

## FAMILY FARMING LIFESTYLE AND HEALTH IN THE PACIFIC

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## SUMMARY

Teaching tools to promote family farming in Vanuatu (primary and secondary)

### 1) Purpose

Provide practical, curriculum-friendly activities for teachers, using demonstrations to make learning tangible and to support the status of family farming.

### 2) How to run each activity

- Demonstration visit: observe and discuss.
- Class preparation: link to objectives and plan tasks.
- School practice over weeks/months: do, monitor, adjust.
- Teaching reinvestment: use outcomes in lessons; stimulate with friendly competitions (yields, diversity).

### 3) Adaptation to local conditions

After 1980, support often favored export crops (copra, coffee, cocoa, kava) more than household food production. With rising imports and knowledge loss, the guide promotes low-input 'ecological intensification' and positions schools as a bridge between custom and sustainable innovation. So, choices depend on rainfall/drought patterns, coastal vs inland environments, population density, and access to land or coastal resources. The guide groups schools into three broad profiles: dry rural coast, wet rural coast, and urban/peri-urban coastal areas.

### 5) Generic tools (usable almost everywhere)

- Chicken coop: nesting boxes to secure eggs; links to biology, behavior, and simple household economics.
- Intercropped garden: show benefits of mixed planting (e.g., maize-bean-squash; companions for tomatoes); school project + diversity challenges.
- Compost: turn organic waste into fertility; teach living soil and decomposition processes.

### 6) Context-specific options and expected impact

- Clam garden (coastal): community agreement; ecology and civic learning; simple temperature tracking.
- Salinized plots: test salt-tolerant tomatoes; introduce selection and propagation (cuttings, seeds).
- Dry zones (Jean Pain-style brushwood compost): improve moisture retention and reduce fire risk (often better for secondary).
- Extensive pigs in enclosed pens: animal welfare and health resilience, but needs space and technical support.
- Overall impact: connect families-school-farming; spread climate-resilient practices and strengthen local food autonomy.

## **Introduction**

This deliverable aims to promote family farming in Vanuatu by providing primary and secondary school teachers with educational tools that complement the school curriculum.

The aim is both to enrich teaching by offering field activities that illustrate the teacher's lessons and to facilitate their assimilation by students, who are particularly receptive to practical applications.

As Vanuatu is a country with an oral tradition, it is important that basic teaching is accompanied by demonstrations that encourage dialogue between students and teachers and, if possible, between students themselves.

This deliverable is therefore primarily intended for teachers in Vanuatu. The teaching tools that will be presented are organized into two groups.

The first group consists of generic tools that can be used in all schools in the country, regardless of their geographical location and the students' level.

It may seem surprising that the same teaching tools are offered to primary and secondary school students, but it is the nature of generic tools to be applicable to different populations. Only the ways in which the tool is presented and the students are guided in its use differ according to the level and sensitivity of the teacher.

Secondly, there are teaching tools specific to the geographical, socio-economic, and demographic context in which the country's schools operate.

This geographical, socio-economic, and demographic context will lead us to draw up a simplified typology of schools in the archipelago.

This typology will be supplemented by a presentation of the historical context in Vanuatu in which the FALAH program and the implementation of the teaching tools that are the subject of this deliverable are taking place.

This first part of the context will be followed in the second part by a presentation of the generic teaching tools and in the third part by the tools specific to each type of school in the typology.

### **1. Typology of schools according to their geographical, socio-economic and demographic environment and the historical context of family farming**

#### ***1.1 Geographical, socio-economic and demographic context***

The geography of the islands of Vanuatu leads us to differentiate the island space into two parts: the coast and the interior of islands.

In the high islands, a further distinction must be made between the so-called "windward" slopes, which are subject to the prevailing winds and receive abundant rainfall, and the "leeward" slopes, which are considerably drier, as the clouds coming in from the sea and

driven by the prevailing winds have discharged a large part of their moisture on the windward slope.

This distinction between windward and leeward slopes means that drought is a major constraint on family farming. This variable must not just be suffered. Farmers need to be proactive in this area. It is therefore important that the educational tools developed at school level to raise awareness of family farming among pupils and their parents should address the issue of drought.

As for the socio-economic and demographic context, it leads to a partition of space into four parts: urban space, peri-urban space, sparsely populated rural space, and medium- and high-density rural space.

This typology leads to constraints and opportunities for developing family farming in Vanuatu, and the educational tools to be implemented to enhance its value.

