Universitat Oberta de Catalunya

The Forest Rises: Desenvolupament d'un joc per a navegador web

Autor: Montserrat Guàrdia Frade

Tutor: Albert Sánchez Amo

Professor: Joel Servitja Feu

Grau de Tècniques d'Interacció Digital i Multimèdia

Videojocs

Crèdits/Copyright

FITXA DEL TREBALL FINAL

Títol del treball:	*The Forest Rises: Desenvolupament d'un joc per a navegador web.*
Nom de l'autor:	*Montserrat Guàrdia Frade*
Nom del col·laborador/a docent:	*Albert Sánchez Amo*
Nom del PRA:	*Joan Arnedo Moreno*
Data de lliurament (mm/aaaa):	*06/2023*
Titulació o programa:	*Grau de Tècniques d'Interacció Digital i Multimèdia*
Àrea del Treball Final:	*Videojocs*
Idioma del treball:	*Anglès*
Paraules clau	*Videojoc, Videogame, Clicker, Farming simulator, Browser game, Steam Deck, Linux, Godot*

Resum del Treball:

The Forest Rises és un videojoc per a navegador que posa el focus en la rehabilitació d'un ecosistema després del declivi del *Progrés*, el pas itinerant d'una societat nòmada que s'assenta en un indret, consumeix recursos, creix i es desplaça en cerca de nous ecosistemes.

L'objectiu és mostrar que qualsevol persona, amb l'acció més simple, pot beneficiar el seu entorn de maneres insospitades.

El projecte es desenvoluparà com un joc multiplataforma disponible tant per a navegador com per PC, prenent la base més simple de la interacció, un clic, com a nucli principal del seu funcionament.

S'ha seguit una metodologia de planificació per sprints, amb una primera fase de disseny del joc i document GDD i unes fases posteriors d'implementació i testeig.

Un cop dut a terme el procés de desenvolupament, el producte resultant compleix els requisits per a ser considerat una Golden Master Version, però donat l'estat actual del mercat és més adequat considerar-la una versió Early Access, llesta per a sortir al mercat i beneficiar-se del feedback directe dels seus usuaris per a millorar-ne l'experiència i atraure nous jugadors.

El present treball pretén apropar els usuaris a l'experiència dels anys 2000 de jugar a un joc en línia sense prerrequisits ni subscripcions. Ha assolit aquest objectiu per a usuaris d'ordinador, però requereix de més desenvolupament per a adaptar-ne l'ús a tauletes i telèfons, donada la seva ubiqüitat en l'actualitat.

Abstract:

The Forest Rises is a web browser game focusing on the rehabilitation of an ecosystem after the decline of Civilization, a nomadic society that settles on a biome, drains its resources to power its growth and marches on to greener, unexploited pastures.

Its primary goal is to show the Player that the smallest action can ripple beyond their self and improve the environment in the most unexpected ways.

The project will be developed as a multiplatform game, available both for browsers and PC, taking the simplest interaction, the mouse click, as the core of its progression.

The development will follow the agile methodology through sprints, its first phase centered on the general design of the game and the elaboration of a GDD document, and subsequent implementation, beta testing and reworking phases.

After the development process, the resulting product can be considered a Golden Master Version on its own but given what has been learnt on the current state of the market it is more accurate to refer to it as an Early Access version, which would benefit from sustained maintenance and direct player feedback in order to improve and deliver the best experience to current and future users.

The present work aims to bring back to internet browser users the early '00s experience of playing a game, no strings attached. It has succeeded on that front for desktop users but requires further exploration on providing tablet and smartphone browser compatibility, a staple of the '20s era.

Quotes

Life will not be contained. Life breaks free, it expands to new territories and crashes through barriers, painfully, maybe even dangerously(...). Life finds a way. – Dr. Ian Malcolm, Jurassic Park (Steven Spielberg, 1993)

"Improvise. Adapt. Overcome." – Edward Bear Grylls, Man vs. Wild (Discovery Channel, 2006–2011)

Acknowledgements

I'd like to thank the Universitat Oberta de Catalunya for the opportunity of growth and learning, and to my advisor for his patience and advice throughout the development of this thesis.

The Godot Foundation – For the support of the Godot Engine, for the chance to present this project in front of an audience in the Godot User Meeting [Valencia, 2023] and for their tips on more efficient use of the engine, which encouraged me to continue working on this project beyond this thesis' scope.

RAWR LAB Games – For their invaluable feedback on user experience, as well as the insight on the current state of the market from a publisher's point of view.

On a personal note, I would also like to thank my partner, Josep, for the emotional and technical support when first faced with new technology and throughout the learning pains, as well as my parents. All of them kept their faith in me, which carried me over when mine wavered. The support of my friends and their willingness to beta-test this project for me and lend a compassionate shoulder on which to sigh in despair when everything looked bleak are responsible for this success as well.

Finally, my most heartfelt thank you to all who beta-tested the game. Without your feedback, this project would have reached all its milestones but would most certainly be unplayable.

Abstract

The Forest Rises is a web browser game focusing on the rehabilitation of an ecosystem after the decline of Civilization, a nomadic society that settles on a biome, drains its resources to power its growth and marches on to greener, unexploited pastures.
Its primary goal is to show the Player that the smallest action can ripple beyond their self and improve the environment in the most unexpected ways.
The project will be developed as a multiplatform game, available both for browsers and PC, taking the simplest interaction, the mouse click, as the core of its progression.
The development will follow the agile methodology through sprints, its first phase centered on the general design of the game and the elaboration of a GDD document, and subsequent implementation, beta testing and reworking phases.
After the development process, the resulting product can be considered a Golden Master Version on its own but given what has been learnt on the current state of the market it is more accurate to refer to it as an Early Access version, which would benefit from sustained maintenance and direct player feedback in order to improve and deliver the best experience to current and future users.
The present work aims to bring back to internet browser users the early '00s experience of playing a game, no strings attached. It has succeeded on that front for desktop users but requires further exploration on providing tablet and smartphone browser compatibility, a staple of the '10s era.

Keywords

Clicker, browser game, farming simulator, environment, wholesome game, ecology, featureless protagonist, minimalism, Godot, Steam Deck.

Índex

Figures

Tables

1. Introduction

1.1. Introduction

The present project is an ode, first and foremost, to browser flash games.

By using the most basic user interaction and cornerstone of internet navigation, the mouse click, the game depicts the regrowth of nature after the crumbling of civilization, and how, when unhindered, life finds a way.

The world problems are huge and unmanageable for the little guy, which can be discouraging and drive us to nihilism and inaction. It is my personal goal that, subtextually, the Player associates the small action of the click -an occurrence so mundane it's become a reflex, like breathing or blinking- with change, and in turn finds that even the smallest actions in real life have positive influence in our immediate surroundings, rippling way beyond our reach.

The game itself is a coalescence of my years of experience with both farm games such as Harvest Moon, Rune Factory and Stardew Valley, and the formative experience that were browser games in the latter '90s and early '00s, with their peak in PopCap and PlayFish.

As such, this game parts from "what if there was a Harvest Moon Browser Game", and then sees its scope greatly reduced in order to fit the tight development schedule and resources.

It's aimed at a population target in its late-20's to mid-30's, who experienced the boom of internet during their formative years and can feel nostalgic for the thrill of emotion the democratization of gaming browser games brought to children and teens from households that couldn't afford "real" gaming systems.

The ultimate goal for this project is to see it published on a storefront like itch.io or Steam for a symbolic price, to benefit from its leaderboards API and foster the sense of community the Player would derive from playing at old rec Machines like Pinball or Dance Dance Revolution, while also offering it for free (minus leaderboards) on its own webpage.

The Forest Rises is also referred to hereafter as "TFR", for brevity.

1.2. Description

The project begins as an exploration of the idea, "What if there was a Harvest Moon [1] Browser Game".

Placing browser interactivity mechanics at its core, the game will begin in a grey wasteland with a single green sprout. By clicking on it, the Player will make it grow and proliferate. As the gameplay advances, more plant specimens will be unlocked as the biome regains biodiversity, until the whole environment is once again lush and thriving. Once a species is unlocked it will appear in the faraway fields and mountains, working as a diegetic inventory and showing the game progression, which will be complete once all colour has been restored.

Figure 1: Concept Art of mid-game progress

Despite the revival for the genre that Stardew Valley [2] brought 7 years ago, the market has since become flooded with reprisals of already existing mechanics.

The currently marketed games take already existing mechanics and apply them to different contexts, such as "With 3D graphics", Coral Islands [3]; "In space", One Lonely Outpost [4]; "On top of a giant beast", The Wandering Village [5] or "While managing a side-business", Graveyard Keeper [6], to name a few. And yet, in constraining themselves to the "sacred tenets" pioneered by the genre-establishing games, developers they must cut the innovation in order to fit the mechanics, instead of modifying the mechanics to enhance the uniqueness of their idea.

As it stands, the genre is becoming once again stale, and any deviation of the norm, as proven by Sakuna: Of Rice and Ruin [7] and Summer in Mara [8] is seen as an outlier and a failure to deliver what they promise, which in turn pushes developers away from experimentation.

Which is why risks like The Forest Rises must be taken, in order to refresh the genre by breaking free of the shackles of convention and allowing a better exploration of the world itself while still remaining relatable to both new and experienced players.

The removal of the inventory and tools strips the game from all the added layers of knowledge one must acquire before playing, and the narrowing down of all interactions to the single mouse click eliminates the need for tutorials by relying on the player's reflex response of "see thing, click thing" while diminishing the extradiegetic experience of user interfaces. This, too, democratizes access for new players while providing a fresh experience for veteran players,

When stripped of everything superfluous, the game becomes a calm experience of interacting with nature and seeing it flourish, contributing to it with small actions that on any other website go unnoticed by the user and are considered undesirable, inefficient and worthless by UX designers [9], in the same way picking up litter or recycling can be considered inefficient by some when pit against the immensity of pollution, microplastics and global warming.

All this loops back to the starting point of "A Harvest Moon Browser Game" in several ways:

Since the inspiration behind this game is nested in the democratization of access to games that the Internet Era brought, to stay true to itself it must necessarily be a browser game.

While it shall be hosted on a personal server for the time being, it would eventually require dedicated servers, which is not a viable business endeavor without a proper sponsor. Even this project's browser precursors' development teams relied on external providers to provide a stable, scalable hosting service, with Popcap [10] hosting their games on zone.msn [11], and Playfish [12] and Zynga [13] on Facebook [14].

Finally, in order to provide the experienced players with extrinsic motivation and enhance its replayability, it has been decided the game shall be published on Steam, in order to use its leaderboards API and their forums to foster a sense of community between the players.

1.3. Project goals

1.3.1. Primary goals

Project goals:

- Publish the game on an on-line storefront and get one unaffiliated review.
- Cover the expenses.

Player goals:

- To make them feel good and hopeful for the future; Dispel their nihilism.
- To spur them into action: Every gesture matters.

Author's goals:

- Learn the process behind the creation of a videogame and see it through.
- Become proficient in the use of industry tools.
- Begin a portfolio of videogame projects.

1.3.2. Secondary goals

Enrichment of the videogame experience goals:

- Extra biomes with different plant species.
- Plot, and an Adventure mode with several levels.
- A relaxing, procedurally generated Endless Play mode.

1.4. Methodology and workflow

The development will follow the agile methodology through sprints, its first phase centered on the general design of the game and the elaboration of a GDD document, and subsequent implementation, beta testing and reworking phases.

Since it's a one-person team the agile methodology will be tweaked accordingly, and the tasks will be managed through a kanban board in a timeboxing procedure, following the pomodoro technique with the Kanbanflow web application, with regular check-ins for every sprint with the project tutor.

