Gameslab SoSe 2024, Team Green, Milestone 3

# Alpha Release

## 1. Overview & Progress

### Functional minimum

- ☑ ~~One map~~
- ☑ ~~Basic resources: food, water, workers~~
- ☑ ~~Basic facilities: 2 or 3 crop fields, water wells~~
- ☑ ~~Basic turn structure: action points dependent on worker amount, recalculating resources at end of round~~
- ☑ ~~2 soil types: degraded & arable~~

### Low target

- ☑ ~~Seasons to improve turn variety (Normal, Dry, Rainy)~~
- ☑ ~~Basic soil change system: arable soil will degrade during dry season if not protected by certain plants, half moons will turn soil arable during rainy season~~
- ☑ ~~Differentiation between conventional and permaculture fields (plant resilience to seasons)~~
- ☑ ~~Half-moons as a buildable structure for land reclamation~~

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## Desired target

- [x] ~~Basic surface water system: water will be retained in natural “pits”, and half moons, and will either dry up over time or sink into groundwater~~
- [x] ~~Easy groundwater system~~
- [x] ~~Crops need different levels of water, they can die if they are not cared for~~
- [x] ~~More crops, with properties related to game mechanics~~
- [ ] Weather events: Storms, Droughts, Sandstorms… which make it harder for the player to reclaim land, or even directly degrade land occasionally

## High target

- [ ] Procedural level generation
- [ ] Saving and loading games
- [ ] Visual improvements: i.e. some animals roaming around in green areas
- [ ] Audio improvements: larger sound and music variety

## Extras

- [ ] Interconnected cities / regions with specialisations
- [ ] In-game “Making-Of” section with additional information about the Great Green Wall project
- [ ] Multiplayer Mode

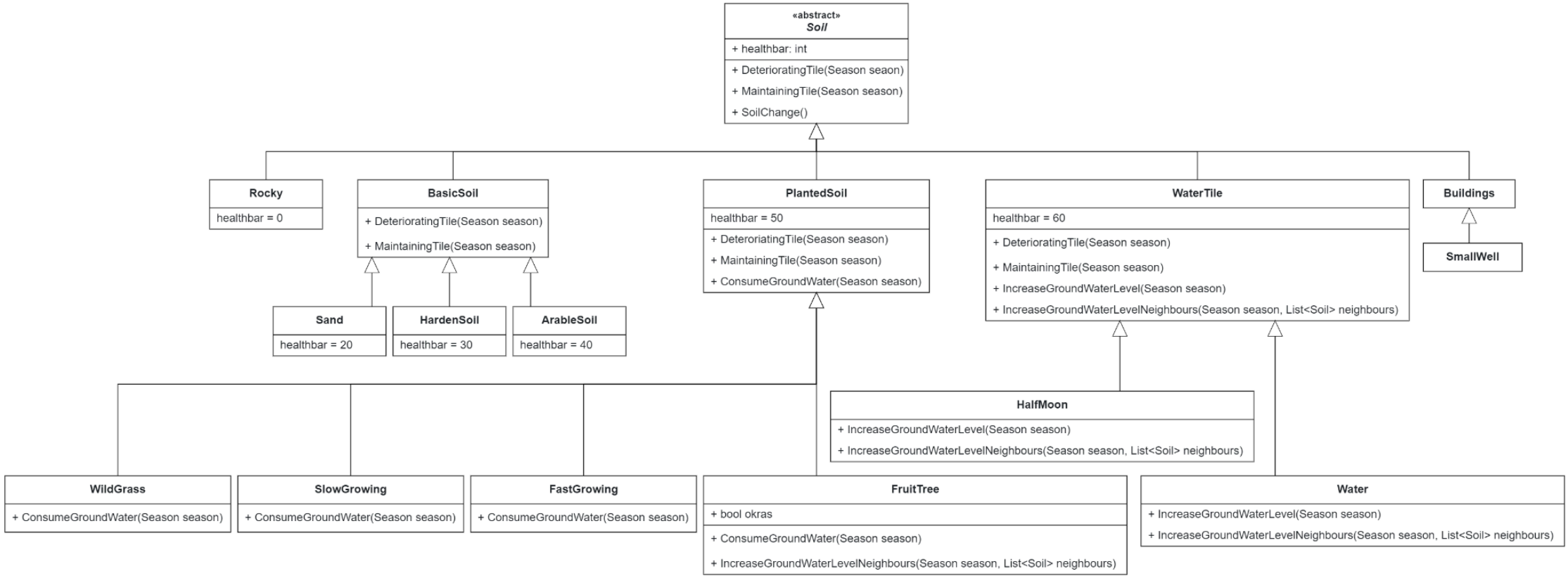
Green: finished subtasks
Blue: not yet started