The distinction between coastal and inland areas leads to the possibility for schools to include or not include fishing and shellfish gathering in family farming, and to emphasize or not emphasize coastal biodiversity management as a practice accompanying small-scale fishing, part of family farming.

All schools are considered to belong to the coastal area if they are located by the sea or less than an hour's walk from it.

This choice to focus on distance in time rather than Euclidean distance is explained by the topography of Vanuatu's high islands. On flat ground, an hour's walk will cover 5 to 6 km, and only 2 km on slopes.

The 6 km isolines on the plains and 2 km on the piedmonts distinguish the coast from the inland.

The distinction between urban, peri-urban and rural areas is based on both the degree of urbanization and population density.

Together, these two parameters determine the potential surface area for family farming.

Urban areas are densely populated and have very little arable land. Family farming is confined to gardening on a few dozen square meters of private land.

Peri-urban space surrounds urban space. Distance from the city, but also the density of the transport network, is what distinguishes peri-urban space from rural space.

For example, the numerous buses linking Port-Vila and Luganville to their "crowns" make day trips easy, so that a city resident can travel to the peri-urban area to cultivate a plot of land and return before nightfall. Similarly, a peri-urban resident can easily travel to the city to sell his farm produce, and return home at the end of the day. Dans cet espace périurbain, la densité de population est bien moindre qu'en ville et les surfaces cultivables sont nettement plus importantes. Elles peuvent atteindre plusieurs centaines de m<sup>2</sup> par parcelle cultivée, voire plus dans les zones périurbaines périphériques, qui sont les plus éloignées de la ville.

In this peri-urban area, population density is much lower than in the city, and arable land is much larger. They can reach several hundred m<sup>2</sup> per cultivated plot, or even more in the outlying peri-urban areas, which are the furthest from the city.

While rural areas are distinguished from urban and peri-urban areas by their lack of urbanization and lower population density, it should be noted that some rural areas can have much higher population densities than the national average (24 inhabitants/km<sup>2</sup>), with obvious repercussions for family farming: the area available for cultivation is much smaller, and not all farmers will have access to the "best" land. The availability of land therefore takes precedence over the agronomic quality of the soil.

A distinction will therefore be made between high-density rural areas and low-density rural areas, where people wishing to farm will be subject to fewer land constraints and will be able to select the land they intend to cultivate according to its agronomic quality<sup>1</sup>. These low-density areas therefore present the most favorable conditions in terms of arable land.

In the end, distance from the sea, degree of urbanization and population density, and degree of exposure to prevailing winds enable us to define six types of areas in which schools are located:

- coastal urban areas: in Vanuatu, as in all the Pacific islands except Papua New Guinea, all urban centers are located on the coast;
- the coastal peri-urban area: as the peri-urban area is associated with the urban area, and the latter is entirely coastal, we have considered that this peri-urban area is also entirely coastal;
- high-density coastal rural areas: generally speaking, coastal areas are much denser than inland areas. This is a historical fact linked to the establishment of Christian missions, which in the second half of the 19th century led inland populations to migrate to the seaside in search of new viability from the missionaries (Bonnemaison, 1986);
- low-density coastal rural areas. This type of area is found on the one hand on islands with overall densities well below the national average, such as Erromango, and on the other hand on coastlines where missions are rare, such as the eastern coast of the Pentecost center, and which have therefore been partly deserted by their population for over 150 years;
- high-density inland areas; this type of area is uncommon and is found mainly in Tanna;
- low-density inland areas, which are widespread on large, high islands.

To these six types of space, we can add the climatic variable that identifies dry zones.

### **1.1. School typology**

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<sup>1</sup> As a reminder, in 1980 Orstom (now IRD) produced an atlas of soils and their agronomic quality on the main inhabited islands of Vanuatu (Quantin, 1980). Ten years later, the results of this atlas were validated by the CSIRO team led by J. MacAlpine, who was in charge of the VANRIS (Vanuatu Resource Information System) project.

Generally speaking, secondary schools (whether denominational or not) have a much wider catchment area than primary schools, which are primarily local establishments. The latter are therefore totally dependent on the geographical and socio-economic area in which they are located.

In this context, there are seven types of primary school:

- Primary schools located in densely populated coastal areas;
- primary schools located on sparsely populated coastlines;
- primary schools in urban areas;
- primary schools in peri-urban areas;
- inland primary schools in densely populated areas;
- inland primary schools in sparsely populated areas;
- coastal primary schools on leeward coasts likely to suffer from drought, whether in peri-urban or rural areas.