The workload is hereby divided as follows:

		Milestones			
		PAC 1	PAC 2	PAC 3	PAC 4
Tasks	Prep Work	Workstation, Kanbanflow	Repository, Game engine		
	Research	Game Mechanics	Market, Technology	Fixes, Extra features	
	Design	Concept art	UX, assets, placeholders	Trailer, art, soundtrack	Game manual, Video presentation
	Development	Draft game functions	Functional gameplay	Extra features	Trailer, Video presentation
	Playtesting	Scout testers	Alpha version	Beta version	v. 1.0
	Feedback		Update thesis document	Fix Alpha, prep Beta	Fix Beta, release v1.0
	Dev Diary	Concept, Bibliography	Comment code	Comment updates	Game documentation
	Thesis document	Section 1	Sections 1 - 3, visual refs.	Sections 4 - 5, Formatting	Sections 5 - 7, Proofreading

Table 1: Relation of Tasks and Contents

1.5. Planning

1.5.1 Key dates

		Key dates		
		Checkpoint 1	Checkpoint 2	Deadline
Milestones	PAC 1	March 6th	March 10th	March 12th
	PAC 2	March 19th	March 26th	April 16th
	PAC 3	April 25th	May 7th	May 21st
	PAC 4	June 4th	June 11th	June 18th

Table 2: Relation of key dates

1.5.2 Milestones

PAC 1: Workstation setup, concept outline, workflow planning, section 1 draft.

PAC 2: State of the Art research, Alpha version development, sections 1-3 draft.

PAC 3: Beta version development, extra features implementation, sections 4-5 draft.

PAC 4: Sections 5-7 draft, manuscript proofreading. Thesis document printing and defense.

1.5.3 Gantt Diagram

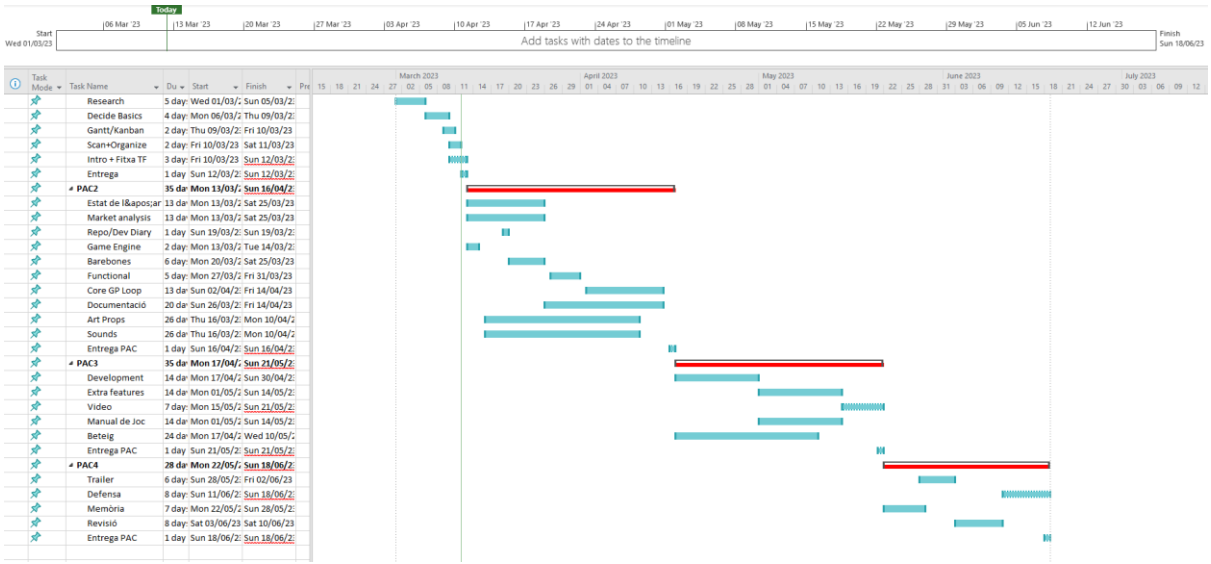


Figure 2: Screenshot of the Gantt diagram

1.6. Budget and accounts

		Author			
		PAC1	PAC 2	PAC 3	PAC 4
Tasks	Prep Work	8	8		
	Research	10	10	10	
	Design	10	15	15	10
	Development	7	35	35	20
	Playtesting	2	5	5	
	Feedback		10	15	10
	Dev Diary	3	5	5	7
	Thesis document	10	10	10	10
Time		50	98	95	57
Cost	(30€/hour)	1500 €	2940 €	2850 €	1710 €

Table 3: Author's Pre-project allotted budget

The initial minimum wage the author ought to receive for their work would amount to 9.000€, not accounting for production costs and based on a standard market rate [15] of 30€ per hour.

		Costs			
		Concept	Specifications	Retail Price	Amortization
Developer tools (Hardware and software)	Computer	Workstation	[16]	1699 €	424,75 €
	Peripherals	Output	[17] Screens (2)	129,99 € * 2	43,33 €
	Peripherals	Input	[18] Mouse + Keyboard	72,95 €	9,12 €
	Peripherals	Input	[19] Webcam	49,90 €	4,00 €
	Peripherals	Output	[20] Speakers	22,45 €	1,87 €
	Web server	Web Host	[21] Utilities	44,39 € /month +46,41 € setup	223,97 €
	ISP	Movistar	[22] 300Mb plan	29,90 € / month	119,60 €
	Electricity	Endesa	[23]	169,63€/MW/h	50,89 €
Consultants	Beta testers	Testing	Beta testers	30 € / hour	300 €
	Tutor	Mentorship	Thesis editing	30 € / hour	300 €
Fees and Taxes	Self-employment	Freelancer taxes		315 € /month +72,60 € setup	2.810,13 €

Table 4: Author's Pre-project planned expenses

The predicted costs and expenses the team would accrue during the development of this project would amount to 4.520,13€, based on standard market rates as of March 2023.

The unplanned addition of assisting to the Godot User Meetup would add travel expenses amounting to 230,75 € but have not been taken into account for the following calculations.

Based on these calculations, the author's final balance towards covering living expenses would be 4.479'87 € total or 1.119'97 € / month given prior ownership of tools, or 3.096 € total or 774 € / month accounting for a full initial investment in purchasing all required equipment and services.

The current minimum wage is set at 1.260 € / month [24]. As such, standard market rates for established freelance workers are insufficient to meet that baseline. In order to achieve that, any freelance worker taking this contract should demand a price per hour of no less than 35 € per hour for their net revenue to match the salary of a standard company's employee.

For a freelance game developer to earn the same as their peers, the market standard salary of game studio employees being currently at 2.500 € / month, their hourly rate ought to be at least 2.23 times the initial amount, going from 30 € / hour to 67 € / hour.

1.7. Document structure and format

Chapter 1: Introduction
Contains the introduction and the description of the game's lore, an overview into the background story of the game which, at the time of writing, is not yet implemented; Development planning and costs; The project's goals and the methodology followed to achieve them; Production costs and developer compensation calculations according to market standards.

Chapter 2: Market analysis
Contains the current competition The Forest Rises will encounter, details its key features and how they set it apart from the rest of games on offer, and highlights the ones that frame it as part of the analyzed niche; Contains target audience and a couple of user profiles for reference. This section closes by detailing the SWOT this project faces.

Chapter 3: Proposal
Contains the proposal of the game itself, delving into its concrete product goals, a tentative roadmap and setting the limitations for monetization practices and marketing strategies, emphasizing the core idea of avoiding current dark pattern practices.

Chapter 4: Design

Comprises the game's graphic and interface design choices and evolution, and the reasoning behind them; Contains and justifies the programming languages, game engine, and APIs involved in the creation of The Forest Rises; Includes diagrams and figures for the general, information, and navigation architecture. Higher resolution versions of the attached figures can be found appended in the Annexes chapter.

Chapter 5: Implementation

Lists the computer requirements for an optimal game experience, both for the navigator and executable versions, and the experience in porting the product to additional platforms, Linux and Android.

Chapter 6: Demonstration

Contains the game manual with gameplay instructions, prototype references and their evolution and justification in response to beta-tester reviews and suggestions, as well as a brief summary of the game's presentation at the Godot User Meetup, Valencia 2023.

Chapter 7: Conclusions and future roadmap

Contains a critical analysis of the development process, reflecting on Chapter 1's oversights and the adjustment of game design and project scope when faced with development hitches such as technology limitations or misguided game design choices incompatible with development times. Hypothesizes on future steps towards the eventual publishing of The Future Rises.

Annexes:

Contain a terminology glossary and the document references for attached, full resolution documentation of game development plans, the (as of yet unimplemented) initial cutscene storyboards, initial database and game progression structure, and a tentative GDD planning. Since most of the initial brainstorming was done on a physical notebook using stream of consciousness style while researching, the manuscripts may contain factual misconceptions, orthographic and grammatical mistakes, circular thought processes, and discarded ideas, as well as mix content in Catalan, English and Spanish.

2. Market Analysis

In recent years, the gaming industry has seen a surge in popularity for simulation games, particularly in the farming genre. The success of games such as Stardew Valley, My Time at Portia, and Rune Factory 5 [25] has thoroughly demonstrated a high demand for this kind of games. However, the current landscape is veering towards content-rich, bordering strategy-like games, which is in turn inducing genre fatigue amongst the players. By simplifying the technology bringing back more outdated gameplay features, there is an opportunity for The Forest Rises to differentiate itself and capture a significant portion of the market. This section aims to delve into the current state of the market and identify opportunities for growth and success for TFR.

One key feature that sets TFR apart from its current competitors is its retro approach to farming gameplay. While Stardew Valley and the latest editions of Harvest Moon [26] focus primarily on crop cultivation, animal husbandry and socializing with the local population, TFR takes a more holistic approach to farming simulation. Instead of focusing in traditional farming activities, players interact directly with a much more familiar environment, a patch of wasteland abandoned after the plowing march of The Progress, helping The Forest rise again by tending to the new life trying to find its way. This more immersive and simplified approach to farming gameplay will offer players a calmer and more engaging experience than what is currently available in the market. With a strong focus on player autonomy and the inevitability of life, TFR will enable players to truly feel like they are able to make a meaningful change through small actions.

Another key aspect of TFR is its minimalist user interface, that aims to diminish barriers between the player and the game. Unlike many other farming games that require players to manage complex inventories, memorize meta-game rules, and navigate through cluttered UIs, TFR relies on intuitive point-and-click actions to drive player interactions with the game. This approach allows players to focus on enjoying the experience of watching life unfold, without the added stress of optimizing every decision through math or struggling with complicated menus. By creating a more relaxed and accessible gameplay experience, TFR will appeal to a wider range of players, including those who may be new to the farming genre or casual gamers who want to unwind and enjoy a more laid-back gaming experience.

While TFR aims to differentiate itself from its competitors, it still adopts mechanics that have flourished recently and proven successful. By striking a balance between the old and the new, TFR offers players a fresh take on the farming genre that stays true to the simplicity that made it popular in the first place.

All things considered, the farming simulation genre has already established a strong following, but there are still opportunities for growth and innovation. By taking a holistic approach to farming gameplay, offering an intuitive user interface, and drawing inspiration from its competitors and applying it to the original Harvest Moon's experience, TFR is poised to carve out its own unique space in the market. With the right marketing strategy and development efforts, TFR has the potential to become a successful and beloved farm-like game that appeals to a wide range of players.

2.1. Target audience and user profiles

2.1.1 Target audience

Casual gamers who enjoy short, pick-up-and-play games with simple mechanics and a fun aesthetic, and idle games.

