay experience. Integrating physics into a game world requires careful consideration of data flow and synchronization between the physics engine and the game engine, and this phase will specifically address these technical aspects.
* **Phase 3: Advanced Physics Implementation and Gameplay Enhancement:** In the third phase, the complexity and fidelity of the physics simulations will be increased. This will involve implementing more advanced physics models, such as those for soil erosion, more intricate plant growth patterns influenced by multiple environmental factors, and detailed vehicle physics that account for factors like load distribution and tire characteristics. The gameplay mechanics will be expanded to fully leverage these more sophisticated physics simulations. For example, players might need to strategically manage irrigation to prevent soil erosion or experience the impact of soil compaction on their subsequent crop yields. Furthermore, user interfaces and feedback mechanisms will be developed to effectively communicate the effects of the physics simulations to the player, providing them with the necessary information to understand and react to the dynamic environment. This phase aims to deepen the gameplay experience by introducing more nuanced and realistic physical interactions that have a significant impact on the player's strategic choices and the overall outcome of their farming endeavors. Moving beyond basic physics to these more complex simulations will allow for richer and more engaging gameplay scenarios that more closely reflect the complexities of real-world agriculture.
* **Phase 4: Testing, Optimization, and Refinement:** The final phase will be dedicated to rigorous testing, optimization, and refinement of the implemented physics simulations and their integration with the game. Extensive testing will be conducted to evaluate the accuracy, stability, and performance of the physics across the target platforms. Performance metrics, such as frame rates and CPU/GPU usage, will be closely monitored to identify and address any performance bottlenecks caused by the physics calculations. Player feedback on the realism and overall fun factor of the physics simulations will be gathered through playtesting sessions. Based on the testing results and player feedback, the physics models and gameplay mechanics will undergo iterative refinement to ensure they meet the desired quality standards and contribute positively to the overall gaming experience. Continuous testing and optimization are crucial for ensuring that the advanced physics simulations enhance the game without negatively impacting performance or player enjoyment. Player feedback will be invaluable in striking the right balance between achieving a high degree of realism and maintaining an engaging and enjoyable gameplay experience.

**5. Evaluation Metrics**

To effectively measure the success and realism of the developed physics simulations, several key evaluation metrics will be employed:

* **Accuracy of Physics Simulations:** The accuracy of the simulations will be evaluated by comparing their outputs with real-world data or established agricultural models. For example, simulated water infiltration rates in different soil types can be compared to empirical data, and the predicted slippage of vehicles on various terrains can be benchmarked against real-world observations. Qualitative assessments will also be sought from agricultural experts to gauge the plausibility of the simulated phenomena. Establishing these benchmarks based on real-world agricultural data will be essential for objectively evaluating the accuracy of the physics simulations. To claim a degree of realism, the simulations need to be grounded in actual physical behavior, and comparing simulation outputs to scientific data will provide a measure of this accuracy.
* **Impact on Gameplay Engagement:** The impact of the physics simulations on player engagement will be assessed through various metrics. These include monitoring player engagement statistics such as playtime, session length, and the frequency with which players interact with physics-based elements within the game. Furthermore, player feedback will be actively solicited through surveys and dedicated playtesting sessions to understand their perceptions of the enjoyment and intuitiveness of the physics interactions. Ultimately, the success of the physics simulations will depend on whether they enhance the player's enjoyment and overall engagement with the game. Player feedback and engagement metrics will serve as key indicators of this success. Realistic physics alone do not guarantee a fun game, so the evaluation must specifically address how the physics contribute to the overall gameplay experience.
* **Level of Immersion:** The level of immersion achieved through the physics simulations will be evaluated primarily through qualitative feedback from players. This will involve gathering their opinions on the believability of the game world and the sense of presence created by the realistic physics. Observational analysis of player behavior during playtesting sessions will also be conducted to see if players interact with the environment in a manner that suggests they believe in the underlying physics. Immersion, while subjective, is a crucial aspect of a successful simulation game. Gathering qualitative feedback on how the physics contribute to the feeling of being present in a realistic agricultural environment will be an important aspect of the evaluation process. The goal is to create a world that feels real, and player feedback on their sense of immersion will help determine if the physics simulations are effectively achieving this objective.
* **Performance Metrics:** Maintaining acceptable performance is critical for a positive user experience. Throughout the development process and during testing, various performance metrics will be continuously monitored. This includes measuring frame rates achieved during gameplay with the physics simulations active, as well as tracking CPU and GPU usage to identify any potential bottlenecks caused by the physics calculations. Addressing any performance issues that arise will be a priority to ensure smooth and enjoyable gameplay.1 Even the most accurate and realistic physics simulations are ineffective if the game runs poorly. Therefore, consistently monitoring and optimizing performance metrics will be essential to ensure the game is playable on the intended target platforms.
* **Educational Value (If Applicable):** If the game has explicitly defined educational goals related to agriculture or physics principles, specific evaluation methods will be employed. This could involve administering pre- and post-gameplay questionnaires to assess any knowledge gained by players. Additionally, player behavior during gameplay can be analyzed to see if they are making decisions that align with real-world agricultural best practices, suggesting an understanding of the underlying principles. If education is a specific aim of the game, it is important to measure whether the physics simulations are effectively conveying relevant information or principles to the players.