As pointed out above, secondary schools have a much wider catchment area than primary schools, are much less numerous and are all located on the coast, so this last typology is too detailed.

In the end, only three main types of primary schools will be distinguished:

- Schools located in rural areas on dry coasts,
- schools located in rural areas on wet coasts,
- schools in urban and peri-urban coastal areas. As the climatic variable drought is not considered a determining factor compared to population density, it will not be taken into account here.

### ***1.3 Historical background***

At independence in 1980, the new government of Vanuatu decided to make agriculture the spearhead of the archipelago's economy.

Alongside family farming, which was still largely subsistence-based, the emphasis was placed on small village plantations, formed from the dismemberment of the plantations of settlers who had left the archipelago (Vanuatu NPO, 1982; David, 1994; David, 2020).

The aim was to establish a viable economic sector based on copra and, depending on the island, coffee (Tanna), cocoa (Malicollo) and kava, enabling Vanuatu to become an agricultural exporter.

Heir to pre-colonial agriculture, small-scale family farming has not received the same attention from the public authorities as export farming.

Yet its role has remained essential in terms of national food security, with tubers (yams, taro, manioc, sweet potatoes, etc.) playing a predominant role, as local food production saves the country from costly food imports, particularly cereals (mainly rice and wheat).

Over the years, however, this essential role of family farming in the country's food security has deteriorated.

While the latest agricultural census shows that almost 75% of the country's households continue to practise small-scale family farming (VNAC, 2022), it has to be said that less and less land is being cultivated, and that while traditional culinary techniques and cooking still survive, they are under threat from the disappearance of ancestral knowledge and the pressure of the modern economy (Lebot and Siméoni, 2015).

As Lebot (2025) points out, only 23% of the food required for daily household energy expenditure comes from locally produced roots and tubers. 26% comes from imported cereals. In total, more than half of this food is the subject of a commercial transaction.

The outlook for family farming is bleak. It is in danger of becoming a hobby and losing much of its nutritional function.

The current global trend, marked by the return of empires (China, Russia, Turkey, USA), climate change and strong demographic growth in India and Africa, risks reducing the planet's productive capacity for agricultural exports.

Against this backdrop, major tensions are expected on the international cereals market.

Small island countries such as Vanuatu risk seeing their demand on this market go unsatisfied, unless they accept political vassalage towards one of the major grain-producing countries with its sizeable armies.

The food security of small island countries is therefore inconceivable without the development of their food autonomy.

In Vanuatu, this development depends on small-scale family farming, whose production must return to levels sufficient to partly feed the national population.

Given the country's demographic dynamism - in 1980, the population was 180,000, whereas it is estimated to be close to 340,000 in 2025, with an annual growth rate of over 2% - this is a major challenge.

It's not a question of going back to pre-colonial agriculture, but of preserving its most successful logics and practices and integrating new logics and practices to achieve ecological intensification, i.e. better use of the natural mechanisms of ecosystems to produce more efficiently, from available resources and based on new scientific foundations (Chevassus Au Louis and Griffon, 2008; Dugué *et al.*, 2011).

To be successful, the response to this challenge must integrate the school and insert family farming into the curriculum, which presupposes developing pedagogical tools available to teachers.

## **2. Generic teaching tools**

All the teaching tools presented here are demonstration actions that will enable students to act by practicing family farming, but also to learn by observing and listening to those in the know, and finally to dialogue and discuss amongst themselves.

It is therefore proposed that each tool be broken down into 4 stages.

1. Visit to a demonstration site where family farming is practiced. Students observe and listen.
2. Preparation at school for putting into practice the type of family farming that was the subject of the visit. This session is an opportunity to make the link between what has been learned in the past days and weeks and the observations made by the students during the field visit. Pupils discuss and plan, i.e. look to the future to ensure that the type of family farming they are going to put into practice is successful.
3. School-based family farming. This stage can last from several weeks to several months, depending on the type of family farming implemented. Pupils not only take action, but also listen to the teacher, talk to each other and, above all, put into practice in the field the actions programmed in the previous phase.  
 This stage is at the heart of the teaching tool. It's important that students perceive that the efforts required of them are not just for them and their classmates, but are part of a dynamic that affects the whole school environment, or at least several schools.  
 To give concrete expression to this perception, it is recommended that schools using these educational tools launch a competition to stimulate pupils and make them aware of the value of learning about family farming.  
 Ideally, prizes for the most deserving classes or schools could be financed by the EU regional delegation in Fiji or its representative in Port-Vila.
4. Use of family farming to enrich lessons and give them an everyday reality.