Demographics:
- Age: 13-35
- Gender: All genders
- Education: High school diploma or equivalent
- Income: Any
- Geographic location: Worldwide

Psychographics:
- Interests: Gaming, social media, entertainment
- Personality traits: Fun-loving, bored, looking for a brief escape from reality
- Values: Enjoyment, simplicity, accessibility

Behavior:
- Preferred device: Desktop or laptop computer
- Frequency of play: Occasional play sessions, ranging from a few minutes to an hour at most

- Motivations: Relaxation, entertainment, brief distraction
- Barriers: Limited time, desire for a low-stress experience

Overall, this target audience is looking for a quick and easy gaming experience that can be enjoyed in short bursts of free time. They prefer games with simple mechanics and a fun aesthetic that can provide a brief escape from reality. Accessibility and ease of use are important, as they may not have a lot of time to devote to gaming and don't want a high-stress experience.

2.1.2 User Profiles
Name: Albert A.
Age: 20
Occupation: Part-time student and part-time customer service worker
Interests: Drawing, handmade crafts, webcomics and cats

Albert is a busy student with a part-time job, but he loves to unwind by playing video games in his free time. He enjoys simulation games, but can't access his gaming device during work hours. He appreciates games that offer a relaxing and immersive experience, where he can escape from the stresses of everyday life. Albert is also environmentally and class conscious, and is drawn to games that incorporate elements of sustainability and eco-friendliness. As a regular gamer, he appreciates games that are easy to learn and play but still offer a degree of challenge and decision-making. Albert is the type of player who enjoys designing his own virtual world and watching how the inhabitants of the game world interact with his designs and bring them to life, making them grow over time.

Name: Bobby B.
Age: 35
Occupation: Marketing manager
Interests: Current events, 90's aesthetics, sitcoms, and hiking

Bobby is a marketing manager who has been playing video games ever since she was a child. She has fond memories of playing Harvest Moon in her cousin's NES and keeps up with the latest releases, even if she can't play them all. As an adult with a busy job, Bobby values games that allow her to unwind and escape from the complexities of work life. She is drawn

to games that incorporate elements of natural landscapes, as well as those that remind her of those simpler times. When she heard about TFR, Bobby was immediately intrigued by the promise of not needing to purchase and carry a new gaming console around. She is excited to see how TFR will hold up against her memories of the past, while also not cutting down on her stablished routines. As a player, Bobby is looking for a game that she can pick up and play at her own pace, but still offers enough depth to keep her engaged over time.

Name: Charlie C.
Age: 19
Occupation: Full-time Twitch streamer
Interests: Gaming, streaming, socializing, and creating entertaining content

Charlie is a full-time Twitch streamer who is always looking for new games to entertain their audience with. While they have played a wide range of games on their channel, they have never been particularly interested in farming simulations. However, after losing a bet with a fellow streamer, Charlie was forced to play TFR on stream. To their surprise, they found themselves enjoying the game far more than they expected. The easy-to-learn controls and relaxing gameplay experience were a welcome change of pace from the fast-paced games they usually play, and allowed them more time to interact with the chat. Charlie appreciated the game's emphasis on relaxation, as well as the potential for community-building and social interaction with their fans. As someone who values their audience's enjoyment and engagement, Alex was pleased to see their viewers responding positively to the game and actively engaging with them during the stream. Although Charlie never thought they would enjoy a real-time farming simulation game, they are now excited to continue playing TFR on their channel and see whether they can unlock all plant species in a single run.

2.2. Competition / State of the art

In order to develop a successful and competitive farm-like simulation game, it is important to stay up-to-date with the latest trends and technologies in the gaming industry. Upon analyzing the strengths and weaknesses of these games, key areas for improvement and innovation in The Forest Rises' development process have been identified. Additionally, this section explores some of the emerging technologies and trends in gaming, such as virtual reality and cloud gaming, that could pose realistic growth ventures and potential income sources for the product.

		Inspiration			
		Harvest Moon (1997) [1]	Harvest Moon: Island of Happiness [26]	Rune Factory 4 (2012) [27]	Plantera [28]
Mechanics	Biomes	Farm Foraging zone Mine	Farm Foraging zones Mine Rice Paddy Greenhouse	Farm Foraging Zones Dungeons Spring Farm Summer Farm Autumn Farm Winter Farm Secret areas Dungeon Seeds	Farm
	Agriculture	4 species 4 crops	29 species 15 crops 5 trees 9 grain/grass	42 species 21 crops 4 trees 17 flowers	15 species 5 crops 5 trees 5 bushes
	Other farm activities	Mining Fishing Foraging	Mining Fishing Foraging	Mining Fishing Foraging Shop managing Exploration Combat	-
	Animals	Pasturing Collecting Breeding	Pasturing Brushing Feeding Collecting Breeding	Brushing Feeding Collecting Breeding Combat Party Farm Helpers	Passive: Collectable Aggressive: Drive off property
	Resources	Stone Lumber	Stone Lumber Ore Forageables	Store Lumber Ore Forageables Enemy Drops	Gold
	Crafting	-	Cooking Produce makers	Cooking Farm Tools Weapons Clothing Accessories Armor Consumables	-
	Unlocks tree	Per season	Prerequisites	Prerequisites Quests	Per level
	Stats/Skills	None	Stamina	Stamina, Health, Proficiencies	-
	NPC	Family	Friendship Family Faceless NPCs	Friendship Family Combat Party Faceless NPCs	Infinite autonomous helpers

	Events	Festivals	Festivals Romance Farm expansions Farm buildings Other unlocks	Festivals Romance Farm expansions Farm buildings City buildings City upgrades Other unlocks Main Quest Events	Farm expansions
	End game	2.5 years	No set goal	Finish Main story Arcs	No set goal
	Controls	ABXY Start/Select D-pad	ABXY Start/Select D-pad L-R Screen touch	ABXY Start/Select D-pad L-R Screen touch Joystick	Point and click Drag and drop
	Inventory	Rucksack Storage Shelves	Rucksack Quick Access Storage Furniture	Rucksack Quick Access Secondary QuickA Storage Furniture	-
	HUD	none	Stats Quick Access Weather Gold savings	Stats Quick Access Weather Gold savings Progress updates Player Level Party Level Party Stats	Gold savings Level Experience gauge
	Exclusive features	-	Sun mechanics	Bumper/Poor yield harvest strategy	Infinite sidescroll

Table 5: Relation of Inspiration games' mechanics

		Competition			
		Stardew Valley [2]	My time at Portia [29]	Rune Factory 5 [25]	Coral Island [3]
Mechanics	Biomes	Farm Foraging zones Lumber zones Mine Greenhouse Island (Farm 2)	Farm Foraging zones Mine Greenhouse	Farm Foraging Zones Dungeons Earth Dragon Farm Wind Dragon Farm Fire Dragon Farm Water Dragon Farm Terra Dragon Farm Secret areas	Farm
	Agriculture	4 species 4 crops	29 species 15 crops 5 trees 9 grain/grass	42 species 21 crops 4 trees 17 flowers	15 species 5 crops 5 trees 5 bushes
	Other farm activities	Mining Fishing Foraging	Mining Fishing Foraging	Mining Fishing Foraging Shop managing Exploration Combat	-
	Animals	Pasturing Collecting Breeding	Pasturing Brushing Feeding Collecting Breeding	Brushing Feeding Collecting Breeding Combat Party Farm Helpers	Passive: Collectable Aggressive: Drive off property
	Resources	Stone Lumber	Stone Lumber Ore Forageables	Store Lumber Ore Forageables Enemy Drops	Gold
	Crafting	-	Cooking Produce makers	Cooking Farm Tools Weapons Clothing Accessories Armor Consumables	-
	Unlocks tree	Per season	Prerequisites	Prerequisites Quests	Per level
	Stats/Skills	None	Stamina	Stamina, Health, Proficiencies	-

	NPC	Family	Friendship Family Faceless NPCs	Friendship Family Combat Party Faceless NPCs	Infinite autonomous helpers
	Events	Festivals	Festivals Romance Farm expansions Farm buildings Other unlocks	Festivals Romance Farm expansions Farm buildings City buildings City upgrades Other unlocks Main Quest Events	Farm expansions
	End game	2.5 years	No set goal	Finish Main story Arcs	No set goal
	Input controls	ABXY Start/Select D-pad	ABXY Start/Select D-pad L-R Screen touch	ABXY Start/Select D-pad L-R Screen touch Joystick	Point and click Drag and drop
	Inventory	Rucksack Storage Shelves	Rucksack Quick Access Storage Furniture	Rucksack Quick Access Secondary QuickA Storage Furniture	-
	HUD	none	Stats Quick Access Weather Gold savings	Stats Quick Access Weather Gold savings Progress updates Player Level Party Level Party Stats	Gold savings Level Experience gauge
	Exclusive features	-		Combat Rich story	Infinite sidescroll

Table 6: Relation of Competition games' mechanics

		Core game mechanics			
		Plant Growth	Crop	Withering	Unlocks
Crop growth	Harvest Moon [1]	Watering Ingame days	Shake Sickle Axe	Off-season	One crop per season
	Harvest Moon: Island of Happiness [26]	Watering Ingame days Fertilizer Sunlight	Shake Sickle Axe	Off-season Underwatering Underexposure to sunlight Weather events	Fulfill prerequisites

	Rune Factory 4 [27]	Watering Ingame days Fertilizer Soil Health Yield mechanics	Shake Sickle Axe	Weather events Soil health	Fulfill prerequisites
	Plantera [28]	In real-world time	-	-	Level up
	Stardew Valley [2]	Watering Ingame days Fertilizer	Sickle Axe Hoe	Off-season Underwatering	Fulfill prerequisites
	My Time at Portia [29]	Watering Ingame days Fertilizer	Sickle Axe Hoe	15	Fulfill prerequisites
	Rune Factory 5 [25]	Watering Ingame days Fertilizer	Sickle Axe Hoe	Weather events Soil health	Fulfill prerequisites

Table 7: Game progression parameters

2.3. SWOT

SWOT			
Strengths	Weaknesses	Opportunities	Threats
- Minimalist UI and easy-to-learn controls. - Inspiration from successful competitors while staying true to original gameplay. - Retro gameplay mechanics that offer an innovative, fresh take on the farm-like simulation genre	- May not appeal to gamers who prefer more action-packed or challenging games. - Base game has limited scope in terms of gameplay activities. - Lack of licensed content or recognizable intellectual property may limit appeal to some audiences.	- Growing market for casual games and simulation games. - Potential for collaborations with popular content creators or social media influencers to boost visibility and appeal. - Possibility of expanding into online game storefronts and mobile platforms to reach a wider audience.	- Competition from established and well-known farming simulation games, and IP's. - Potential for copycat games to emerge and dilute the market. - Economic downturn or changes in consumer behavior that impact the gaming industry as a whole.

Table 8: SWOT table

3. Proposal

https://the-forest-rises.netlify.app/theforestrises.html
https://youtu.be/yaAPp1zBUKk

3.1. Product goals

To provide the player with an escapist fantasy and a welcome distraction from the dreary day-to-day routine.

This is, first and foremost, a low-stakes, feel-good game. A respite and a beacon of hope. It is also a call to action, to taking care of the real world within the user's capabilities, but not to their detriment. It's meant to plant a seed of how easy it is to change the world for the better, just for the sake of doing it.

3.2. Roadmap

Pre-beta testing	
Beta version – 0.9	Basic game experience with ending
Release – 1.0	Balanced basic game experience
6 months – Free update 1.5	Endless mode
1 year – 2.0, DLC #1	Extra biome
1st – 2nd years	Unroll Seasonal Events
2 years – 3.0 DLC #2	Extra biome + Multiplayer
3 years – 4.0, Sequel teaser	Modding support
4+ years	Extra features

Table 9: Roadmap

3.3. Monetization

The following revenue sources are being explored:

One-time Purchase: Players can purchase the game for a one-time fee. This model is simple and transparent, and allows players to fully own and enjoy the game without being subjected to any additional monetization strategies. This is the planned method under which v1.0 will be released once it reaches storefronts such as itch.io or Steam.