| | Interrim Demo | | | Alpha Release | | | Playtesting | | Final Release | |
|---|---|---|---|---|---|---|---|---|---|---|
| | CW 19 | CW 20 | CW 21 | CW 22 | CW 23 | CW 24 | CW 25 | CW 26 | CW 27 | CW 28 |
| **Functional Minimum** | | | | | | | | | | |
| Basic Art Assets | | | | | | | | | | |
| Building First Map | | | | | | | | | | |
| Unity Setup | | | | | | | | | | |
| Resources & Turn System | | | | | | | | | | |
| Placing "Buildings" | | | | | | | | | | |
| UI & Main Menu | | | | | | | | | | |
| Sounds & Music 1 | | | | | | | | | | |
| **Low Target** | | | | | | | | | | |
| Soil Change System | | | | | | | | | | |
| Season System & Effects | | | | | | | | | | |
| Art Assests: Seasons, Crops, new Soil | | | | | | | | | | |
| Additional Crops | | | | | | | | | | |
| ~~Community Buildings~~ | | | | | | | | | | |
| Sounds & Music 2 | | | | | | | | | | |
| **Desired Target** | | | | | | | | | | |
| Ground Water System | | | | | | | | | | |
| Surface Water System | | | | | | | | | | |
| Water Stats for existing Crops | | | | | | | | | | |
| Art Assets: Water, Weather, new Crops | | | | | | | | | | |
| Tutorial | | | | | | | | | | |
| Weather Events | | | | | | | | | | |
| **High Targets & Finalization** | | | | | | | | | | |
| Procedural Level Generation | | | | | | | | | | |
| Saving & Loading | | | | | | | | | | |
| Audio Improvements | | | | | | | | | | |
| Visual Improvements | | | | | | | | | | |
| Feedback integration | | | | | | | | | | |
| Bugfixing | | | | | | | | | | |

# 2. Improved Soil Hierarchy

We decided on a set of tiles we want to use in our game and adapted our soil hierarchy accordingly. While we increased the number of different tile types we tried to keep the logic inside the classes to a minimum to make the soil hierarchy more understandable and compact. We removed the groundWaterLevel variable and measure the water levels with the healthbar now. The healthbar values indicate the water percentage of the tiles. The water levels can increase or deplete at the end of each turn depending on the current season. When the healthbar value reaches the value of the next higher or lower tile type in the hierarchy, we passively change the soil. Rocky tiles are the worst kind of tile and can't change any more. Similarly, tiles that are occupied by a building don't change.

The BasicSoil tiles only increase or decrease their water levels based on the season. Sand tiles can improve into HardenSoil tiles can improve into ArableSoil tiles, or deteriorate accordingly. If the water levels are high enough ArableSoil tiles can become WildGrass tiles and if the water levels improve even further WildGrass tiles change into Water tiles.