The following types of family farming will be presented in turn:

- The henhouse,
- The complantation of vegetables, roots and fruits,
- Composting.

### **2.1 Chicken coops**

As in many countries in the inter-tropical zone, chicken farming in Vanuatu is based on two models:

- that of the free-range hen, practiced at family household level in rural and sparsely populated peri-urban areas,
- intensive farming, practiced by a company that supplies the local market with quality eggs and even broiler chickens.

From an economic point of view, the first model requires no inputs, the hens feed on the "field" but production is limited to the young animals hatched from the eggs, hens or chickens known as "bicycles" in reference to the extreme firmness of their flesh.

As the hens do not have a nesting box, eggs are laid in the natural environment, wherever the hens wish, and are never collected by the family. Some of the eggs laid are lost to predation by rats or other small animals, while others are incubated.

This model therefore deprives families of the eggs laid by their hens, which could be a free, high-quality source of protein if another model were implemented.

The second model is not family farming, but commercial farming. The hens are raised by a company whose aim is to produce eggs for sale on the local market. The eggs laid are therefore a commercial commodity, and as such are rarely consumed by people on modest incomes.

However, there is another model, still relatively undeveloped in Vanuatu, that of family poultry farming.

### 2.1.1 Poultry farming at school

The school is the ideal place to familiarize pupils with family poultry farming, with the hope that in the short term, as the children raise their parents' awareness, they will provide them with a henhouse and a few chickens, and that in the long term, once they have become adults, the pupils will become involved in this type of farming.

This type of breeding takes the form of gallinaceous birds parked in a modest-sized enclosure, sheltered at night in a henhouse and laying eggs in a part of the henhouse known as the "nesting box".

This type of farming allows the family to benefit from eggs, a much simpler and less expensive source of protein than fish, milk or meat, to cover daily expenses, which average 50 grams for any human, regardless of age or sex.

As the hen is a social animal, it is not advisable to raise only one hen. Micro-farms must therefore have at least two hens, but for a class, a minimum of five hens is required for this type of farming. In this context, two to three eggs a day can be expected on average over the year, or 15 to 20 eggs a week.

In addition to eggs, if a rooster is added to the barnyard, the family can enjoy the meat of young chickens.

A ratio of one rooster to ten hens is the average recommended by the literature<sup>2</sup> but, depending on the breed of hen, this ratio can range from six to twelve hens to one rooster.

It is recommended that hens be kept for laying, and that only chickens be slaughtered for meat. These are sold live at between two and four months of age.

The animals are fed by the pupils, who bring to school the leftovers from the previous day's family meal. When the pupils take their lunch at school, the leftovers from this meal are added to the food.

The eggs collected are redistributed to the pupils and their teachers according to the quantities of meal leftovers brought in to feed the chickens.

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<sup>2</sup> <https://animaleyedocteur.fr/combien-poules-coq/>

Proceeds from the sale of the chickens will be donated to the class to develop its educational activities in family farming.

To stimulate the pupils, it is recommended that a competition be organized between primary schools for the most productive chicken coop. Such a competition could also be organized for secondary schools.

### 2.1.2 Pedagogical value of poultry farming in schools

#### Interest for primary schools

##### Notions of physics

- learning about temporality by watching chicks grow until they reach adulthood.

##### Biology

- learning about the life cycle by watching chicks hatch and grow to adulthood.

##### Notions of social science

- learning about social relationships by observing the behavior of hens among themselves when they don't have a rooster, or the relationship between hens and roosters.

##### Economics

- demonstration that domestic waste can be a resource when the leftovers from meals serve as staple food for the hens;
- demonstration that small-scale family food production can make a significant contribution to a family's economy by avoiding the need to buy eggs at the market;
- the notion of competition between groups through the school competition on hen houses and poultry farming.

#### Interest for secondary schools

##### Notions of physics and chemistry

- gravitation (when an egg is dropped on the ground),
- cooking with eggs offers numerous examples of physics (density) and chemistry (mixtures, solutions, emulsions, cooking).

##### Notions of biology

- introduction to reproduction,
- introduction to ecology by observing the henhouse as an ecosystem,
- demonstration that small-scale family food production can make a significant contribution to a family's food security by providing a good proportion of its protein requirements (50 g per person per day).

##### Notions of economics

- discovery of the market economy by observing the demand and supply of chickens on the local market and setting a price so that the supply produced by the school can meet sufficient demand to sell all the chickens for sale, and even eggs when there is a surplus of production compared with the students' families' own consumption.

