**Agent types:**

* Agri farmers (small, middle, corporate)
* Aqua farmers (small and large)
* Wage workers (in agri and aqua)
* Service farmers
* Migrated agents
* Mix, consisting of multiple members in different professions

**Sustainable livelihood theory**

According to (Chambers & Conway, 1992), a sustainable livelihood is defined by the ability to cope with and recover from stresses and shocks, which are for example caused by environmental changes. Based on this definition, (DFID, 1999) created a sustainable livelihoods framework. The framework consists of five assets, to give an understanding of people’s strengths:

1. Human capital, this refers to the skills, health and knowledge people have.
2. Social capital, these are the social resources people can rely on. Examples are networks, memberships of groups, and relationships.
3. Financial capital, these are the financial resources, such as savings and loans, which can be used to achieve their goals.
4. Physical capital, this refers to the infrastructure, for example transport, housing, access to information
5. Natural capital, these are the natural resources such as water and erosion protection.

Multiple studies have already been conducted in Vietnamese Mekong Delta (VMD) using this framework. (Tran et al., 2020) studied the sustainable livelihood of rice farmers in three districts in An Giang province. This is a province at the west side of the VMD. In addition, Tran et al., (2020) decided to add two assets to the framework: “livelihood strategy” and “natural disaster and climate change”.

Furthermore, (Thu Trang & Loc, 2021) studied the livelihoods of shrimp farmers in three coastral districts in Ben Tre, which is located on the east side of the VMD. They have used more than fifty variables to determine the five assets.

Each researcher has their own implementation of the framework, and when implementing all variables, the ABM will become huge. Furthermore, there is a lack of data representing the VMD. For each of the five assets, a few factors have been chosen to represent the asset:

|  |  |
| --- | --- |
| **Livelihood** | **Factors** |
| Human livelihood | * Meetings agrocensus yes/no * Education level * Experience in farming |
| Social livelihood | * Part of social organisation/community * Support from the government yes/no |
| Financial | * Savings * Loans |
| Physical livelihood | * Land size * Facilities such as supermarket, transport, bank) |
| Natural livelihood | * Salinity level * Access to water * Measures to increase water or decrease salinity / equipment |

**MOTA framework**

The MOTA framework is created to help in assessing the implementation feasibility of a plan (Phi et al., 2015), and is often applied to the VMD (Korbee et al., 2019; Pham et al., 2022). In the framework, the motivation for an option is multiplied by its ability. The option with the highest score will be implemented. Motivation is based on perceived threats and perceived opportunities. Ability can be divided into technical ability, financial ability and institutional ability. Below is an implementation of the framework for agricultural farmers.

Afbeelding met schermopname, tekst, ontwerp

Door AI gegenereerde inhoud is mogelijk onjuist.

Financial ability will be defined by the financial livelihood, and the price of the alternative. Institutional ability will be defined by the human livelihood of the households. Technical ability will be defined by the natural livelihood, and depends on the requirements per alternative. If an agent wants for example to change to mangos instead of rice, but its salinity level is too high, the technical ability will be lower.

Motivation depends on the type of strategy. If the strategy is based on measures for water or salinity levels, the motivation depends on the natural livelihood. If the strategy is implemented to increase income, the motivation will be based on financial livelihood.

For each possible strategy, the motivation and average ability will be multiplied, and the highest score will be implemented.

The idea is to implement the sustainable livelihood framework and MOTA framework for all farmers (agricultural and aqua).

**Yield**

The impact of salinity levels will be calculated based on formula by (FAO, n.d.):

Yield = 100 – b(EC – a), where b = slope (% per dS/m), a = salinity threshold (dS/m) and EC is the currect salinity level. These values can be found for different crop types in (Blom-Zandstra et al., 2017)

(Blom-Zandstra et al., 2017) also distinguished between sensitive, moderately sensitive, moderately tolerant and tolerant crops in the VMD. Later, experts should be consulted which crop types agents can switch to.

**Strategies**

(Kurukulasuriya & Rosenthal, 2013) defined a matrix with all possible strategies farmers can implement, together with their purpose and prerequisites. Based on these factors, and the adaptation measures defined by (Blom-Zandstra, 2017; Trung Thanh et al., 2021), the following strategies are defined for farmers. I want to validate this by asking experts by Deltares next week, and give them the correct price, knowledge and ability.

*Small and middle agri farmer:*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Type** | **Price** | **Knowledge** | **Technical ability** | **Impact** |
| Change\_seed\_quality | Crops |  |  | Agro census yes/no | Change seed quality |
| Use fertiliser | Crops |  |  | Agro census yes/no | Yield is higher |
| Switch from 2 to 3 crops or other way around | Crops |  |  | - | Higher yield |
| Change to coconut | Crops |  |  |  | Change yield type |
| Change to mango | Crops |  |  |  | Change yield type |
| Change to corn | Crops |  |  |  | Change yield type |
| Alternative drainage method | Water |  |  |  | Decrease salinity |
| Water reservoirs | Water |  |  |  | Decrease salinity |
| Irrigation efficiency (use waste water, better scheduling, drip irrigation) | Water |  |  |  | Decrease salinity |
| Migration | none |  |  | Contacts in the city | Migrated agent |

*Corporate / large farmer:*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Type** | **Price** | **Knowledge** | **Technical ability** | **Impact** |
| Use fertiliser | Crops |  | 0.7 | Agro census yes/no | Yield is higher |
| Switch from 2 to 3 crops or other way around | Crops |  | 0.5 | - | Higher yield |
| Change to coconut | Crops |  |  |  | Change yield type |
| Change to mango | Crops |  |  |  | Change yield type |
| Change to corn | Crops |  |  |  | Change yield type |
| Alternative drainage method | Water |  |  |  | Decrease salinity |
| Water reservoirs | Water |  |  |  | Decrease salinity |
| Irrigation efficiency (use waste water, better scheduling, drip irrigation) | Water |  |  |  | Decrease salinity |
| Research and development | Water or Crops |  |  |  | Higher yield |
| Adoption of new technologies | Water or crops |  |  |  | Higher yield |

*Shrimp farmer small:*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Type** | **Price** | **Knowledge** | **Technical ability** | **Impact** |
| Change in biological species | Animal |  |  |  | Yield is higher |
| Prevent diseases | Animal |  |  |  | Higher yield |
| Use more effective gear | Animal |  |  |  | More yield |
| Migration |  |  |  |  | Become migrated agent |

*Shrimp farmer large:*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Type** | **Price** | **Knowledge** | **Technical ability** | **Impact** |
| Change in biological species | Animal |  |  |  | Yield is higher |
| Use more effective gear | Animal |  |  |  | More yield |
| Prevent diseases | Animal |  |  |  | Higher yield |
| Water recycling | Water |  |  |  | Increase water quality |
| Migration |  |  |  |  | Become migrated agent |
| Adoption of new technologies | Water |  |  |  | Better water quality |

**Flowchart for agri farmer**

**Afbeelding met tekst, schermopname, Rechthoek, Lettertype

Door AI gegenereerde inhoud is mogelijk onjuist.**

**To do list**

* Loans, ik moet even uitzoeken hoe dit werkt. Wanneer kunnen mensen een lening krijgen, hoe hoog is die, en hoe betalen ze die terug
  + Mensen kopen nu dingen die ze niet kunnen betalen
* Technical abilities 🡪 wat ga ik doen met hoeveel equipment iemand heeft, wat de measures zijn etc?
* Impact van measures op de yield 🡪 alleen focussen op salinity of ook water toevoegen?
* Strategies laten valideren
* Aqua farmers toevoegen
* Migraties
* Wage workers