

An opportunity for overseas agriculture: multipurpose plants

Overseas agricultural systems has been facing multiple changes. Their aims and impacts on socioecosystems are discussed locally. This policy brief is the result of a collective work involving a group of researchers. It deals with the interest of perfume, aromatic and medicinal plants (PAMPs) to the economic and environmental sustainability of these agricultural systems, due to their diversified uses.

The agricultural systems of the French overseas territories show many signs of decline. They are largely based on industrial crops, primarily sugarcane, which accounts for 74% of arable land in Guadeloupe and 81% in Reunion.¹ This type of farming uses a high concentration of production factors and does not meet the sustainability criteria prioritized by public policies and by large sections of local societies.² The search for more attractive jobs for young people and the increase in income for most of the working population, by enabling them to develop the processing of their production, are among the main challenges³ to ensure sustainable production, activities and jobs.

This note sheds light on the possible contributions of perfume, aromatic and medicinal plants (PAMPs) in response to the issues of agricultural development in the French West Indies, French Guyana, Mayotte and La Réunion. These plants have a double asset. Firstly, some of them are part of the French pharmacopoeia and many of them have a strong pharmaceutical potential.⁴ Moreover, they could be used to diversify local exports.

PAMPs are indeed marketed in dynamic niche markets. For France⁵, the wellness market (phytotherapy, herbal teas, food supplements) was estimated at €3 billions in 2020, twice what it was in 2010. For the cosmetics sector, the value of sales of natural and organic products has been increasing (€900 millions in 2019). The agri-food sector (fresh, frozen or incorporated in flavours) had a turnover of €624 millions in 2019 (+ 59% compared to 2011). More generally, in 16 Caribbean countries, production is still

contained (37,000 tonnes in 2020, which is nevertheless much higher than production in mainland France, which stands at 3,819 tonnes)⁶, but it has increased by 64% since 2009. The market for PAMPs in the Caribbean is therefore considered to be “buoyant” by COLEACP⁷ experts.

Local stakeholders expertise covers a wide range of environmental and resource knowledge and utilization, making them important actors in these dynamics. It may be related to i) the plant and its cultivation (ecology, production methods), ii) harvesting and gathering (identification of species and varieties, potential toxicity, etc.), iii) the uses of plant parts (active natural substances, phytochemical and pharmacological properties), or iv) product processing. Could the development of PAMPs contribute to the shaping of production patterns that are more favourable to healthy ecosystems and populations in the French overseas departments and regions (DROM)? What local knowledge is used and what development opportunities does it represent? Are they a resource for innovation and under what conditions could they constitute adding value for farms? To address these issues, a small working group was formed, bringing together Valérie Boisvert (University of Lausanne), Nicolas Lainé (Institut de recherche pour le développement, IRD), Harry Ozier-Lafontaine (Institut national de la Recherche pour l'Agriculture, l'Alimentation et l'Environnement, INRAE) and Nathalie Kakpo (Centre d'études et de prospective - CEP, Centre for Studies and Strategic Foresight). Three meetings were planned in April and May 2022, based on interviews, the analysis of the 2020

agricultural census (RA) and a literature review. At the first session, the scope of the plants studied was clarified: the category of PAMPs, which has been considered too restrictive to cover the diversity of tropical plants and their uses, was included in a broader category that included tropical fruits and palm trees. Subsequently, the term “multipurpose plants”⁸ was preferred. Furthermore, while many specialists favour the study of wild plants in search of new properties of interest, the group chose to focus on local agrodiversity, starting from the idea that important sources of innovation can be associated with “traditional” cropping systems.

The first part highlights the differences between PAMPs, usually associated with three uses (food, cosmetics, wellbeing), and multipurpose plants, which have a dozen or so uses. The second part presents examples

1. Graph'Agri, 2022, *L'agriculture, la forêt, la pêche et les industries agroalimentaires*.

2. Ozier-Lafontaine H. et al., 2018, *De l'agroécologie à la bioéconomie. Note d'orientation sur les agricultures d'outre-mer*, Académie d'agriculture de France.

3. Marzin J. et al., 2021, *Étude sur les freins et leviers à l'autosuffisance alimentaire : vers de nouveaux modèles agricoles dans les départements et régions d'outre-mer*, CIRAD.

4. Labbé J. et al., 2019, *Rapport de la Mission sénatoriale d'information sur le développement de l'herboristerie et des plantes médicinales, des filières et métiers d'avenir*.