## **2.2 Combining leafy vegetables, root vegetables and fruit vegetables**

Combining root vegetables, leafy vegetables and fruit vegetables or fruits on the same plot of land is one of the most remarkable strategies of small-scale family farming in Oceania.

Unfortunately, this practice is on the wane. Modern agriculture (associated in the minds of the local population with the most productive form of farming) advocates the specialization of crops on plots of land.

A large part of the population therefore considers complantation to be an outdated practice, and understands neither its agronomic nor its economic benefits.

It is therefore essential that the people of Vanuatu reappropriate this type of family farming and take pride in it.

### **2.2.1 School vegetable gardens**

The practice of vegetable gardening in schools became widespread following the Covid pandemic, but most of the time, the garden is limited to a monoculture bed, generally of Chinese cabbage. A minimum size of 50 m<sup>2</sup> is required for a vegetable garden to be planted in combination.

The current tendency to cultivate a bed for each class should therefore be abandoned in favor of a school-wide project, unless the school has a cultivable area of several ares.

While it's a good idea to plant "traditional" plants, such as Kanak cabbage (*Hibiscus Manihot*)<sup>3</sup>, it's also a good idea to plant plants from other biogeographical areas, as long as they fit in perfectly with the composition of a planted garden.

Such is the case of the *climbing green bean, pumpkin and corn* combination, widely used in Mexico in pre-colonial times.

The corn supports the beans.

The squash provides shade with its broad leaves, protecting the soil from the sun's rays and conserving moisture, which benefits both the corn and the beans.

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<sup>3</sup> The term "traditional plants" refers to plants belonging to the floristic family of plants cultivated in pre-colonial times.

Being a leguminous plant, beans have nodules on their roots, in which bacteria of the *Rhizobium* genus convert nitrogen from the air in the soil (N<sub>2</sub>) into ammoniacal nitrogen (NH<sub>3</sub>), which can be used by corn and squash for their development.

Instead of corn, a perennial plant such as papaya can be used.

This combination brings together 3 fruiting vegetables: *corn, beans and squash*. But many other combinations are possible, combining fruit, root and leaf vegetables.

The tomato is a fruit vegetable that is much sought-after on Vanuatu markets. It can therefore be the mainstay of associations, provided that the plants grown alongside it benefit from this proximity.

This is the case with the *tomato, dwarf bean, Chinese cabbage or lettuce* association. As in the previous association, the bean (in this case, the dwarf bean, so that the other two vegetables are not invaded) will provide nitrogen for the tomato and the lettuce/china cabbage. The latter will benefit from the shade provided by the tomato plant, and its leaves will help reduce soil evaporation.

This combination of 2 fruit vegetables, tomato and bean, and a leaf vegetable, lettuce or Chinese cabbage, can be enriched with a root vegetable such as carrot or onion. The scent of onions will help keep pests away from tomatoes. As for the carrot, it decompacts the soil, giving tomatoes and beans better access to water and soil nutrients.

Another way of improving the combination is to plant a leafy vegetable, basil, close to the tomatoes, enhancing their taste while acting as a natural fly repellent.

Combining flowers and vegetables can also be beneficial. India roses and carnations, for example, repel nematodes that can attack tomato roots.

As these few lines show, there are many possible combinations, and this will be an opportunity for students and teachers to try them out. Ideas can be gleaned from Companion planting in Australia (Litte and Gilroy, 1982).

The planted vegetable garden can benefit from two other educational activities: composting and raising chickens.

Hen droppings are very rich in nitrogen, making them a valuable fertilizer for leafy vegetables such as Chinese cabbage. To prevent fresh droppings from burning young vegetable plants, they should be incorporated into the compost.

A specific compost made from hen droppings and vegetable waste can also be made to complement "classic" compost. Compost containing poultry droppings should be reserved for leafy vegetables and citrus fruits, which are generally very fond of nitrogen.

To stimulate pupils, it is recommended that a competition be organized between primary schools for the most complete planted kitchen garden (i.e. with the greatest diversity of plants).

Such a competition should also involve secondary schools.

### 2.2.2 The educational benefits of a planted kitchen garden

This type of garden generates many observations about plants, their needs, the relationships between plants and the garden's vulnerability to natural hazards such as cyclones and drought.

These observations support the teacher's lesson on nature in primary school and ecosystems in secondary school.

The interrelationships between plants can lead to philosophical reflections on the value of mutual aid in coping with life's trials and tribulations.