«abstract»
Soil
+ healthbar: int
+ DeterioratingTile(Season seaon)
+ MaintainingTile(Season season)
+ SoilChange()
Rocky
healthbar = 0
BasicSoil
+ DeterioratingTile(Season season)
+ MaintainingTile(Season season)
PlantedSoil
healthbar = 50
+ DeteroriatingTile(Season season)
+ MaintainingTile(Season season)
+ ConsumeGroundWater(Season season)
WaterTile
healthbar = 60
+ DeterioratingTile(Season season)
+ MaintainingTile(Season season)
+ IncreaseGroundWaterLevel(Season season)
+ IncreaseGroundWaterLevelNeighbours(Season season, List<Soil> neighbours)
Buildings
SmallWell
Sand
healthbar = 20
HardenSoil
healthbar = 30
ArableSoil
healthbar = 40
HalfMoon
+ IncreaseGroundWaterLevel(Season season)
+ IncreaseGroundWaterLevelNeighbours(Season season, List<Soil> neighbours)
WildGrass
+ ConsumeGroundWater(Season season)
SlowGrowing
+ ConsumeGroundWater(Season season)
FastGrowing
+ ConsumeGroundWater(Season season)
FruitTree
+ bool okras
+ ConsumeGroundWater(Season season)
+ IncreaseGroundWaterLevelNeighbours(Season season, List<Soil> neighbours)
Water
+ IncreaseGroundWaterLevel(Season season)
+ IncreaseGroundWaterLevelNeighbours(Season season, List<Soil> neighbours)

The PlantedSoil tiles consume bits of their groundwater based on the type of crop they need more or less water. The FruitTree tiles are special, they can improve the groundwater levels of their neighbouring tiles. The okras variable indicates if FruitTree tiles also have harvest.

The WaterTile tiles can not only improve their own groundwater levels but also their neighbours. Players can dig HalfMoon tiles on AriableSoil tiles. Over time, HalfMoon tiles will become Water tiles.

### Soil Data Storage Changes

We have also made backend improvements regarding how we store and interact with game data. Initially, we relied on checking the tilemap elements, names, and sprites to get information about the status of the map tiles. However, as we needed to store more data, such as water levels and plant growth levels, the native Unity tilemap wasn't enough.

To address this, we decided to build a dictionary of soil tiles, with the keys being the coordinates at the start of each level. This approach allows us to efficiently store and access detailed information for each tile. Every time the player makes a change, the soil dictionary is updated accordingly. This method not only made our soil data management process easier but also improved the capabilities of our system.
We also revised most of our existing code to utilize the dictionary instead of the previous method. This transition has enabled us to implement additional features and enhancements more effectively.

## 3. Basic Seasons

We have implemented a basic season system for our game. The game starts in a Dry season and cycles through Rainy and Dry seasons. The length of each season is a random value, ranging from a minimum of three turns to a maximum of eight turns, directly influencing the water system. These seasons impact water level changes on the map and the water consumption of plants.

Additionally, certain tiles behave differently depending on the season. For instance, HalfMoon tiles store water during the Rainy season, improving and maintaining water levels around them during the Dry season. This seasonal mechanic introduces a strategic choice to the game, requiring players to adapt their strategies according to the changing conditions.

## 4. Water System

The water system is based on the type of tile and the current season. Generally, in the Rain season, the groundwater levels of the tiles rise, while in the Dry season, the levels deplete. WaterTiles provide neighbouring tiles with water. HalfMoon tiles are a special type of

WaterTile. They will become “full” Water tiles over time when their groundwater levels rise during the Rain season. PlantedSoil tiles consume water. FastGrowing tiles consume more water than SlowGrowing tiles. FruitTree tiles are special since they don’t consume much water and help keep the groundwater levels of their neighbouring tiles constant.

# 5. Challenges & Revisions

## Displaying Water Level Information

Our initial idea was to display the water level for each tile separately, allowing players to plan accordingly. This concept was intended to give players more control over the entire map and soil conditions. However, during the development and implementation of this idea, we found that displaying water levels for each tile was not very clear for the player and created unnecessary clutter on the screen during gameplay. The complexity of managing water levels for all tiles did not enhance the fun factor and added unnecessary complexity without contributing to gameplay mechanics.