Expansion Packs: Marked on the roadmap as DLCs, expansion packs are planned to be sold as an additional purchase and will offer new biomes and features to players. These can be released periodically to keep players engaged and interested in the game, following the roadmap described in section 3.2.

Sponsorships and Product Placement: An income source to explore, sponsorships and product placement with real-world companies, such as farm equipment manufacturers, seed companies, or agricultural organizations. This could offer a new revenue stream for the game while also adding a sense of realism and authenticity to the gameplay experience.

It's important to note that any monetization strategy should be implemented ethically and transparently. Dark patterns [30], such as manipulative or deceptive marketing tactics, should be avoided. The priority should be to provide a fair and enjoyable experience for players, while also generating revenue to support ongoing development and improvements to the game. As such, microtransactions, timed advertisements, lootboxes and other exploitative mechanics are not planned and will not be implemented in The Forest Rises and any other future installments of this IP.

3.4. Marketing

The following marketing strategies are being explored:

Social Media Marketing: Social media is a great way to reach a broad audience and build a community around TFR. By creating accounts on platforms like Twitter, Mastodon, and Instagram, the game's developer team can share screenshots, gameplay videos, and development updates with fans and potential players.

Limited-Time Offers: Once TFR is available on a games storefront, it would make economical sense to take part in seasonal sales.

Bundle Packs: Once the DLCs are released, offering bundle packs at a discount would be a great way to lure new players in.

Paid Advertising: Not currently taking Google Ads et al into account either as a possible marketing strategy or revenue source due to their aggressive targeted ads campaigns, their stance on data harvesting and their data protection policies.

4. Design

4.1. Game architecture

For the browser version of The Forest Rises, the game runs on a server currently hosted by Netlify hosting service. The terminal requires internet connection through the entirety of the gameplay.

For the Windows and Linux / SteamOS versions of The Forest Rises, the downloadable package is self-contained and requires neither installation nor prior system configuration. Each player's computer runs the application locally, which is why no internet connection is required to execute it.

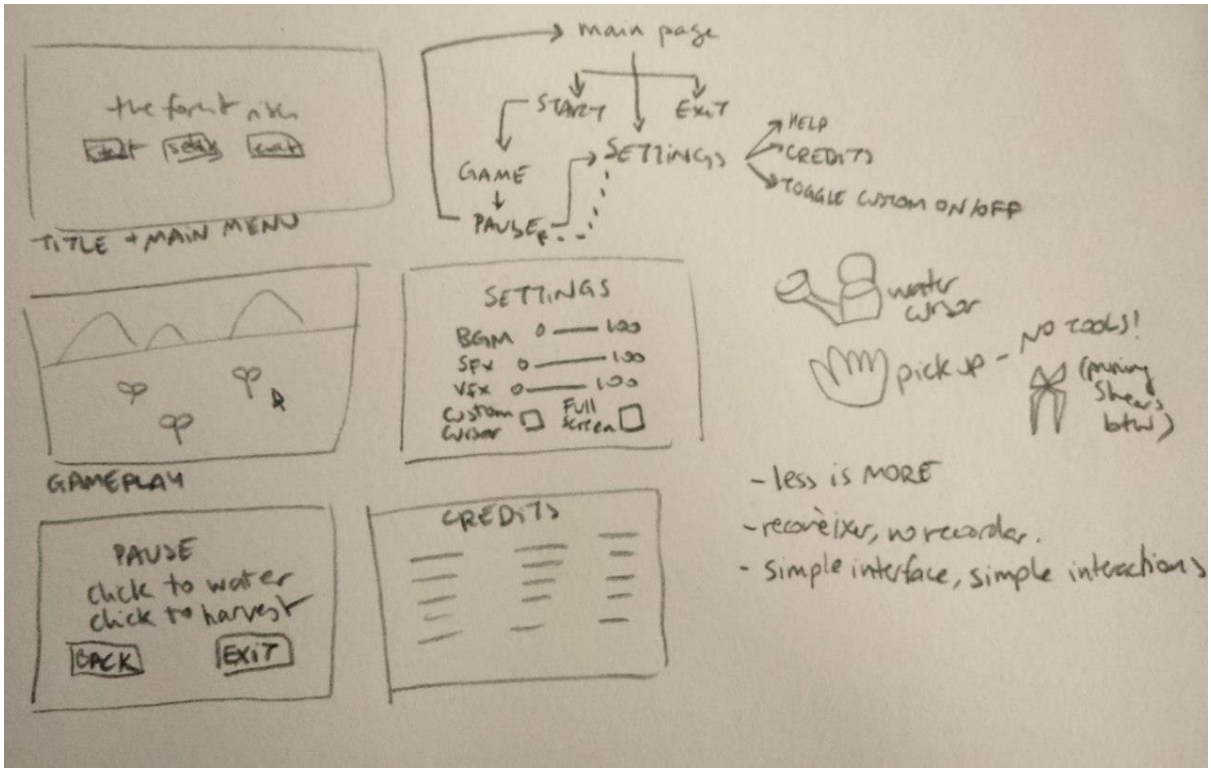


Figure 3: Game Architecture sketch

4.2. Information architecture and navigation diagrams

Root

- Sound Manager
  - Audio feedback manager
- Cursor Manager
  - Cursor skin manager
- Game Manager
  - BGM player
  - Title screen
  - Start Game: kill title, create game.tscn
    - Background
      - Backdrop scenery sprites & animations
      - HUD texture manager
    - Plant Manager
      - Database manager (Ecosystem)
      - Plant actors
        - Growth stage
        - Inventory manager (stats)
        - Animations
      - Collision manager
        - Hovered actor selector
      - Progression tracking (biome)
      - Mouse input manager
        - Water
        - Harvest
        - Sow
        - Reap (Endgame)
    - HUD
      - Game inventory and player progression visual feedback
    - Pause Menu
      - Game Management: kill game
      - Game Management: Settings [WIP]
      - Player instructions
  - Roadmap pop-up
    - Game development information
  - Help pop-up
    - Player interaction tips
  - Almanac pop-up
  - Settings pop-up [WIP]
  - Credits pop-up
  - Exit Game
    - Game Management: kill process
  - Victory pop-up
    - Switch game mode to Endgame mode

Figure 4: Game Architecture as of version 0.9

The following figure depicts the initial distribution of information, both in-game and documentation wise, at the beginning of this project.

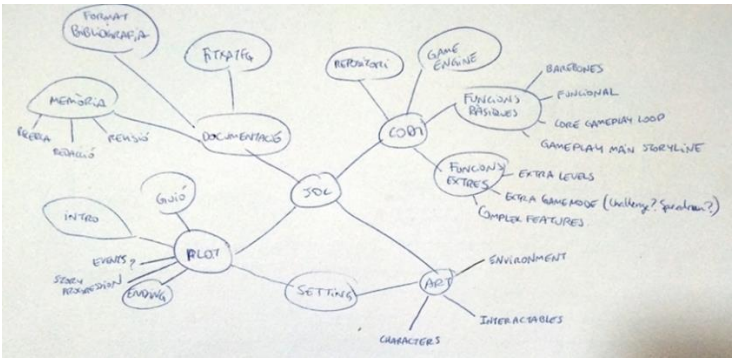


Figure 5: First approach to data architecture

The following figures include a rough list of functions and features as they were initially planned. Many of them have since been dropped, or modified, to fulfill the project's goals.

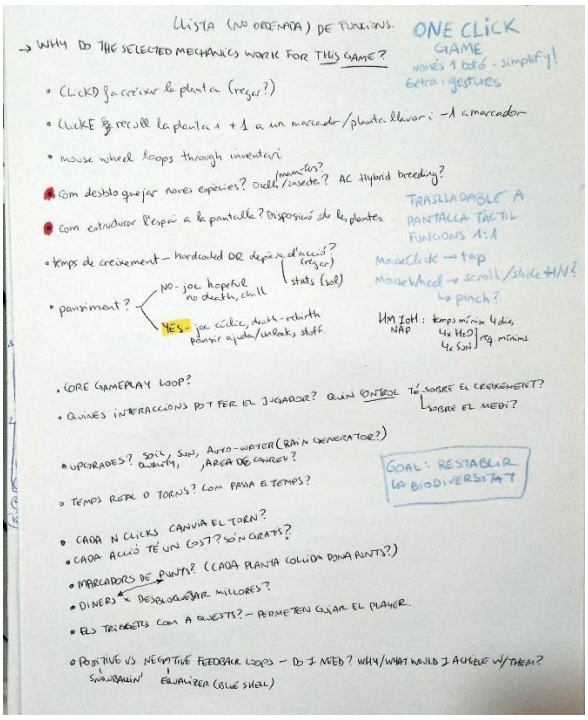


Figure 6: First draft of functional programming

A tentative GDD was drafted in order to organize the concepts and separate goals from functions, mechanics and interactivity.

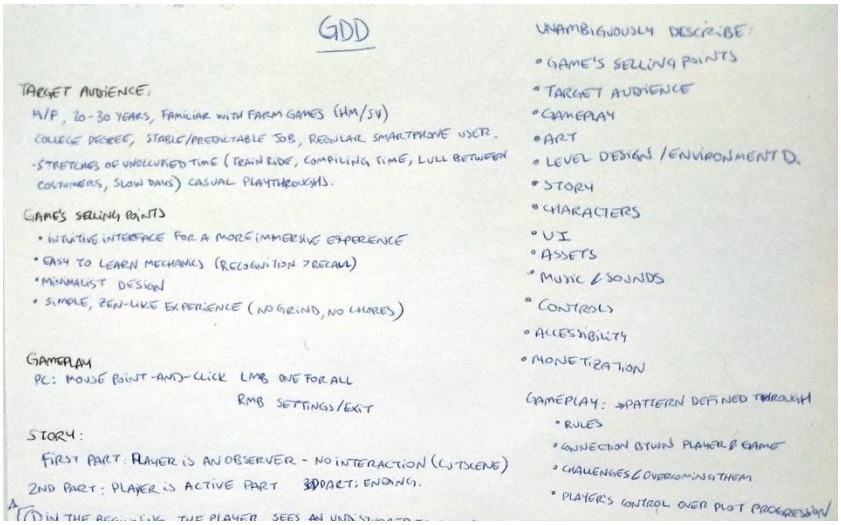


Figure 7: Rough draft of GDD

The following image defines the nesting of the different databases that manage the game's information and the player's progression and current status. It eventually required the creation of a transversal set between the habitat and the biome to manage the plants that have been harvested, in order to update the inventory and fulfill the victory requirements upon harvesting one of each species instead of upon unlocking all species.

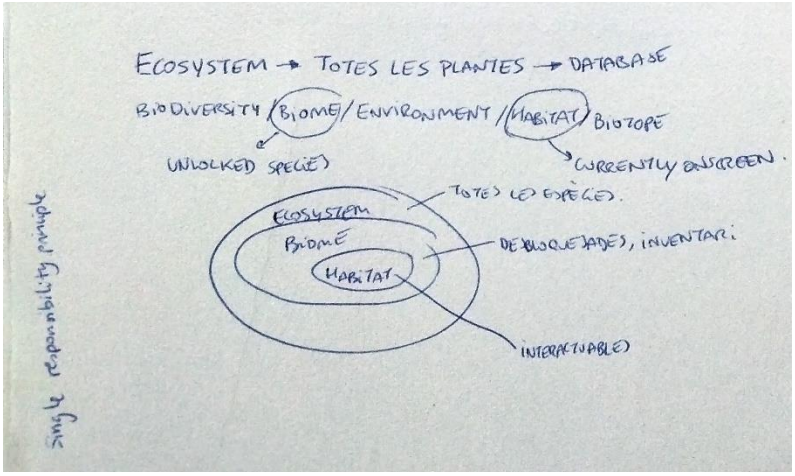


Figure 8: First approach to game progression architecture

Once settled on that hierarchy, the actual game progression design monopolized the developer's efforts. The following are the cleanest of all the rough database planning sketches.