Presenting the logic of the planted vegetable garden is also part of the strategies for adapting to climate change, and builds a bridge between the themes of family farming and climate change.

Finally, if the school has enough space, even very young children can make comparisons between different ways of cultivating the soil.

We propose to set up 4 beds.

The first will see a monoculture such as Chinese cabbage, with the soil left bare.

The second bed will also be cultivated with a monoculture of Chinese cabbage, but the soil will be covered with plant debris to protect it from driving rain and sun.

The third bed will be planted with tomatoes, bush beans, Chinese cabbage, carrots, onions, maize, climbing beans and zucchinis, but the soil will be left bare between plants.

The fourth bed will be planted, but the soil will be covered with plant debris to protect it.

Watering will be kept to a minimum, and the only fertilizer allowed will be that from the henhouse or compost bin. After a few weeks, it should be possible for students to observe the advantages and disadvantages of each cultivation practice. The most productive bed will be the fourth, the least productive the first.

## **2.3 Composting**

### 2.3.1 Composting at school

As in many countries in the inter-tropical zone, composting is not sufficiently practiced in Vanuatu, and it is still all too common to see households burning organic waste that could easily be composted.

A composter can be fed with household waste that should not be fed to the chickens, such as potato peelings, leaves, shredded branches and dry grass clippings.

It is also possible to compost fresh grass clippings, but care must be taken to incorporate cardboard into the latter, so that the excess carbohydrate provided by the freshly cut grass is compensated for by the cellulose and lignin from the cardboard.

Crowd droppings from the henhouse can also be added to the compost.

To introduce the practice of composting in a school, the first step is to build a composter from the wood of pallets, taking care to place it in an area free of trees to prevent roots from colonizing the composter if it is placed on the ground.

It is also advisable to place the composter in a shady spot so that it can retain as much moisture as possible, as dryness is not conducive to microbial activity.

### 2.3.2 Pedagogical benefits of setting up a composter at school

The processes that lead bacteria and fungi to transform raw organic matter into compost are too complex to be presented at primary school level.

Composting, on the other hand, is a good way of highlighting the fact that soil can be likened to a living organism and needs to be nourished.

Soil is alive, and it's easy for children to observe this life in the composter.

The animals present all have a precise function, and each contributes to the ultimate goal of the composter: to break down organic matter into humus.

In this context, compost is a free alternative to the use of chemical fertilizers, which have to be imported.

In Port-Vila, a number of small-scale digesters are beginning to operate (at the market and Montmartre college, for example). The digestate produced by the methanization of organic waste placed in these digesters can be spread in the garden, in the same way as compost.

The comparison between composting and digestate leads us to contrast the aerobic fermentation produced in the composter with the anaerobic fermentation of the methanizer.

Anaerobic fermentation has been used for centuries by Oceanians to store breadfruit in earthen pits until the cyclone season is over. Breadfruit and anaerobic fermentation thus create a link between peasant agriculture and climate change.

The family home, the school and family farming are linked by a living relationship that involves raising chickens, composting and planting vegetables.

- a) The family home feeds the hens its domestic waste and feeds the composter;
- b) The hens' litter feeds the composter;
- c) The compost is used as fertilizer for the plants in the planted garden, especially those that appreciate humus, such as cucurbits and peppers;
- d) The planted vegetable garden provides quality food for the family home.

### **3. Specific educational tools**

In addition to generic teaching tools, the geographical, demographic and socio-economic environment of schools provides opportunities and constraints for developing teaching tools adapted to this environment.

In this issue, we'll be focusing on the opportunities offered by the coast, sparsely populated rural areas and the constraints imposed by drought.

The rationale behind these specific tools is similar to that of the generic tools. It is therefore proposed that each tool be broken down into 4 stages.

1. Visit to a demonstration site where family farming is practiced. Students observe and listen.
2. Preparation at school for putting into practice the type of family farming that was the subject of the visit. This session is an opportunity to make the link between what has been learned in the past days and weeks and the observations made by the students during the field visit. Pupils discuss and plan, i.e. look to the future to ensure that the type of family farming they are going to put into practice is successful.
3. School-based family farming. This stage can last from several weeks to several months, depending on the type of family farming implemented. Pupils not only take action, but also listen to the teacher, talk to each other and, above all, put into practice in the field the actions programmed in the previous phase.
4. Using family farming to enrich lessons and give them an everyday reality.

The following types of family farming will be presented in succession:

by the sea, the clam garden and the vegetable garden with salt-resistant plants,  
in the dry zone, the vegetable garden on brushwood compost;  
on the larger plots, free-range pig farming.