The lack of clarity and the unnecessarily complex nature of the initial design led us to rethink our approach. We decided to convey water level information visually through different tile types and sprites that change over time, reflecting various tile conditions and soil moisture levels.

Also by limiting interactions to the tiles where players build and plant instead of the whole map, we reduced the management burden. This shift allowed players to focus on planning and resource management, rather than being bogged down by micromanaging each individual tile. Simplifying the soil and water management elements and incorporating a more gamified approach made the overall experience more enjoyable and accessible. We simplified certain elements of soil and water management, as well as crop growth, to strike a balance between realism and enjoyable gameplay.

# 6. Sprites and UI

## Sprites and Tilesets

We have created some additional custom sprites for our game and updated the small house and farm sprites.

- - Wheat Crop Tiles

- - Beans Crop Tiles

- - Tree Tiles (small, middle, normal tree)

- - Tree Tiles (tree with fruits version 1 and 2)

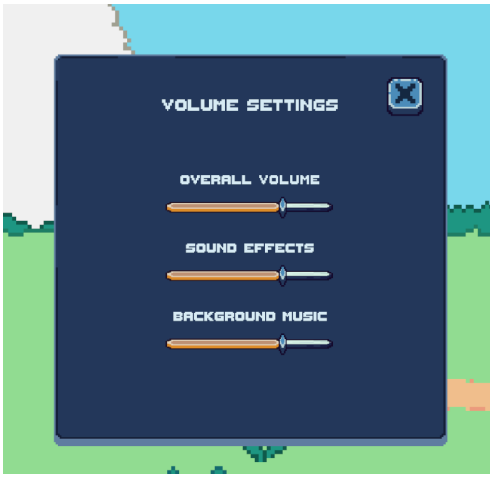
- - Updated house and farm tiles

- - Water storage Tiles

## User Interface

We have updated the in-game UI with our custom sprites and further expanded the Main Menu scene. Currently, we have implemented the Settings button, which opens a window for volume controls in the main menu. It has 3 separate sliders for overall volume, sfx volume and background music volume. Also, the start button was substituted with the level-choosing button. This button opens a window where the player can choose a level directly. The level buttons are set up dynamically at the start of the level based on the level names that can be assigned to the list.


# 7. Audio




## Audio Manager

The Audio Manager was to control the audio. It handles the music volume (implemented which can be controlled from settings mentioned in the User Interface part) and executes background music (currently, depending on level) and sound effects.

## Background Music

We have created several compositions with Google's experimental AI: MusicFX. The language model can generate music based on a text prompt. We tried to use all the basic keywords that remind us of our game in the prompt and control the mood of the composition with adjectives. Even though those compositions might not be the best possible quality, they provide a nice solution for our prototype. This music is currently looped and changed depending on the level.

## Sounds

Right now, we have implemented some basic sfx for the game: button sound, putting building sound, planting and harvesting sounds. Those sounds cover basic functions in our game and are managed by the Audio Manager.

# 8. Additional Levels

Now that work on implementing the features is mostly finished, we have begun designing and building additional levels.The first set of levels introduce the player to all our features step by step.

- Level 01:
  Introduces basic mechanics: interaction with tiles, building huts, wells and fields, explanation of basic resources (food, water, action points)

- Level 02:
  Introduces half-moons for soil improvement and soil changing system, as well as fruit trees as new crop. Explains how crops consume water and how this affects soil changes.

- Level 03:
  Introduces seasons and how they affect soil and it's change system as well as crop growth.

- Level 04:
  Has all mechanics unlocked and presents the player his first full challenge, to build and expand his first patch of the green wall.

Further levels will be crafted to present the player with challenges targeted at specific aspects of the mechanics. For example, one level could be set in a especially dry environment with strong tendencies for land degradation, in another the player could be located between dry, sandy land and a swelling river, leaving him with little room to grow crops and expand.