



## FAMILY FARMING LIFESTYLE AND HEALTH IN THE PACIFIC

### GRANT AGREEMENT NUMBER 873185

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<https://falah.unc.nc/en/falah-events-presentation>

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## Context of the research

After two years of the COVID 19 pandemic, the FALAH Consortium launched mobilities with different secondments from and to New Caledonia. Colleagues involved in these secondments presented shared methodologies and tools between WP2 and WP3 (Figure 1 below) and identified specific sites for field research in communities. One of the aims was to launch pilot quantitative and qualitative studies in New Caledonia that can be later deployed in Fiji, Solomon Islands and Vanuatu in view of a comparative approach in the Pacific region. This is what we will report in this document.



### Research project

#### Scientific organisation (3 WPs)

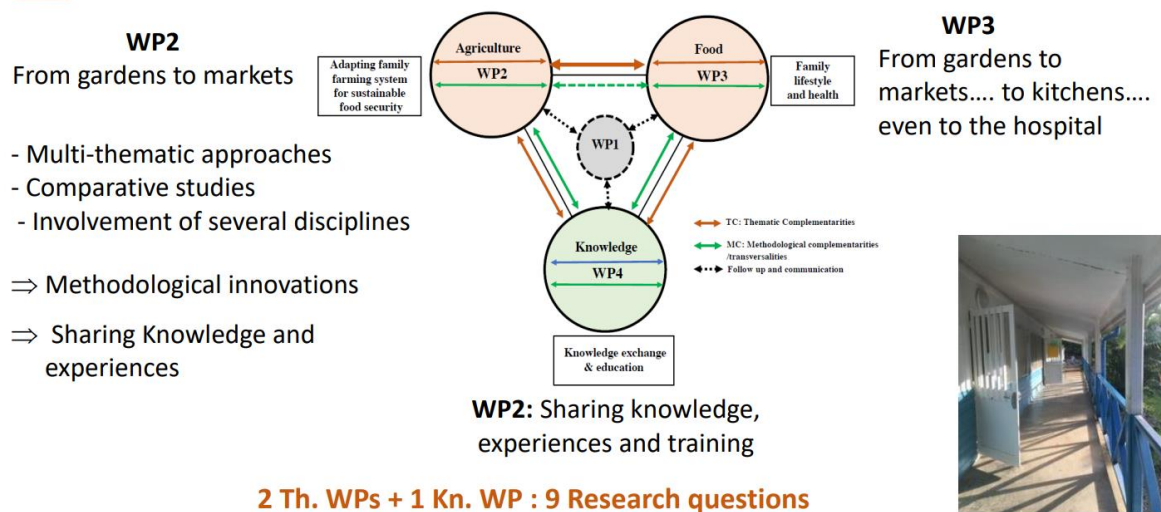


Figure 1: Scientific approach of FALAH project including WP1, WP2, WP3 and WP4

## Background and research questions

The agility of research teams in the Pacific region has a strong dependence of their ability to build similar tools and use similar metrics to answer the main research questions addressed at the regional level. To achieve this objective and fill the gap, FALAH consortium built a specific approach for the use of tools and specific metrics that PhD students or researchers can use after training sessions that will be organized during their secondments. This is one of the ambitions of the project. In so doing, we must be aligned with the main research questions that are addressed in FALAH project (Figure 2) and presented below and develop a pilot study. This has been done in New Caledonia.