### **3.1 Clam gardens**

#### **3.1.1 Clam gardens at school**

Clam gardens are basins where young clams are grown.

These young clams are collected from the natural environment and placed in the garden to grow, protected from predators and humans, until they reach an adult size that allows them to be marketed.

Only seaside schools with such basins nearby will be able to carry out this activity.

The establishment of such a garden is at the initiative of the teacher, but its operation requires the agreement of the whole population and the local authorities.

The garden must be recognized as an annex of the school, which implies that all villagers respect the place and do not engage in poaching.

#### **3.1.2 Pedagogical value of the clam garden**

From the point of view of civic education, a clam garden enables children to realize that they have to manage a part of the ocean that has been granted to them as an annex to their school.

It's a kind of open-air classroom where they can observe nature and watch clams grow.

From a biological point of view, clams are home to zooxanthellae, with which they live in symbiosis like corals.

This symbiosis could be the subject of a presentation by a secondary school science and technology teacher to explain the principles of ecology, in particular biocenotic relationships.

As the coral gardens are located in shallow areas, the issue of global warming and changes in water temperature may threaten the survival of the clams.

Water temperature measurements can be taken regularly by the students and monitored as part of MOET's contribution to Vanuatu's climate change adaptation policy.

Taking regular temperature readings teaches students about the concept of observatory.

A recent book on the clam was published in 2022 (Gaertner Mazaoui, Gartner, 2022). Teachers will find a wealth of teaching material to build interventions around the clam garden<sup>4</sup>.

### ***3.2 Vegetable gardens adapted to over-salted locations***

#### ***3.2.1 an over-salted vegetable garden at school***

Rising sea levels will be a problem for many of the coastal plains of the Vanuatu islands.

Low-lying areas will be threatened by marine intrusions, making the soil salty and therefore unsuitable for vegetable growing.

However, there are some vegetables that can live in salty areas. These include tomatoes and beet.<sup>5</sup>

The aim of this garden is to test the cultivation of tomato plants in salty soil conditions.

This activity will take place over several years.

The first step will be to test the salt resistance of tomato plants by irrigating a tomato bed with fresh water to which seawater will have been added at different concentrations:

- $\frac{1}{4}$ , i.e.  $\frac{1}{4}$  seawater and  $\frac{3}{4}$  fresh water,
- $\frac{1}{2}$ , i.e. half seawater and half fresh water,
- $\frac{3}{4}$ , i.e.  $\frac{3}{4}$  seawater and  $\frac{1}{4}$  freshwater.

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<sup>4</sup> See <https://auventdesiles.pf/catalogue/collections/beaux-livres/les-benitiers-lautre-perle-du-pacifique/>

<sup>5</sup> When I lived in Nouméa, I had a vegetable garden on the coast and I used to buy tomato plants by walking along the Ouémo shores. The sea transported tomato seeds, which found favorable conditions for germination and development in the high seas.

In a second stage, the most salt-resistant tomatoes will be propagated by cuttings and layering. These means of propagation are very easy to implement, as tomato stems crawling close to the ground reveal whitish outgrowths that are the beginnings of roots.

Layering consists in covering these creeping stems with soil so that these potential roots can develop. These roots will be detached from the mother plant after a few weeks.

Cutting consists in detaching these creeping stems from the mother plant, and rooting them in a vat of water. As soon as 5 cm roots appear, the plants can be planted.

In a third stage, some of the fruit from these hardy tomatoes will be used to make seeds.

These seeds will be sown the following year, and it is hoped that after a few years, highly salt-resistant tomato plants will be produced.

These seeds, known as "peasant" because they are not produced by the major international agronomic groups, could be marketed for the benefit of the school or delivered free of charge to students' families.

### 3.2.2 Pedagogical benefits of the oversalted garden

The oversalted garden establishes a clear link between family farming and the adaptation of families to climate change.

The three-step method for obtaining salt-resistant tomato seeds is an excellent introduction to agronomic research.

Combining vegetative reproduction (layering, cuttings) with sexual reproduction (seeds) is a good introduction to a course on plant reproduction in Oceania, and the difference between horticulture and agriculture.

It is also an introduction to varietal selection and to a course on the evolution of plants domesticated by humans.

## 3.3 ***Vegetable gardens adapted to dry zones***

### 3.3.1 Vegetable gardens on brushwood compost at school

Drylands face two crucial problems:

firstly, the lack of water makes it difficult to develop family farming when irrigation is not possible;

secondly, drought makes vegetation more combustible, increasing the risk of fire. Yet small island countries like Vanuatu are ill-prepared to manage this risk, which, once a major fire has broken out, requires human and material resources to extinguish it that often exceed local resources.