After several -failed- iterations, it was considered more expeditious to add every plant's data by hand, hardcoded, and push the production forward until a moment was reached where the

abstraction of data became a necessity instead of a hindrance. At that point, csv databases of the ecosystem and unlocks data were created, and a data parser was created in order to import and manage them directly from Godot.

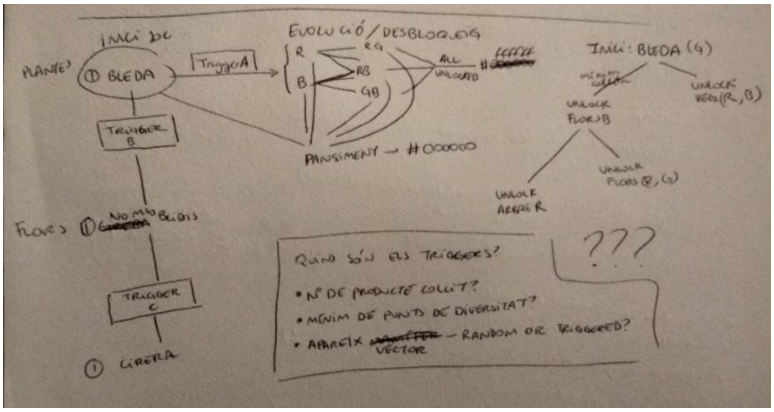


Figure 9: First approach to plant unlocks system

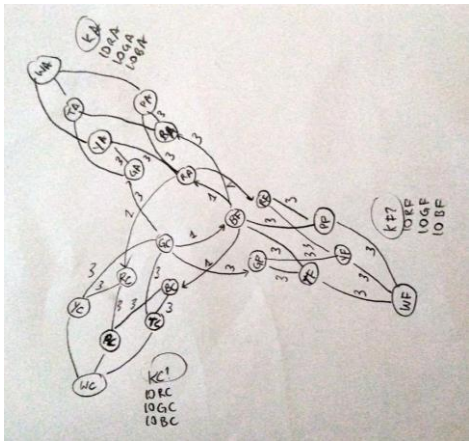


Figure 10: Plant unlocks progression tree

The first draft of the story script depicted the animated cutscene that will play on game start from v1.0 on.

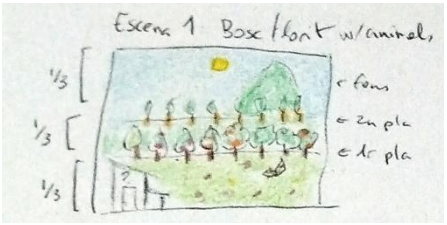


Figure 11: Opening cutscene, scene 1

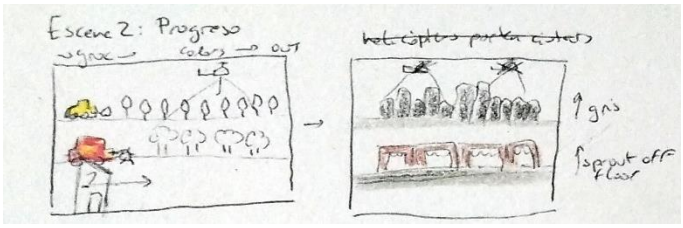


Figure 12: Opening cutscene, scene 2

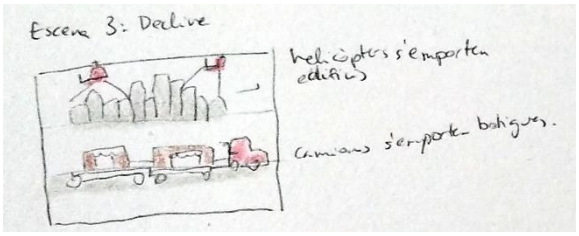


Figure 13: Opening cutscene, scene 3

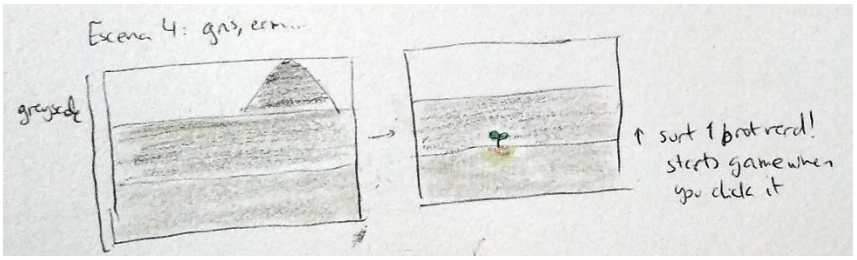


Figure 14: Opening cutscene, scene 4

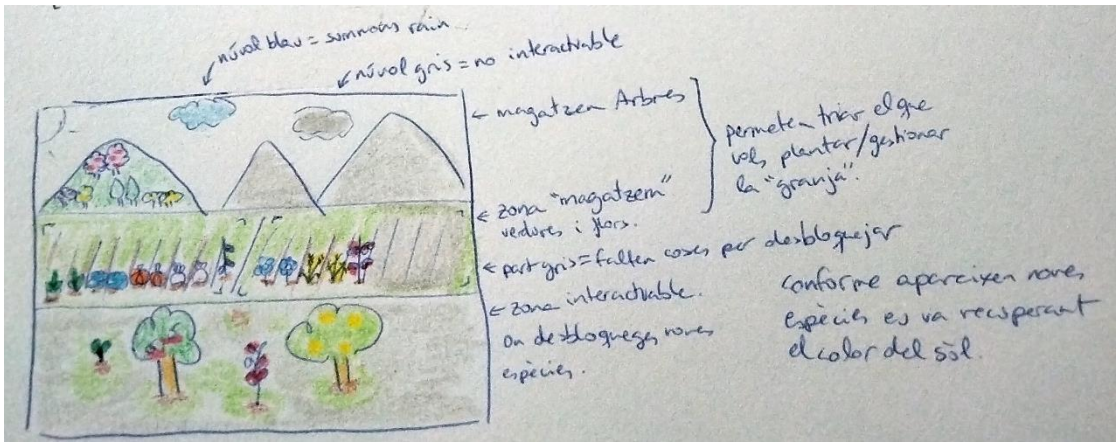


Figure 15: Mid-gameplay concept art

Once the game progression system was decided upon, the storyboard was cleaned up and its steps were clearly defined. As of writing, only the animation of the previously showcased script remains, as well as the creation of a dedicated Godot scene to house and manage it all.

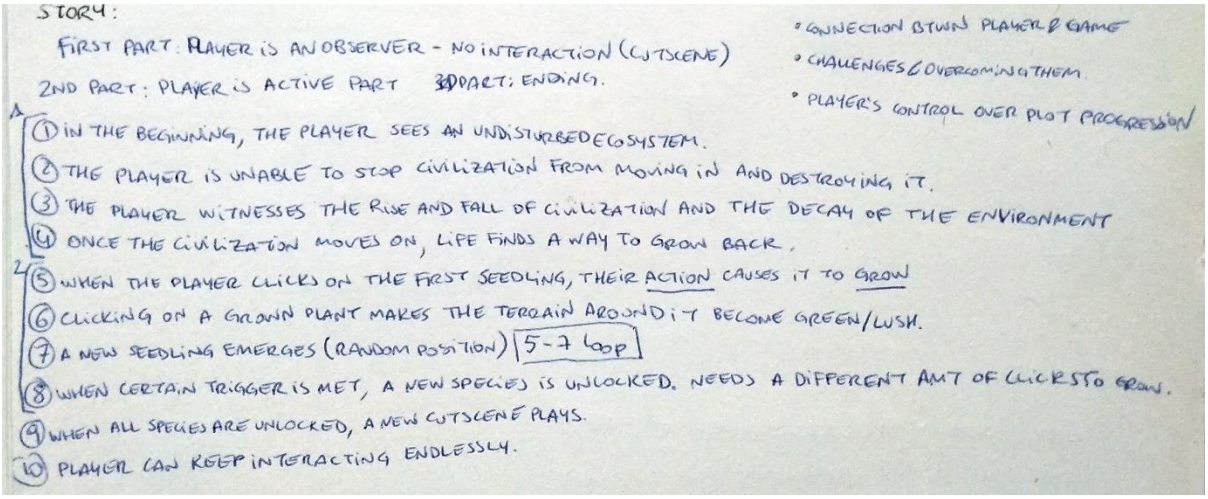


Figure 16: Story script scene by scene

4.3. Interface and graphics design

4.3.1. Styles

1. Game logotype

When designing the logo and thumbnail, the following factors were considered to ensure both its alignment with the project and its eye-catching appeal:

Brand identity: The logo aims to capture the essence of the game and evoke the concepts of reforestation and environmental restoration. The thumbnail design, in turn, represents the first plant players encounter within the game, thus firmly linking in the player's mind the icon with the metaphor it represents.

Readability: The font, outline, background and spacing between characters has been adjusted for readability throughout its iterations, as seen in figures 20 to 22. Several coloring options were considered from the game's logotype palette before settling on the final design (Figure 17). To enhance the logotype's readability, especially in printed form, a monochrome version has been designed as well (Figure 18).

Both versions have been used in the creation of a double-sided informational badge, available in HD as an attached project deliverable under the title "Acreditacio".

Figure 17: The Forest Rises' current logotype

Game logotype: Simplified version (monochrome)

Figure 18: Game logotype: Monochrome version

Thumbnail / icon designs:

Figure 19: Game thumbnail / icon in color and monochrome

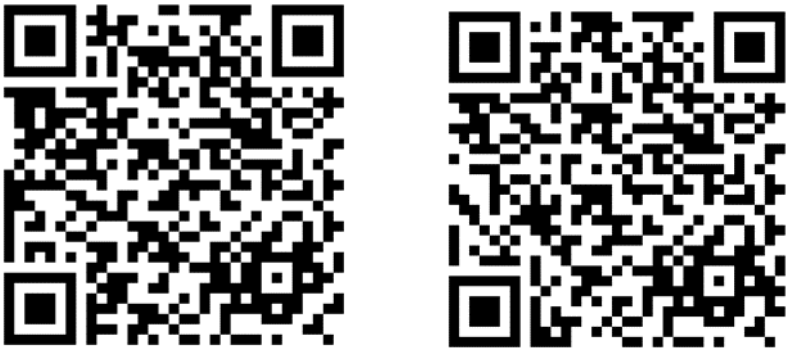


Figure 27: Badge QR Codes for browser version (Left) and Linux download (Right)

Figure 20: Logotype readability tests pt.1

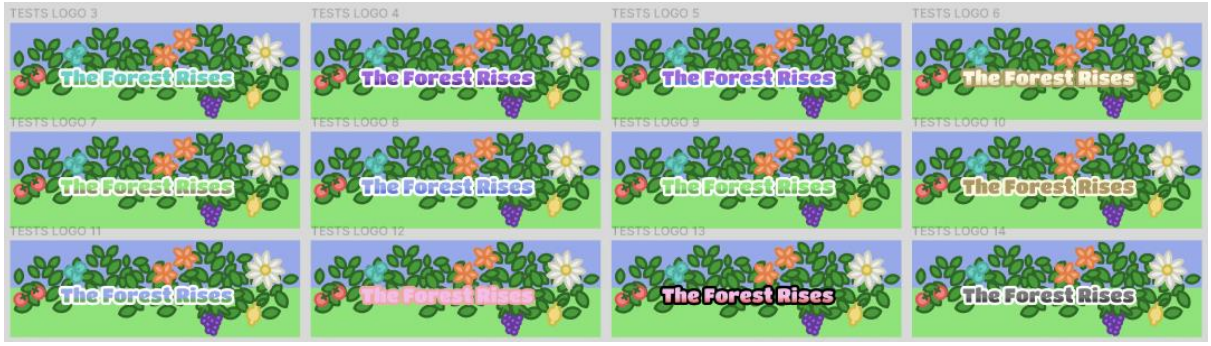


Figure 21: Logotype readability tests pt.2

Figure 22: Font and character spacing readability tests

2. Color palette

The main concern when choosing the color palette became how to convey the visual atmosphere of an abandoned wasteland slowly recovering from the exploitation of the Progress. The following factors were considered to ensure both its aesthetic appeal and its contribution to the enhancement of the player's experience [40 to 46].