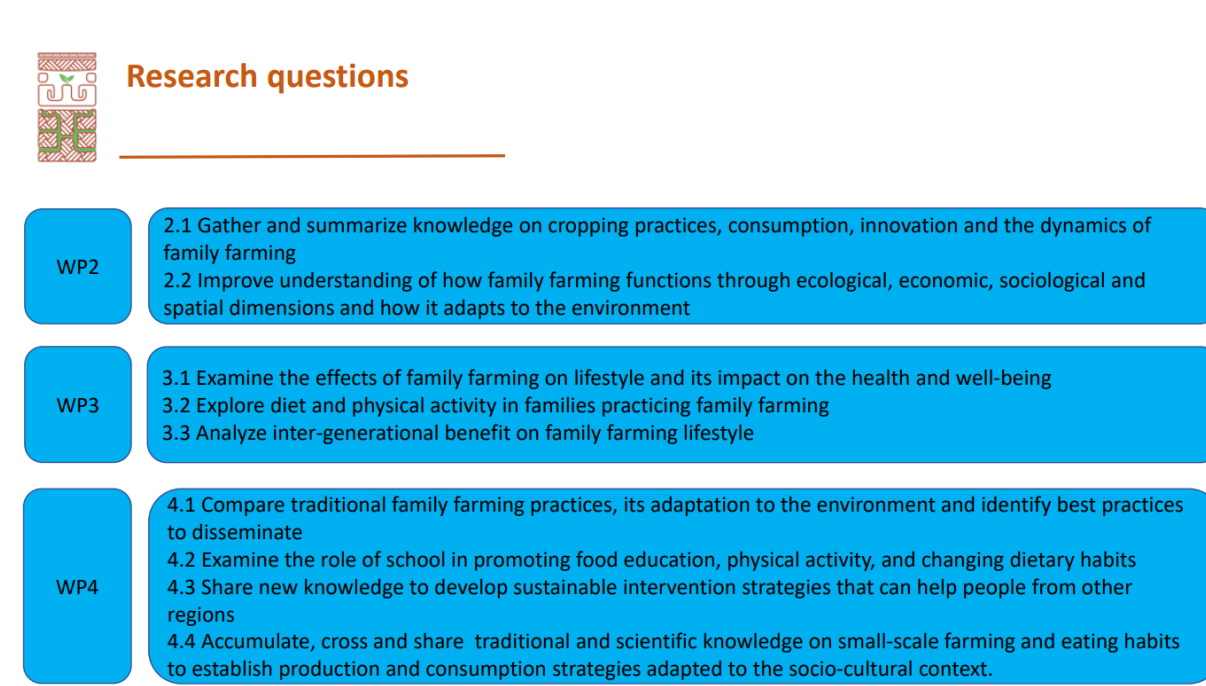


Figure 2: Presented the ninth FALAH research questions

## State of the art on family farmers in the context of Pacific islands

Family farming is one of the pillars of cultures all over the world and is at the heart of the United Nations 2019-2028 strategy, Decade of Family Farming (<http://www.fao.org/family-farming/detail/en/c/1195619/>), which highlights the crucial role of family farming in eradicating hunger and shaping the future of food. In the Pacific region, populations have gained faster access to modern lifestyles in the past few decades, causing fundamental changes in the way people move about and eat (including food choices, physical activity, and sedentary time) and a dramatic increase in noncommunicable diseases<sup>1-3</sup>. A recent study from the Pacific region nevertheless showed that individuals living on remote atolls had the most traditional lifestyles and the healthiest lifestyles<sup>4</sup>. Yet overall, food consumption has shifted from a traditional diet of mostly fresh fish, vegetables, and tubers to a modern diet that includes canned meat or fish, oil, sugar, rice, and processed food<sup>5</sup>. The energy expenditure of family farmers, which is associated with family farming production and nutritional outcomes, is relatively unknown<sup>6</sup>, especially in the Pacific region<sup>7</sup>. The influence of energy expenditure at individual and household levels is therefore still not well understood and remains a “black box” for researchers<sup>6</sup>. However, interdisciplinary approaches based on the agricultural, food, exercise, and health sciences might comprise a set of comprehensive tools for opening this “black box”<sup>6, 8</sup>. This has

major importance for societies in the Pacific region where family farming is one of the pillars of culture and the traditional lifestyle.

The Melanesian population of New Caledonia is particularly exposed to the transitioning environment. New Caledonia, a French territory in the Pacific, is fast approaching the socioeconomic level of Western countries<sup>9</sup> because of French financial transfers, the recent growth in nickel mining, and local transformation to ferronickel in the past few decades.