Developing a vegetable garden adapted to the dry zone provides a solution to both these problems, by cutting brushwood (e.g. "blackcurrants" - *Leucaena leucocephala*) and composting it using a method perfected at the end of the 1960s by gardener Jean Pain.

Brush cutting cannot be carried out on a school scale, but rather on the scale of the village in which the school is located.

The cut brush is shredded into 5-8 mm chunks.

The shredded material is then brought to the school site and laid out in a pile approximately 1.5 m high, 2 to 3 m wide and 10 to 20 m long.

Ideally, the shredded material is surrounded by a palisade of interlinked bamboo or branches, or even pallet wood when available in quantity.

The shredded material is then wetted with fresh water at a rate of 700 l per m<sup>3</sup> of shredded material.

It is advisable to wet the shredded material during the rainy season, by collecting the water running off the school roof.

The wet shredded material is then covered with a layer of earth or sand a few centimetres thick, so that the moisture remains in the pile.

After 3 months, vegetables can be planted in the soil above the shredded material. The roots of the vegetables will feed on the shred without any water.

Composted brushwood shavings are ideal for creating a garden planted with low-growing plants.

This type of garden is reserved for schoolchildren, as the cultivable surface is 1.5 m high, too high for primary school children.

### 3.3.2 Educational value of brush compost

This type of garden introduces pupils to ecological intensification and the possibility for humans to overcome the constraints imposed by nature, while drawing inspiration from nature's mechanisms.

The high mound vegetable garden helps students realize that family farming is accessible to all, including the elderly, who won't need to think or kneel to cultivate.

In terms of numeracy, the size of the piles of shredded material makes it possible to carry out a number of exercises involving the notions of perimeter and volume.

In terms of biology, Jean Pain-type composting introduces a number of notions concerning soil fertility, the degradation of organic matter and soil life.

## 3.4 ***Extensive pig farming on closed plots***

### 3.4.1 Extensive pig farming at the school

Like chickens, pigs are part of the procession of domestic animals introduced to the islands by Austronesian migration.

The pigs soon became enslaved.

In response, the farming practised at family level is intensive, on very small surfaces, with the pig fed on domestic waste.

Extensive farming on enclosed plots is not practiced. However, this type of farming provides far superior living conditions for the animal.

But the essential advantage is that it allows a family to have a henhouse too. Chickens will be fed primarily with the leftovers from their meals. The pigs can feed on the resources they find in the plot where they are kept.

Like Jan Pain composting, this type of rearing requires that areas of "bush" be grubbed. Cut shrubs are ground. The shredded material is placed in piles.

The piles are large: around 20 m long, 1 to 1.5 m high and 4 to 5 m wide.

The organic matter is broken down with the help of numerous macro-organisms that serve as food for the pigs, which are originally burrowing animals.

Fed in this way, the pig is much more resistant to disease than a pig raised in a pen that barely exceeds its own size.

The main constraint of this type of breeding is the space available. It can therefore only be carried out in a few of the island's colleges that have the necessary surface area and can dispose of shredded material, or have the equipment needed to gyro-cultivate bush shrubs.

### 3.4.2 The educational value of free-range pig farming

As pigs in Vanuatu are generally reared in very confined spaces, an open-air pig farm enables students to understand animal welfare and to observe that pigs with sufficient space develop better and with fewer health problems.

The technical itinerary is quite complex, so teachers are advised to seek advice from the Ministry of Agriculture's pig farming specialists.

## **Conclusion**

The revitalization of family farming undoubtedly involves the school environment. It offers a space where students can discover or rediscover the family farming practiced by their parents or grandparents, and learn how to make it more productive and sustainable through ecological intensification. The fact that it is the school, which in the Ni Vanuatu imaginary is assimilated to the path of modernity, as opposed to the path of custom, that emphasizes this ecological intensification should facilitate the dissemination of this innovation among parents. The school will be enhanced by this pedagogical exercise, as ecological intensification family

farming is close to traditional family farming, and the school will be seen in a very positive light as a bridge between the family farming of the ancestors and the family farming of tomorrow. Tomorrow's family farming offers adaptive solutions to the challenges posed by climate change to the society and economy of Vanuatu and all the small island nations of Oceania. In developing these educational tools, Vanuatu is both a pioneer and a model for the entire region.

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