Natural environment representation: The chosen colors represent saturated idealizations of the natural elements found in a natural landscape, including tree leaves, trunks, flowers, and produce.

Visual hierarchy and contrast: The game progression relies on the harvest of a certain number of primary-colored plants in order to unlock secondary and ternary-colored plants. As such, it was vital to ensure both a clear contrast between plant colors, and the establishment of a visual hierarchy as to hint at color-mixing as the method of unlocking new species.

Aesthetics, visual appeal, and accessibility: The first palette was deemed too unbalanced by beta tester and industrial design expert David Lozano, who suggested the rectification of the colors' brightness to adhere to color theory principles. The applied method consisted in unifying each base color's K value (in the CMYK scale) and obtaining its accompanying outline color by applying a set reduction in K value. This section's closing Table 10 shows a first

column with the rectified colors as well as a second color with the original values, for comparison.

Color harmony: The color shades were adjusted to ensure a harmonious and balanced palette throughout the project. By redefining and aligning them, the overall visual composition became more cohesive and pleasing.

Readability and contrast: By fine-tuning the shades, the contrast between foreground and background elements was optimized, ensuring that important visual information stands out from the background.

		Rectified Palette			Original Palette		
		Sample	RGB	CMYK	Sample	RGB	CMYK
Red	Base		#FF8A8A	00 46 46 00		#F28383	00 46 46 05
	Outline		#CC6E6E	00 46 46 20		#DA5858	00 60 60 15
Yellow	Base		#F2DA83	00 10 46 00		#F2DA83	00 10 46 05
	Outline		#CCB86E	00 10 46 20		#CABD4C	00 06 62 21
Green	Base		#A1FF89	37 00 46 00		#8FE37A	37 00 46 11
	Outline		#62AC50	37 00 46 20		#62AC50	43 00 53 33
Teal	Base		#88FEF0	46 00 06 00		#6FD0C5	47 00 05 18
	Outline		#6ECCC0	46 00 06 20		#50ACA1	53 00 06 33
Blue	Base		#A6BAFF	35 27 00 00		#97A9E8	35 27 00 09
	Outline		#8595CC	35 27 00 20		#5C78DB	58 45 00 14
Purple	Base		#B578FF	29 52 00 00		#9D69DE	29 53 00 13
	Outline		#9161CC	29 52 00 20		#663A9D	35 63 00 38
Orange	Base		#FFB48A	00 29 46 00		#F2AB83	00 29 46 5
	Outline		#CC906E	00 29 46 20		#E37E44	00 44 70 11
Black	Base		#797979	00 00 00 53		#797979	00 00 00 53
	Outline		#424242	00 00 00 74		#424242	00 00 00 74
White	Base		#EFEFEF	00 00 00 00		#EFEFEF	00 00 00 06
	Outline		#CCCCCC	00 00 00 20		#D2D0BE	00 01 10 18
Leaf 1	Base		#6BA262	34 00 40 36		#489D3A	54 00 63 38
	Outline		#55804E	34 00 39 50		#316629	52 00 60 60

Leaf 2	Base		#FFC8F3	00 22 05 00		#F3BFE8	00 21 05 05
	Outline		#CCA0C2	00 22 05 20		#EFA5A5	00 31 31 06
Trunk 1	Base		#958369	00 12 30 42		#958369	00 12 30 42
	Outline		#AA9F82	00 06 24 33		#AA9F82	00 06 24 33
Trunk 2	Base		#80765B	00 08 29 50		#53400D	00 23 84 67
	Outline		#94896E	00 07 26 42		#6A5E40	00 11 40 58
Ground	Base		#CAAF68	00 13 49 21		#C38E05	00 27 97 24
	Outline		#A08B54	00 13 48 37		#80641C	00 22 78 50
GUI	Base		#FFF9E3	00 02 11 00		#FFF9E3	00 02 11 00
	Outline		#CCC7B6	00 02 11 20		#E5E0B1	00 02 23 10

Table 10: Color Palette V1 & V2

3. Game sprites

The basic, most frequent shape in-game is the leaf. All shapes for the central design of the harvestable produce emerge from uniting, intersecting, and bending the basic shape, using auxiliary circles when necessary to balance the designs. For the general shape of the plants themselves, the approach was to oversimplify their structure in order to maintain their silhouette as close to those found in their real counterparts.

Fruit trees, on the other hand, deserved special consideration, for their lignified trunks made it impossible to apply the same shape-simplification criteria as the rest of crops. For that reason, while their fruits follow the same simplification procedure as flower and vegetable crops, their silhouette follows their own special pattern of vertical trunk + canopy, consistent between the 9 species, while staying true to the size differences and growth systems. As such, special emphasis was put in the distinction between blackberry brambles, with non-lignified trunks, the fruit clusters in blueberry bushes, and the drooping heavy bunches on grape vines, and the trunk and canopy colors of taller trees.

In order to illustrate that difference further, tree sprites are 2x the size of flower and vegetable sprites, providing the landscape with breaks in uniformity and allowing the player to rest their eyes so they don't become overwhelmed with the regularity between shapes.

Figure 23: Sketches and tests on tree shape and yield readability

	Red	Yellow	Green	Teal	Blue	Purple	Orange	Black	White
Crops									
Flower									
Fruit trees									

Table 11: Plant sprites on growth stage 4

4. GUI elements

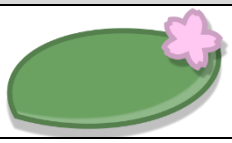
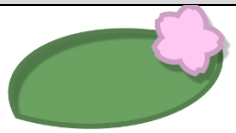
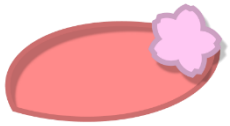
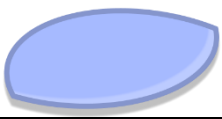
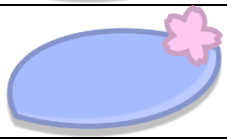
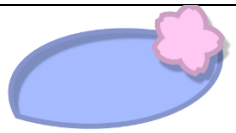
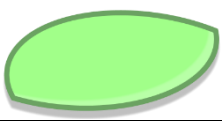
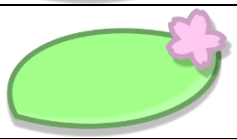
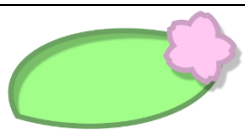
		Standard	Hovered/Focused	Clicked
Buttons	Start			
	Exit			
	General			
	Back			

Table 12: Button sprites

While the project began, as stated, with the goal of eliminating as much as possible extradiegetic layers between player and experience, the beta testing team found a complete lack of GUI in-game counter-productive. The players have grown to rely on concrete, numeric feedback as well as visual cues, which is why the following features were added:

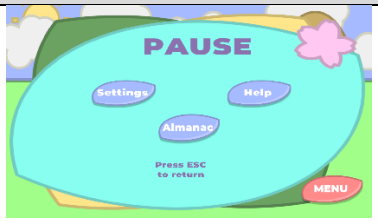
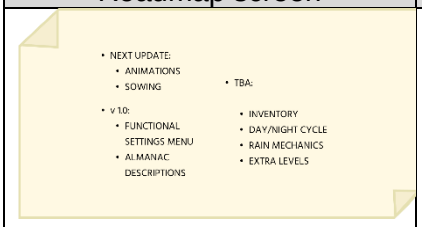
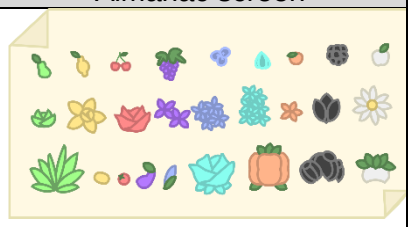
<table>
<tr><td>Menu screen</td><td>Help screen</td><td>Pause screen</td></tr>
<tr><td> 
</td><td> 
</td><td> 
</td></tr>
<tr><td>Roadmap screen</td><td>Credits screen</td><td>Almanac screen</td></tr>
<tr><td> 
</td><td> 
</td><td>  </td></tr>
<tr><td>Pause menu hint</td><td>Inventory thumbnail</td><td></td></tr>
<tr><td> 
</td><td>  </td><td></td></tr>
<tr><td colspan="3">Full functional inventory (depicted is a placeholder version):</td></tr>
<tr><td colspan="3">  </td></tr>
<tr><td>Cursor: Pointer</td><td>Cursor: Water can</td><td>Cursor: Pickup v1 and v2</td></tr>
<tr><td>  </td><td>  </td><td>  </td></tr>
</table>

Table 13: GUI elements

5. Fonts

- Logotype font

The logotype font, Titan One, was chosen for its bold yet round appearance. This font exhibits strong and prominent letterforms that capture attention and create a memorable impression, conveying the game's look and feel without overshadowing the content.

- Font pairing: Montserrat / Hind
  - Montserrat: This font was chosen for its clean aesthetic, to ensure readability across various screen sizes and resolutions.
  - Hind: Hind was selected as a complementary font to Montserrat, as suggested by Fontpair [31]

4.3.2. Usability

The Forest Rises' usability has been modeled following Nielsen/Norman's 10 usability heuristics [32, 33] as its main feature, with the aim to forego the need for in-game tutorials, as follows:

- Visibility of system status:
  Each of the user's actions returns clear visual and auditory feedback.
- Match between system and real world:
  The visual hints and auditory feedback match those which a player would probably encounter when carrying out the same tasks in the real world.
- Consistency and standards:
  Each action's outcome can be easily predicted after the first low risk encounter with the first spawned plant. All following interactions follow the same pattern and build a sense of trust and reliability between player action and game reaction.
- Error prevention:
  The game's learning curve has been balanced towards leniency at the start of the game, blocking high risk actions behind a learning barrier and easing the recovery from mistakes. In order to reduce slips, the UI has been reworked so irreversible choices (Exit Game) are more inaccessible than low risk actions (Back), while still remaining clearly visible and color-coded.
- Recognition rather than recall:
  The game relies on very simple interaction mechanics any user is bound to be skilled in in order to interact with any computer. It has no specific controls, and those which would appear to be of a higher complexity are tied to higher complexity tasks that are not strictly necessary to the core gameplay experience, for all they enhance the core gameplay loop.
- Aesthetic and minimalistic design:

Every part of the game interface is designed to guide the player. The harvest animations point downwards towards the inventory bar, the watering animations indicate the plant has been successfully watered, and so on.

- Help and documentation:

  The players have a clear graphic showing the available interactions and game mechanics, and a hint as to the game progression, without it overloading their experience with out-of-turn information.

4.4. Programming languages and APIs

- Software
  - Game engine: Godot (GDScript) GLSL (shaders)

For the game development the team analyzed the suitability of three different game engines: Unity, Godot, and Pixi.js.

Pixi.js was quickly discarded once the decision of creating a multi-platform game was reached, for the resources invested in porting it to PC were deemed to demand too much of the allotted production time.

While both Godot and Unity presented similar benefits, GDScript's similarities to Python's syntax and Godot's increasing popularity in the industry tipped the scales in its favor.