In Melanesian societies, contemporary family subsistence activities have been maintained despite the growth in development hubs<sup>10</sup>, increases in education levels, and improvements in material conditions, as these have not been systematically synonymous with a decline in agricultural activities, hunting, and fishing<sup>11, 12</sup>. However, the food environment is changing how people access, prepare, and consume food<sup>13</sup>. Today, an increasing demand for packaged imported foods, such as canned meats, instant noodles, cereals, rice, and sugar-sweetened beverages (SSBs), with the subsequently decreased consumption of locally produced plants and animals, has led to a heightened vulnerability to food insecurity<sup>14</sup>. Emergent food environments in low- and middle-income countries (LMICs) have created conditions where “people often choose to eat lower-cost, less-healthy, more energy-dense foods, choices that can lead to people becoming overweight and obese as their means to access healthy food diminish”<sup>15</sup>. In New Caledonia, choices are even more constrained in a context of high living costs linked to the narrowness of the economy and its oligopolistic structure<sup>16</sup>. The hyper-insularity of Lifou has further amplified the transport costs and the difficulties of being supplied with healthy products at affordable prices. Recent studies on adolescents have reported specific dietary patterns including high consumption of meat, fast food, fruits and vegetables, and sweets, with few dairy products<sup>17</sup>; low consumption of energetic foods<sup>18</sup>; and high consumption of highly processed drinks like SSBs<sup>19</sup> and energy drinks<sup>20</sup>. This has been accompanied by breakfast skipping<sup>21</sup> and relatively low physical activity<sup>22, 23</sup>. These changes might reflect an intergenerational nutrition transition within families and plays a major role in the high levels of overweight and obesity in Melanesian families, especially those living in rural areas on customary lands.

Yet, the Melanesian population has continued to maintain a traditional Pacific tribal lifestyle, especially on the Loyalty Islands, which are characterized by traditional family farming, fishing, and cultural activities that follow tribal customs (e.g., house construction, weddings, and mourning)<sup>24</sup> and generally require vigorous daily physical activity. One of these Loyalty Islands, Lifou, is inhabited mainly by Melanesian people living on customary lands and is 40 minutes by plane from Noumea, the capital of New Caledonia. Lifou’s small-scale family farming predominates in the organization of the ancestral agricultural system and is one of the pillars of the traditional cultural practices that contribute directly and indirectly to the sustainability of community living on customary lands. Indeed, family farming contributes directly to the economy (by ensuring food security and selling on local markets), socialization (strengthening social and family ties through daily donations of plant production and mutual aid in the fields) and culture (maintaining customary traditions and donations) of the families within tribes<sup>10</sup>.

To sum up, New Caledonia today is in the earlier stages of a transition already observed in countries like the USA and those in the Pacific region (Australia, Fiji, and New Zealand). “It is a nutrition transition, in which traditional food environments based on farming and hunting are being replaced by those where foods are designed by chemists and food technologists to appeal to human appetites, then manufactured and shipped to every corner of the earth, always with the same consequences: skills associated with traditional feeding habits are lost, and obesity and associated diseases increase”<sup>25</sup>. However, almost nothing is known about the agricultural practices of families (parents and children) living on customary lands and their influence on daily diet, physical activity, and health outcomes. For this question, we assumed that Lifou Island would offer a valuable case study of what we might observe in advanced transitioning Pacific Island countries and territories (PICTs), which would then help in setting policies for future actions. We therefore hypothesized that, in the current socioeconomic context of transition, practices linked to family farming like eating food from the sea, bush and garden (tubers, fruits, vegetables, hunted animals and drinking water) and the related physical activities (on the crop plot) are transitioning across generations and are not strong enough to feed families and

counteract an insufficient energy expenditure. As a consequence, they do not play a sufficiently strong role in preventing overweight and obesity that has been shown to be high in the Melanesian population of New Caledonia<sup>17, 26</sup>.

The aim of this pilot study was to:

- 1) determine the links between family farming (produced, exchanged, sold, and consumed food), diet (focused on produced, hunted, and caught food), physical activities (sedentary, light, and moderate-to-vigorous physical activity) and obesity in Lifou Island families (parents and children).

- 2) bring a common qualitative and quantitative approach to merge family farming and lifestyle aspects (WP2 and WP3) with an interdisciplinary approach.