**6. Timeline**

The following timeline provides a realistic estimate for completing the research and development phases of this project:

* **Phase 1: Research and Prototyping (3 Months):**
  + Month 1: Conduct a comprehensive literature review on agricultural physics models and analyze existing implementations of physics in relevant game genres.
  + Month 2: Develop basic functional prototypes for core agricultural physics concepts, including fluid dynamics for irrigation, soil mechanics focusing on deformation, and a simplified model for plant growth.
  + Month 3: Perform initial performance testing on the developed prototypes and refine them based on the results.
  + **Milestone 1:** Achieve functional prototypes for the core agricultural physics concepts.
* **Phase 2: Integration with Game Engine and Basic Gameplay Mechanics (4 Months):**
  + Month 4: Integrate the developed physics prototypes into the chosen game engine environment.
  + Month 5: Develop basic gameplay mechanics that directly interact with the integrated physics systems, such as controlling tractors and operating rudimentary irrigation equipment.
  + Month 6: Implement basic collision detection and interaction mechanisms between various game objects and the physics simulations.
  + Month 7: Conduct initial testing of the integrated systems and basic gameplay mechanics.
  + **Milestone 2:** Develop a basic playable build of the game with core physics integrated into fundamental gameplay mechanics.
* **Phase 3: Advanced Physics Implementation and Gameplay Enhancement (5 Months):**
  + Month 8-9: Implement more advanced physics models, including those for soil erosion, more complex plant growth influenced by multiple factors, and detailed vehicle physics.
  + Month 10-11: Expand the existing gameplay mechanics to fully leverage the capabilities of the advanced physics simulations, creating more intricate and realistic scenarios.
  + Month 12: Develop user interface and user experience (UI/UX) elements to effectively communicate the effects of the physics simulations to the player, providing necessary feedback.
  + **Milestone 3:** Achieve a build of the game that incorporates advanced physics features and enhanced gameplay mechanics that significantly utilize these features.
* **Phase 4: Testing, Optimization, and Refinement (4 Months):**
  + Month 13-14: Conduct extensive internal testing of the game, focusing on identifying and fixing bugs related to the physics simulations and their interaction with other game systems.
  + Month 15: Organize playtesting sessions with the target audience to gather valuable feedback on the realism, engagement, and performance of the physics simulations.
  + Month 16: Perform optimization and refinement of the physics models and their implementation based on the results of internal testing and player feedback.
  + **Milestone 4:** Produce a final polished build of the game that is ready for potential release or further stages of development.
* **Total Estimated Timeline: 16 Months**

This timeline represents an initial estimate and may require adjustments based on the complexity of the chosen physics models, the size and expertise of the development team, and any unforeseen technical challenges that may arise during the development process. Game development, particularly when involving advanced physics simulations, is often an iterative process, and the timeline should be considered flexible and subject to revisions based on the progress and findings during each phase.

**7. Conclusions**

The integration of realistic physics simulations into agriculture-themed video games holds significant potential for enhancing player immersion, engagement, and even educational value. By carefully considering the relevant physics concepts, leveraging existing technologies, and following a structured research and development plan, it is possible to create a new generation of agriculture games that offer a more authentic and compelling experience. The phased methodology outlined in this plan, coupled with the defined evaluation metrics, provides a robust framework for achieving this goal. While challenges related to computational demands and the balance between realism and gameplay fun will need to be carefully navigated, the increasing power of gaming hardware and the growing demand for realistic simulations make this research direction a promising avenue for innovation in the agriculture gaming genre.