  - Design – Figma

For the game art design, it was decided early on that the art would be vectorized. The developer's familiarity with Figma and its browser-app feature were key in securing the choice, for they ensured both ease of access and waived the necessity of grappling with new technology.

  - Hosting – Netlify

After consulting with several professionals in the field, the developer was sponsored, for the duration of the project, with Netlify's hosting service by Sànchez-Ferreres, Ph.D.

  - Management – Kanbanflow

The developer has had extensive experience using Kanbanflow to track their progress and schedule production sprints using agile methodology and the pomodoro technique, which

made this choice a given. The usage of Trello was pondered and discarded for those same reasons.

- Version control – Git

The developer has had previous experience with the Git control system in prior projects. The repository was managed and is accessible via GitHub.

- Credits and acknowledgements

- Shaders

The Wind Sway 2D shader was developed by Maujoe [34] and modified by HungryProton, and made available on the Godot Shaders library [35].

- SFX

The game's sound effects have been procured from the Mixkit [36] library, which lists no composer and requires no attribution.

- BGM

The main soundtrack, Windswept, was composed by Kevin MacLeod [37].

- Assets

Artist @CuervoSolsticio [38] provided an upgraded, more rounded version of the pick-up sprite for the custom cursor.

A gold texture [39] was used for the HUD's outline on victory mode.

- Hardware requirements:

The browser version currently works on desktop browsers only, smartphone and tablet browsers aren't compatible. The executable version works on Windows 10 and 11, and the Linux version works on SteamOS and Manjaro.

5. Implementation

5.1. Browser version

Link found on Bibliography [47]

The browser version has a known bug: Clicking exit on the menu will stop running the game but will not close the game's browser tab/window.

5.2. Windows version

Download and uncompress the file from the link found on Bibliography [48].

Launch by double clicking on TheForestRises.exe.

5.3. Linux / Steam Deck desktop version

Download and uncompress the file from the link found on Bibliography [49].

Launch by double clicking on TheForestRises.x86_64.

5.4. Android version

In preparation for a public showing of the game a port to Android was worked on, but the exported .apk package was deemed invalid for installation by all the testing hardware. Since the Android build was not included in initial planning schedule, its development was discarded once the effort required for troubleshooting was deemed detrimental to meeting the project's established milestones. The idea has been postponed until sufficient resources can be allocated for its proper development.

6. Demonstration

6.1. Game Manual

Find the user manual in HD as an attached project deliverable under the same title.

Figure 24: User Manual

6.2. Development

As seen on section 4, the distribution of the screen has not changed from the initial sketches and the current product. The plants' design matured during the creation of the assets, which

are currently on their v2. For the first stage of the project, placeholders were used, as can be seen in the figure below.

Figure 25: The Forest Rises' with placeholder backgrounds

6.3. Port to Android and Linux

With sights on reaching a broader market the team made an effort to port the project to Android and Linux. Godot allowed easily both exports, but the Android version would not run in any of the available devices and so that endeavor has been postponed until it can be properly troubleshot. The Linux port worked hitchlessly, albeit it will not be recognized as playable when imported to Steam as a non-Steam product.

6.4. Beta testing and Godot User Meetup presentation

6.4.1. Beta testing, phase 1:

In this stage there was no game progression implemented so all species spawned randomly from the given pool. The plants' information was hardcoded into the plant manager script, and their spawn position was randomized within a hardcoded, eyeballed area. The background was the previously shown placeholder.

Issue: "Plants spawn too fast, and the screen becomes unmanageable".

The plant spawn rate was hardcoded to one every 5 seconds plus one plant spawned per each plant harvested.

- Fix: It was fixed to one spawned plant every 5 seconds.

Issue: "Plants disappear too fast, and I don't know where they go".

- Fix: Initially, each plant had only a water meter which filled with every click and there was no delay between waterings, which meant the player could spam-click a target and have it grow and disappear before they realized what was happening.
  This led to the implementation of the sun meter system and the drafting of the inventory, as well as the creation of custom cursor pointers that hinted towards what the next action would be. The growth rates were rebalanced in order to allow the player to see the changes in the sprite.

6.4.2. Beta testing, phase 2:

In this stage the game had its final assets but no animations and no victory condition. Sounds and custom cursors were added. The previous fixes inadvertently broke some features and exposed overlooked bugs:

Issue: "Plants spawn too close together", and "Plants only grow if I click in the exact middle"

- Fix: The collision box was upgraded and taken into account when calculating spawn locations, and its shape changed to accommodate each growth stage and plant.

Issue: "Plants are floating!" and "Some plants appear too close to the edge of the screen"

- Fix: The spawn area was resized accordingly, calculated from the screen size instead of hardcoded, and the plants spawn point script included the final stage sprite size into its calculations so fully grown plants would still remain fully visible inside the play area. The collision box fix from the previous issue caused the "Plants are floating" bug, so that change was included in the spawn new plant script.

Issue: "I can water more than one plant at once"

- Fix: A script was added which calculated the plant closest to the mouse cursor and consumed the click so it wouldn't pass down to the plants underneath.

Issue: "New plants appear on top of everything" and "All plants look the same size"

- Fix: Plant sprites were scaled depending on their vertical (Y) position, and their Z index was tied to their Y position so that plants that spawned further away would appear beneath plants closer to the player.

Issue: "New plants appear on top of the pause screen"

- Fix: A new Z index was assigned to all pop-ups, so that they always appear on top of anything else currently on screen.

Issue: "Maybe the water can could have a bit of a watering animation?"

- Fix: A watering shader was created with particles that spawn from the cursor that played when a plant's watered level increases. More animations were added, such as the Wind 2D animation, the background clouds' movement, and the plant harvest tweens to guide the player's attention from the harvested plant towards the inventory.

Issue: "So when do I win?"

- Fix: A placeholder victory screen was created, modifying the watering shader to animate the falling petals. The main game background and inventory changed to show that victory state has been reached. Endgame mechanics were added, and a debug feature to trigger the victory state was implemented.

6.4.3. Beta testing, phase 3 Godot Sprint User Meetup feedback [39]

It was purely coincidental that, on the final development stage of this project, a Godot Sprint Event was held in the close-by city of Valencia. Taking advantage of the opportunity the Users meet-up that was taking place on June 3rd posed, this project was presented before a mixed crowd of power users, Godot Engine developers and members of the Board of Directors and benefitted from their direct feedback to redesign the roadmap and future steps.

Transcribed underneath features, to the best of the writer's capabilities, the observations and tips received and the possible, as of yet unimplemented, fixes.

Issues, as risen by the audience, and possible solutions and reflections where needed:

- The game controls should be shown clearly before the game starts.

- The main menu is too cluttered, the user does not need that many options when they first encounter your game.

The proposed fix would be to add a sub-menu housing all the extra information that is not "Start" and "Exit".

- There is not enough information for the player on the game's goals.

On asking whether it would be too much hand-holding or give the player the feeling of fulfilling a task-list, it was implied that those are the issues that game design must fix; Not everything can be solved through coding or UI design, the User Experience must be taken into account as well.

- In the same line, a small tutorial pop-up at the beginning would go a long way, and the almanac and help screens would benefit from being less abstract. There is a gradient between "These are the steps [the player] must follow to win" and "This is how the game is played."

This is part of UX design as well, which has been found lacking and needs reworking.

- The first plant should remain alone until the player has completed the first game loop; That would avoid their attention wavering and would display the basic gameplay mechanics more clearly.

- After an idle period, the game should provide some visual cue to guide the player's attention towards the next action.

An option would be a hovering arrow pointing towards an interactable plant, ideally the one that is closest to changing growth stage.

- This would also be necessary at the beginning of the game, because once the (as of yet unimplemented) initial cutscene is over, the players would need some visual cue in order to know they can interact with the world.

- The player would benefit from more information on which plant is focused, the one under the mouse which will receive the player's next action.

A proposed solution would be a backlight or outline shader animation that helps the focused plant stand out from the rest.

- There should be a delay that stops the player from watering more plants while the previous watering animation is playing. That would regulate the pacing of the game and eliminate the spam-clicking issue, which is counter-productive in a chill game.

This is an easily fixable issue and will be the first one to be addressed in the next build.

- The sun mechanics aren't clear enough; There should be a way to signal which plants are ready to grow to the next stage.

In the games this project is inspired by, the crop growth is tied to in-game time, and growth happens simultaneously for all plants onscreen. This is a fundamental mechanic that needs reworking beyond a simple fix. It is, essentially, a Turn-Based mechanic that has been imported into a Real Time Strategy environment, and in its current state is actively hindering the project.

- Game progression isn't clear enough; There are not enough clues to inform the player that a new species has been unlocked or that unlock requirements have been met.

Diegetic ways to inform the player are currently being considered, but no consensus has been reached.

Figure 26: Godot User Meetup presentation of The Forest Rises [39]

7. Conclusions and future work

7.1. Conclusions

The project's main goal was to publish the game and receive an unaffiliated review, and that has not been reached. While the product meets the requirements to be considered a Golden Master Version, current marketing practices would consider The Forest Rises' state to be that of an "Early Access" Game, and as such could be published and keep receiving updates, improving on the game's core mechanics while receiving feedback and integrating it into the development process.

The game has nonetheless received several unaffiliated in-person reviews, which have been dissected in section 6.4.3 from the project's point of view. From the developer's personal perspective, the reviews received were encouraging; The art style and the complexity of the mechanics were profusely complimented, as well as the color palette and the results obtained after such a short development span.

Upon reviewal of the initially stated project stages one can safely say the one-person team's capabilities were overestimated, particularly when faced with the challenge of learning the ins and outs of a new environment, such as Godot Game Engine, and the idiosyncrasies of its scripting language, GDScript. The team can safely say they barely scratched the surface of the GLSL shader language, and that gaining proficiency on the Godot Engine overall would merit its own project, separately from the game design part and the user experience design which reviewers found lacking for a serious project, but remarkable for a first venture.

In consequence, the project has had several supplementary features filed down in order to produce a fully playable game experience. The "extra features" time was filed out in favor of extending the base game production times, leaving out of the development pipeline planned features like friendly animals, enemy attacks, plant unlocks through genetic crossing determined by plant position onscreen, soil upgrades, rain generation, gameplay area expansion, multiple ecosystems, and plant relocation amongst many others.
In addition to this, some of what were considered trivial, quality of life features were found to be unexpectedly time-consuming implementation-wise, which pushed them forward into the

future in order to ensure the completion of a fully-functional beta version, and minor changes turned out to require major refactoring of the main code.

From the design point of view, the beta testing sessions of The Forest Rises have highlighted several misconceptions and challenged the game's core design. Where this project seeked to simplify the experience, reviewers found that such a minimalistic approach was detrimental to the understandability and enjoyment of the work. Where this project relied on usability principles to guide the player instinctively and reinforce their freedom, the players reported a feeling of confusion, and disconnection between their actions and the consequences. While this game built its mechanics around the core idea of "if it doesn't make sense in-world it shouldn't exist", the users expect a certain degree of extradiegetics to their experience. Depriving the players of that layer of unreality hindered their ability to suspend their disbelief and immerse themselves fully into the experience.

This last part has been the most enlightening of the whole project; It is unlikely that a single-person team will undertake an endeavor of this magnitude without consulting professionals or externalizing the management of the planning, marketing, and legal areas, but the project itself was based on some misconceptions on the reality of user experience design that were thoroughly debunked throughout this project. It was startling to find out that features which from a design perspective looked like the optimal choice, from the user experience point of view were confusing, distracting and even counterproductive.