## **Pilot study design**

Our study was conducted on Lifou Island (Figure 3) in New Caledonia. The eligibility of the participants was to live all year round on Lifou Island, which is a customary land with one or more children in the public secondary school. Customary land is a Melanesian territory that follows both customary and civil society rules. Among these rules, any initiative done by civil institutions, here a research program on Lifou families, must be submitted to the customary authorities to get an agreement. The customary authorities of Lifou island (Loyalties Islands Province) were first contacted to have their consent to do the study with the families among the three districts: Wetr, Gaica and Lössi (Figure 3). Then, the study was proposed to 48 families from 16 tribes, all belonging to the three districts of Lifou Island. Families were selected among the classes (two classes of 25 children per level across four levels: 6ème (11–12 years old), 5ème (12–13 years old), 4ème (13–14 years old), and 3ème (14–15 years old)) of the public school of Lifou. In each class, six families were randomly selected by grouping all the families in each class into the three districts of Lifou and then randomly selecting two from each district by pulling numbers out of a box. The selected families were then contacted in alphabetic order. This permits us to select six different families among the two classes of each of the four levels of the public school (total potential participating families – 48). Calls and the first visit was done by a member of the research team native of Lifou. At the end of the selection process, 40 families agreed to participate in this study. In each household, all the adults over the age of 18 years old and any children/adolescents aged 10 to 18 years invited to participate.

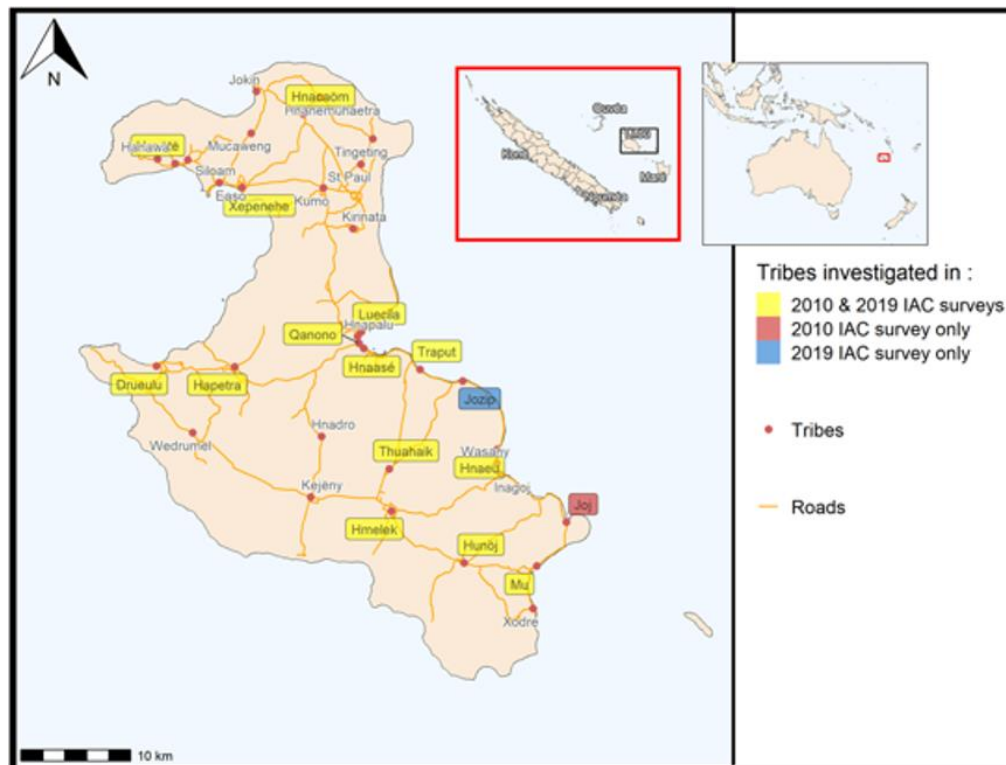


Figure 3: Map of New Caledonia showing the main island, the Loyalty Islands and Lifou Island with the investigation sites.

## Measures on the field and survey design

## Family farming questionnaire

Before visiting the family, a member of the team native from Lifou contacted each family by phone to explain that we were trying to understand more about the situation in rural Lifou households and that we would like to do a survey with the head of the household or the person in the household that has the most knowledge about agriculture activities and production. Once we obtained the agreement of the family, a visit was scheduled. Then, the questionnaire was done at home with the heads of households in order to collect all the data in a single operation (Figure 4). The household themselves identified the household head. Then, we asked if the household head would have an hour to spare to complete the questionnaire<sup>28</sup>. If the household head was not available, then we asked to speak to some of the adult household members only if these household members felt they could well represent the household situation.