#### Works cited

1. Exploring the Importance of Game Physics in Console Games ..., accessed May 5, 2025, <https://sdlccorp.com/post/exploring-the-importance-of-game-physics-in-console-games/>
2. sdlccorp.com, accessed May 5, 2025, <https://sdlccorp.com/post/exploring-the-importance-of-game-physics-in-console-games/#:~:text=Game%20physics%20is%20at%20the,every%20pixel%20on%20the%20screen.>
3. The Role of Physics Simulations in 3D Gaming Animations - AAFT, accessed May 5, 2025, <https://aaft.com/blog/animation-multimedia/the-role-of-physics-simulations-in-3d-gaming-animations/>
4. Immersion Through Video Games - USC Viterbi School of Engineering, accessed May 5, 2025, <https://illumin.usc.edu/immersion-through-video-games/>
5. The Role of Physics in Game Development - Play Fusion, accessed May 5, 2025, <https://www.playfusion.org/blog/the-role-of-physics-in-game-development>
6. Farming Simulator 2025: Everything You Need to Know - Delanclip, accessed May 5, 2025, <https://delanclip.com/farming-simulator-2025-article/>
7. Why do people care so much about realistic ground deformation? : r/farmingsimulator, accessed May 5, 2025, <https://www.reddit.com/r/farmingsimulator/comments/1dxy5sw/why_do_people_care_so_much_about_realistic_ground/>
8. The next Farming Simulator must have simulations of soil physics :: Farming Simulator 19 General Discussions - Steam Community, accessed May 5, 2025, <https://steamcommunity.com/app/787860/discussions/0/1812044473313637817/>
9. My Uncut First Impressions Of Starting, Log Physics and Overall Feel of Farming Simulator 2025 - YouTube, accessed May 5, 2025, <https://www.youtube.com/watch?v=fLjKRN7oT9U>
10. Incorporating Physics in Video Games | Science Project, accessed May 5, 2025, <https://www.sciencebuddies.org/science-fair-projects/project-ideas/Games_p031/video-computer-games/physics-in-video-games>
11. More hardcore physics would NOT be that bad : r/farmingsimulator - Reddit, accessed May 5, 2025, <https://www.reddit.com/r/farmingsimulator/comments/1i2qxad/more_hardcore_physics_would_not_be_that_bad/>
12. Farming Simulator, Agricultural Education Role of AgriNext, accessed May 5, 2025, <https://agrinextcon.com/farming-simulator-agricultural-education-and-the-role-of-agrinext-conference-in-fostering-agriculture-education/>
13. www.agdaily.com, accessed May 5, 2025, <https://www.agdaily.com/technology/new-farm-games-and-simulators-teach-players-about-ag/#:~:text=Research%20conducted%20by%20a%20Ukrainian,and%20weigh%20risk%20management%20practices.>
14. Stimulating awareness of precision farming through gamification: the farming simulator case, accessed May 5, 2025, <https://centaur.reading.ac.uk/117835/>
15. Realism in Gaming with Havok: Enhancing Immersive Experiences - Curate Partners, accessed May 5, 2025, <https://curatepartners.com/blogs/skills-tools-platforms/unlocking-realism-in-gaming-with-havok-enhancing-immersive-experiences/>
16. Advancements in Realistic Physics Simulation for Games - Argentics, accessed May 5, 2025, <https://www.argentics.io/advancements-in-realistic-physics-simulation-for-games>
17. Physics Engine: A Key Component of Game Engines - Bluebird International, accessed May 5, 2025, <https://bluebirdinternational.com/physics-engine/>
18. How Does Video Game Physics Work - Game Design Skills, accessed May 5, 2025, <https://gamedesignskills.com/game-development/video-game-physics/>
19. Games and Fieldwork in Agriculture: A Systematic Review of the ..., accessed May 5, 2025, <https://www.mdpi.com/2073-4336/11/4/47>
20. New farm games and simulators teach players about ag - AGDAILY, accessed May 5, 2025, <https://www.agdaily.com/technology/new-farm-games-and-simulators-teach-players-about-ag/>
21. Engage, train ag's future leaders with 'Serious Education Games' - Feed Strategy, accessed May 5, 2025, <https://www.feedstrategy.com/feed-mill-of-the-future/article/15636461/engage-train-agricultures-future-leaders-with-serious-education-games>
22. Educational Video Games, Farming, and Agriculture | Filament Games, accessed May 5, 2025, <https://www.filamentgames.com/blog/educational-video-games-farming-and-agriculture/>
23. Games in Agriculture, Food, and Natural Resources Education - ERIC, accessed May 5, 2025, <https://files.eric.ed.gov/fulltext/EJ1254007.pdf>
24. Game Physics: Definition & Techniques | StudySmarter, accessed May 5, 2025, <https://www.studysmarter.co.uk/explanations/computer-science/game-design-in-computer-science/game-physics/>