In conclusion, while the initial planning seemed perfectly planned and streamlined, and its development a mere procedure of learning and applying a technology, the results have been educational in unexpected ways; That rigidity in planning performs poorly when pit against the reality of development; That an optimized design does not secure successful communication; That aesthetic features can carry more weight towards player engagement than game mechanics; That a rushed development decision can branch out and affect the code in ways that will be easier to rewrite than fix; That even one single piece of feedback can dredge up enough oversights to warrant a full project upheaval.

In short, that no matter how perfectly a plan is drafted, its strength lies in the development team's ingenuity to improvise, and the management team to adapt the milestones to the production and jointly overcome the challenges as they crop up.

7.2. Future work

While section 3.2 outlines a development roadmap, it has proven to be too idealistic and unreal for a project of this scope at this point in time.

In turn, section 6.4.3 outlines some direct points of action and improvement towards reaching project completion that would benefit the project and enhance the experience in order to fulfill the project's main goals in more concrete, actionable ways. Those are the next steps in this development process and once they have been implemented, -along with a refactoring and clean-up of the code for readability-, The Forest Rises will be formally released, with a tentative release date set for Autumn 2023.

Once the game has been released a new roadmap will be drafted and presented to the public as part of the end-of-year review in time for the 2023 winter sales.

Bibliografia

[1] **USHI NO TANE website:** https://fogu.com/hm/snes/crops.php, viewed on 13/03/2023.

[2] **STARDEW VALLEY Wiki website:** https://stardewvalleywiki.com/Stardew_Valley_Wiki, viewed on 13/03/2023.

[3] **Coral Island Wiki website:** https://coralisland.fandom.com/wiki/Fruit_plants, viewed on 13/03/2023.

[4] **One Lonely Outpost Wiki website:** https://onelonelyoutpost.wiki.gg/wiki/Farm, viewed on 13/03/2023.

[5] **The Wandering Village Wiki website:** https://the-wandering-village.fandom.com/wiki/The_Wandering_Village_Wiki, viewed on 13/03/2023.

[6] **Graveyard Keeper Wiki website:** https://graveyardkeeper.fandom.com/wiki/Items, viewed on 13/03/2023.

[7] **Sakuna of Rice and Ruin Wiki website:** https://sakuna-of-rice-and-ruin.fandom.com/wiki/Planting, viewed on 13/03/2023.

[8] **Summer in Mara Wiki website:** https://summer-in-mara.fandom.com/wiki/Farming, viewed on 13/03/2023.

[9] **Nielsen Norman group website:** https://www.nngroup.com/articles/3-click-rule/, viewed on 25/03/2023.

[10] **PopCap website:** https://www.ea.com/ea-studios/popcap, viewed on 20/03/2023.

[11] **Zone.msn.com website:** https://zone.msn.com/en-us/home, viewed on 20/03/2023.

[12] **Wikipedia entry on Playfish website:** https://en.wikipedia.org/wiki/Playfish, viewed on 20/03/2023.

[13] **Zynga website:** https://www.zynga.com/, viewed on 20/03/2023.

[14] **Facebook website:** https://www.facebook.com/restaurantcity/, viewed on 20/03/2023.

[15] **Fiverr website:** https://www.fiverr.com/, viewed on 10/03/2023.

[16] **PCComponentes website:** https://www.pccomponentes.com/pccom-ready-intel-core-i5-13400f-16gb-1tb-ssd-rtx-4060ti-windows-11-home-negro, viewed on 10/03/2023.

[17] **Amazon website:** https://www.amazon.es/Philips-243V7QDSB-00-resoluci%C3%B3n-tecnolog%C3%ADa/dp/B06Y13QBYL/ref=sr_1_5?__mk_es_ES=%C3%85M%C3%85%C5%BD%C3%95%C3%91&crid=1P2SMGFA7HKTQ&keywords=monitor+PC&qid=1686584411&sprefix=monitor+pc%2Caps%2C101&sr=8-5, viewed on 10/03/2023.

[18] **Amazon website:** https://www.amazon.es/KLIM-Unity-Inal%C3%A1mbrico-semimec%C3%A1nico-

retroiluminado/dp/B08LNMPTVM/ref=sr_1_44?__mk_es_ES=%C3%85M%C3%85%C5%BD%C3%95%C3%91&crid=10ZZBAFF4S44C&keywords=raton+y+teclado&qid=1686584594&sprefix=raton+y+teclado%2Caps%2C103&sr=8-44, viewed on 10/03/2023.

[19] **Amazon website:** https://www.amazon.es/Trust-Gaming-GXT-1160-Vero/dp/B0784BWH3H/ref=sr_1_5?__mk_es_ES=%C3%85M%C3%85%C5%BD%C3%95%C3%91&crid=FHK9WRJNQOTL&keywords=webcam&qid=1686584694&sprefix=webcam%2Caps%2C98&sr=8-5, viewed on 10/03/2023.

[20] **Amazon website:** https://www.amazon.es/AmazonBasics-Computer-Speakers-Desktop-USB-Powered/dp/B07D7TV5J3/ref=sxin_26_trfob_0_B07D7TV5J3?__mk_es_ES=%C3%85M%C3%85%C5%BD%C3%95%C3%91&content-id=amzn1.sym.6ef0bb3c-2608-48dd-86e9-1a0748060c9e%3Aamzn1.sym.6ef0bb3c-2608-48dd-86e9-1a0748060c9e&crid=2UWTH1429MI&cv_ct_cx=altavoces&keywords=altavoces&pd_rd_i=B07D7TV5J3&pd_rd_r=11a42987-1f52-42ee-97e7-62d4c9f3d63e&pd_rd_w=qu9Nu&pd_rd_wg=tJnwl&pf_rd_p=6ef0bb3c-2608-48dd-86e9-1a0748060c9e&pf_rd_r=02SM10A0XQVCES946P8N&qid=1678648660&sbo=RZvfv%2F%2FHxDF%2BO5021pAnSA%3D%3D&sprefix=altavoces%2Caps%2C98&sr=1-1-cc7a04fe-cc55-42ad-b883-1b910070c86a, viewed on 10/03/2023.

[21] **Hetzner website:** https://www.hetzner.com/cloud, viewed on 10/03/2023.

[22] **Movistar website:** https://www.movistar.es/particulares/internet/fibra-300mb, viewed on 10/03/2023.

[23] **Omie website:** https://www.omie.es/es/market-results/daily/daily-market/daily-hourly-price, viewed on 10/03/2023.

[24] **SEPE website:** https://www.sepe.es/HomeSepe/que-es-el-sepe/comunicacion-institucional/noticias/detalle-noticia.html?folder=/2023/Febrero/&detail=El-salario-minimo-interprofesional-publicado-para-2023-se-establece-en-1080-euros, viewed on 10/03/2023.

[25] **HowLongToBeat website:** https://howlongtobeat.com/game/66124, viewed on 19/03/2023

[26] **FOGU website:** https://fogu.com/hm7/, viewed on 19/03/2023.

[27] **GameFAQs website:** https://gamefaqs.gamespot.com/3ds/635388-rune-factory-4, viewed on 19/03/2023.

[28] **Plantera website:** https://store.steampowered.com/app/421040/Plantera/, viewed on 19/03/2023.

[29] **My time at Portia Wiki website:** https://mytimeatportia.fandom.com/wiki/Farming, viewed on 12/12/2012

[30] **Dark Pattern Games website:** https://www.darkpattern.games/, viewed on 12/12/2012

[31] **Fontpair website:** https://www.fontpair.co/, viewed on 12/12/2012

[32] **Nielsen Norman group website:** https://www.nngroup.com/videos/heuristic-evaluation/, viewed on 29/03/2023.

[33] **Nielsen, J.** (1993). *Usability Engineering.* Academic Press.

[34] **Github website:** https://github.com/Maujoe, viewed on 15/05/2023.

[35] **Godot Shaders website:** https://godotshaders.com/shader/2d-wind-sway/, viewed on 15/05/2023.

[36] **Mixkit website:** https://mixkit.co/free-sound-effects/water/, viewed on 04/05/2023.

[37] **FMA website:** https://freemusicarchive.org/music/Kevin_MacLeod/Calming/Windswept, viewed on 04/05/2023.

[38] **Wallpaperaccess website:** https://wallpaperaccess.com/gold-texture, viewed on 26/05/2023.

[39] **Twitter website:** https://twitter.com/scottmada/status/1664989405575098369, viewed on 03/06/2023.

[40] **GMTK youtube:** https://www.youtube.com/watch?v=iIOIT3dCy5w, viewed on 02/03/2023.

[41] **GDCVault website:** https://www.gdcvault.com/play/1023141/Level-Design-Workshop-Adding-Life, viewed on 02/03/2023.

[42] **GDCVault website:** https://www.gdcvault.com/play/1028680/Exploring-Hidden-Stories-in-the, viewed on 02/03/2023.

[43] **GDCVault website:** https://www.gdcvault.com/play/1024250/-Mini-Metro-When-Less, viewed on 02/03/2023.

[44] **GDCVault website:** https://www.gdcvault.com/play/1025879/Level-Design-Workshop-Hitman-Levels, viewed on 02/03/2023.

[45] **Hunike, R., LeBlanc, M., Zubek, R. (2004). "MDA: A Formal Approach to Game Design and Game Research".** *Proceedings of the AAAI Workshop on Challenges in Game AI*. Vol. 4. No. 1. 2004.
Available online at: https://users.cs.northwestern.edu/~hunicke/MDA.pdf, viewed on 02/03/2023.

[46] **Manovich, L.** (2020). *Cultural Analytics.* Cambridge: MIT Press.

[47] **The Forest Rises website:** https://www.tumblr.com/theforestrises, viewed on 18/06/2023.

[48] **Mid-development progress https://youtu.be/yaAPp1zBUKk**, viewed on 13/06/2023.

[49] **The Forest Rises Trailer:** https://www.youtube.com/watch?v=3lU6Ojg6G-U , viewed on 18/06/2023.

[50] **Github repository:** https://github.com/mguardiafr/TF_TIDM

Annexes

Annex A: Glossary

API – Application Programming Interface

Biome – The group of species that live in a set location. In this context, the species that are able to sprout and mature in the current ecosystem.

Browser flash game – A video game that requires an internet connection in order to be played, accessible only through an internet browser. "Flash" refers to the macromedia flash player software, which has been discontinued.

Diegetics – Anything existing and pertaining to a world, like coffee aroma in a coffee shop, or birdsong in a park. Its opposite, extra-diegetics, may exist in a world while not pertaining to it, for the benefit of the person experiencing it, like adding ambient lighting in a dark cave during a movie shoot, for the benefit of the viewer.

DLC – Downloadable Content: Additional content not included in the base experience of a game.

Ecosystem – The totality of species that live or used to live in a set location. In this context, all the species contained in The Forest Rises.

Gameplay loop – The sequence of interactions a player encounters and repeats systematically for the game to advance.

GDD – Game Design Document.

Habitat – A subset of an ecosystem. In this context, the species that are currently onscreen.

Hand-holding – A practice where every action is overly-explained to the player in a way that breaks the immersion and hinders their engagement with the media.

HUD – Heads Up Display: A visual help that allows the player to keep track of their progression within the game.

IP – Intellectual Property; In this context, applies to videogames as a piece of media in relation to the company they belong to or the people who created them.

NPC – Non-Playable Character.

Subtext – Implied, hinted at through contextual clues but never declared outright.

TFR – The Forest Rises

UI – User Interface: Point of communication between a videogame and its user, the player.

UX – User Experience: A user's feelings when their needs, abilities and expectations meet the game's design.

Annex B: Project deliverables

- Windows executable version: **TheforestrisesWIN.zip**
- **SteamOS executable version: TheforestrisesSteamOS.zip**
- Gantt diagram containing the initial programming: Gantt
- Game Manual in HD. **Manual.pdf**
- Project design manuscripts, scanned: **SCANS_20230310.pdf**
- The Forest Rises Badge (front and back). **Acreditacio.pdf**