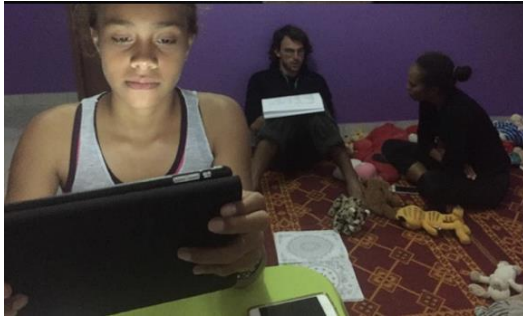


Figure 4: Scientific team in community's home. Surveys are done on tablets. Bio-impedencemetry balance and stadiometer are present and, on the side, interview of a mother in Lifou island.

The survey design was deeply inspired by a wide survey conducted in 2011 covering all of New Caledonia<sup>11, 29, 30</sup>. As the aim was to understand the roles and links of agricultural, fishing, and hunting activities with food practices and diet, the observation unit was the household in order to focus on the traditional social organization and noncontractual family farming with a prevailing nonmarket dimension<sup>24</sup>. For family farming, the main observation unit was the household, which comprised all the people living on the same residential plot, sharing meals and some of the agricultural work.

The structure of the survey was based on the “sustainable rural livelihoods”<sup>31, 32</sup> approach with a microeconomic perspective. The multi-thematic questionnaire used in this study was the questionnaire deployed in almost all tribes in New Caledonia in 2011<sup>11, 30</sup> and made it possible to quantitatively measure the agricultural volumes produced by the tribal population in 2018, as well as the distribution of these volumes between self-consumption, daily gifts, ceremonial gifts, and market sales.

1. The first goal of this survey, referenced as the 2019 dataset in this paper<sup>28</sup>, was to define the household composition (number of persons, education, land access and ownership, monetary incomes).
2. The second was to quantify the agricultural production (plants, cattle, hunting, fishing, and food gathering) and the allocation of these productions in the eating and sharing (daily and ritual exchanges) habits of the families.

As the majority of the households do not weigh their harvests and keep no accounting records, the questionnaire relied on daily practices, taking into account the wide range of tools used for harvesting purposes (plastic bags, tote bags, palm-leaf baskets, etc.) and the harvesting practices (weekly, monthly, during periods of traditional customs). These quantities were then converted into conventional units of measure using charts created specifically for the study based on measurement results taken from a sample of units used locally.

The production of each household was broken down according to: (1) plant production, including the production of tubers (taro, yam, cassava, etc.) from the tuber category in the data file, the production of fruits and vegetables (avocado, star fruit, lemon, salad, etc.) from the categories of fruit trees,



bananas, dessert bananas, poingo bananas, coconuts, field fruits, and vegetables in the data file<sup>28</sup>, and the total crop production; (2) animal production (pigs, poultry, etc.); 3) hunting production (flying foxes, wild pigs, pigeons, etc.); and 4) fishing production (sea fishing, shellfish and crabs, etc.). For each type of production, a distinction was made according to the finality of production: sale, personal consumption, exchange, or total production.

In order to accurately compare individual data, we converted “farming data” according to the number of people in the household. The proportion of adults, children, and adolescents was not taken into account in this calculation. This means that for a household comprising *n* people, the announced consumption was divided by *n*. For example, household one had six members and the consumption of tubers is 139.9 kg. We therefore associated this household with a consumption of approximately 23.3 kg of tubers/person/years. Finally, the ratio computation was mainly performed in order to avoid an imbalance in production and consumption of production between individuals belonging to large families and those belonging to small families.

### **Food frequency questionnaire (FFQ).**

The short FFQ was adapted from the validated version of the FFQ for Aboriginal and Torres Strait Islanders by Gwynn et al., 33, in the absence of a validated FFQ for New Caledonia. Minor modifications were made by the research team to include foods identified as important in the diet of Melanesians<sup>5</sup> and described elsewhere<sup>18</sup> and in the extended data section<sup>28</sup>. We then classified food in the ‘traditional food’ category, and the ‘limited food’ and ‘limited drinks’ categories. The traditional food category helped us estimate the proportions of tubers, fruits and vegetables, meat, and fish eaten as well as water drunk at home. We focused on the consumption of traditional food like tubers, fruits and vegetables, and fish, and of limited food and drinks classified as follows by the Pacific Community guidelines<sup>5</sup>: foods to limit (butter + breakfast cereals + canned meat + cold cuts + noodle soup + fries + chips + hamburger + sweets + cookies) and drinks to limit (SSBs).

For the analyses, we categorized individual consumption as follows: low tuber consumption: < 1 unit/week, medium tuber consumption: 1 to ≤ 5 units/week, high tuber consumption: > 5 units/week; low fruit and vegetable consumption: ≤ 14 units/week, medium fruit and vegetable consumption: > 14 to ≤ 35 units/week, high fruit and vegetable consumption: > 35 units/week; low fish consumption: ≤ 1 unit/week, medium fish consumption: > 1 to ≤ 3 units/week, high fish consumption: > 3 units/week; low limited food consumption: ≤ 2 units/week, medium limited food consumption: > 2 to ≤ 5 units/week, high limited food consumption: > 5 units/week; and low limited drinks consumption: ≤ 1 unit/week; medium limited drinks consumption: > 1 to ≤ 10 units/week, high limited drinks consumption: > 10 units/week.

### **Physical activity**

The weekly physical activity levels of each family member were assessed via GENEActiv activity trackers positioned on the nondominant wrist for seven days starting on the day of the FFQ survey. This weekly physical activity level was not detailed per activity (i.e.: walking, hunting, garden activity). The datasets from these trackers contained 60-Hz 3-dimensional accelerometer data. Raw data were processed into one second epoch signal vector magnitude data points of daytime activity and were then categorized into physical activity (PA) levels: sedentary, light, and moderate-to-vigorous PA (MVPA) for each second. PA was analyzed according to the WHO recommendations<sup>34</sup> and a more in-depth analysis for PA patterns in the adults was conducted using Diaz and Yacef’s method<sup>35</sup>. For children, we used Phillips’s cut points<sup>36</sup>. We focused on bouts of sedentary activity, light activity, or MVPA occurring with a minimum duration. A bout was defined as a continuous episode of PA at a specific range of intensity, and the length of a bout was the number of seconds spent at that intensity during that episode. Thresholds for sedentary bouts (60 seconds minimum duration), light bouts (10 seconds minimum duration), and MVPA (three seconds minimum duration) were based on the literature<sup>35</sup>.



## Anthropometry

A trained researcher who is a native from Lifou Island without any family relationships with any of the participants and with an expertise in sports sciences collected the anthropometric data in the homes as outlined in the data collection section. A portable stadiometer (Leicester Tanita HR 001, Tanita Corporation, Tokyo, Japan) measured height to the nearest 0.1 cm. Weight was assessed to the nearest 0.1 kg using a 11-questionnaire scale (Tanita HA 503, Tanita Corporation, Tokyo, Japan), with the participants wearing light clothing. From these measurements, body mass index (BMI) was calculated in adults as follows:  $BMI = \text{weight [kg]} / (\text{height [m]})^2$ . Normal weight was considered a  $BMI \leq 25$ ; overweight was a  $BMI > 25$  and obesity was a  $BMI > 30$ . We used the International Obesity Task Force (IOTF) criteria for children to define adolescents as thin (underweight), normal weight, overweight, or obese<sup>37</sup>. The IOTF criteria provide BMI cut-offs for weight status based on BMI values according to age and sex<sup>37</sup>.

## Sociodemographic status

Ethnicity was self-reported by each family member and categorized as recommended in the report on New Caledonia (INSERM, 2008) from the Institut National de la Santé et de la Recherche Médicale (INSERM; National Institute of Health and Medical Research). Three socioeconomic (SES) categories were determined based on the National statistics socio-economic classification: managerial and professional occupations (high), intermediate occupations (medium), and routine and manual occupations (low).

## Next Steps and conclusion

Best gold standard methods and measurements developed for this pilot study, discussed and validated by the consortium, are presented in Figure 5 below. For the next step after this pilot study on the island of Lifou, the consortium plans to deploy the tools on other islands, increasing the variables to cross-reference more measurements.

# Tools, methods & metrics For WP2 & WP3

The challenge of creating a database considering the diversity of dimensions, scales and variables

Each participant is allocated an ID number - Data in the platform are de identified						
Theme	Level of observation	Variables	Tools	Methods	Units	Time of observation
Family farming and livelihoods	Members of the household	Farming-related activities of each member	Questionnaire/ interview	mixed	N/A	1- Data collected at home in the family ; 2- time scale: one day per year
	Household	Land use/cultivated area	Questionnaire	Quantitative	sq meters or acre	
		Agricultural equipment, fishing gear	Questionnaire	Quantitative	local currency & USD	
		Crop, Livestock production, fisheries, hunting	Questionnaire	Quantitative	kg	
		Destination (auto-consumption, gift, sell)	Questionnaire	Quantitative	local currency & USD, kg	
		Crop production, livestock, hunting and fishing costs	Questionnaire	Quantitative	local currency & USD, kg	
Nutrition	Members of the household	Monetary incomes	Questionnaire	Quantitative	local currency & USD	1- Data collected at home in the family ; 2- time scale is of one day (can be repeated over the year)
		Diet & nutrition	24hr dietary intake survey (Digital)	Mixed	Categories, % of diet, mg, g, calories	
		Diet & nutrition	Food Frequency Questionnaire	quantitative	portions, unit/week	
	Household	Assessment of processed food consumed	NOVA classification	Mixed	% in each NOVA category	
Physical activity	Household	Number and time of meals	Questionnaire	Quantitatif	number of occurrence	1- Data collected at community level, 2- Time scale if one year
	Community	Food environment (shops selling food)	Questionnaire/existing database	Quantitatif	NOVA classification for food available in shops	
	Members of the household	Physical activity (Type of activities, mode of transportation etc...) and sleep	Questionnaires, Wrist Accelerometry, heart rate sensors and GPS	Mixed	Nature of activities, duration (min), frequency, time (min/day), Heart rate variability (day), Distance (m or km/day) and area of daily activities (m2/day), sleep duration (hr) and quality Barriers and facilitators of PA	
	Household	Physical activity equipment	Questionnaire / interview	Qualitative	Number and nature of equipment	
Descriptive variables & Health outcome variables	Members of the household	Land use	Questionnaire / interview	Mixed	Equipment / natural and built environment with regards to physical activity	1- Data collected at home in the family 2- time scale: day of measure
		Descriptive variables: Age, gender, education, occupation	Questionnaire/ interview	mixed	year, N/A	
		Health questionnaire	Questionnaire	Qualitative	N/A	
		Body composition	Bioimpedancemetry/scale	Quantitative	Kg, Body Fat %, Total Body Water %, Muscle Mass, Physique Rating, Bone Mineral Mass, Basal Metabolic Rate, Metabolic Age, Body Mass Index, Visceral Fat	
		Body height	Height gauge/ruler	Quantitative	cm	
		Well being	Well being index	Quantitative	index	
		Waist	Measuring tape	Quantitative	cm	

Figure 5: Tools, methods and metrics for Work package 2 and 3 – [Presentation](#) (slide 172)  
Dr. Olivier GALLY (UNC), Mr. Guillaume WATTELEZ(UNC), Mr. Pierre-Yves LE ROUX (UNC), Mr. Jonas BROUILLON (IAC) and Dr. Séverine BOUARD (IAC)

To conclude, this deliverable helps the consortium to identify gold standards tool and metrics that can be used in the Pacific islands and necessary to answer to FALAH research questions with the use of crossed methodologies (quantitative and qualitative) and thematic (WP2, WP3). Training sessions during future secondments and scientific events (SINU and USP) are planned for ERS and ER.

The protocol has been published<sup>38</sup>: O. GALY, S. FRAYON, M. GOLDIN, and al.: Protocol of the pilot study: generational issues in linking family farming production, traditional food in diet, physical activity and obesity in Pacific Islands countries and territories: the case of the Melanesian population on Lifou Island. Open Res Eur. 2021. 10.17504/protocols.io.bydgps3w [CrossRef] [Google Scholar]

A publication linked to this deliverable can be read through the link: <https://open-research-europe.ec.europa.eu/articles/1-135/v2>

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