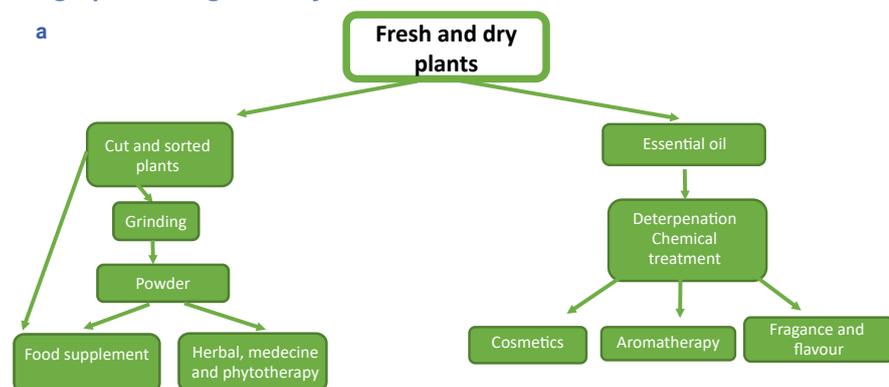
5. FranceAgriMer, 2021, *Marché des plantes à parfum, aromatiques et médicinales. Panorama*.

6. *Ibid.* et FranceAgriMer, 2020, *Marché des plantes à parfum, aromatiques et médicinales. Panorama*.

7. COLEACP, 2022, *Market study of fruit and vegetables from ACP-Caribbean countries*.

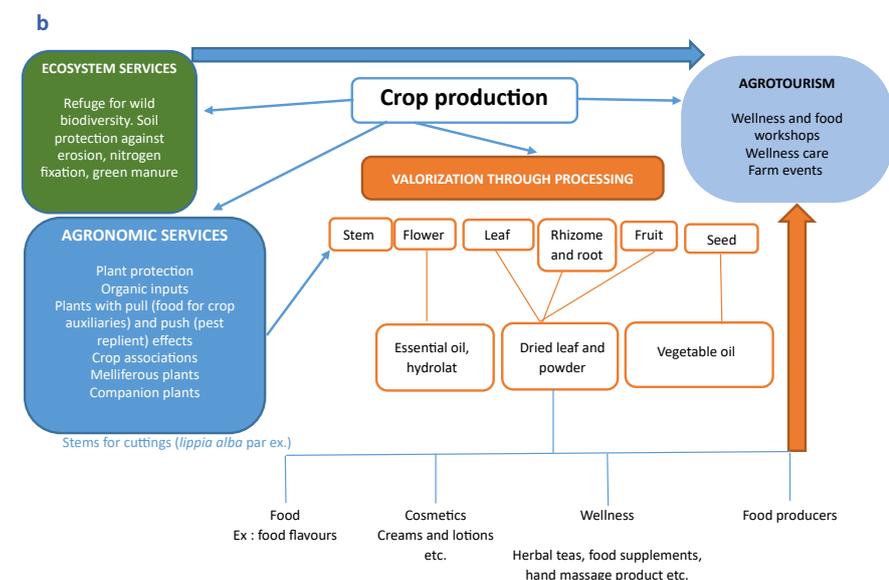
8. Ilboudo Z. et al., 2022, « Le management des connaissances liées aux usages des plantes », in Profizi J.-P. et al., *Biodiversité des écosystèmes intertropicaux*, IRD.

Figure 1 - PAMP's (a) and multipurpose plants (b): two different approaches of agroprocessing industry



Source: authors.

Reading: PAMP's production is usually seen within a commodity chain perspective. The latter does not enable to consider how diversified productions, activities, market and non market spheres are likely to interact. The figures shows this compartmentalised perspective.



Source : authors based on agricultural productions (technical sheets from Farming offices) and interviews with experts.

Reading : the systemic approach to multipurpose plants make it possible to plan several productions, activities and knowledge. How they interact is a potential source of value creation, more significant than in the commodity chain approach.

of overseas production and achievements in this area. The paper concludes by suggesting ways to strengthen the contribution of PAMPs to the performance and sustainability of local agriculture.

1 - From PAMPs to multipurpose plants

The literature review shows the partial nature of the data on PAMPs, but also and above all, the many advantages offered by the multipurpose plants approach.

Incomplete data

It is not possible to account for all the production and processing activities of PAMPs, both in France and in the overseas territories. Data on harvesting are incomplete. Moreover, the economic aspects of the transformation processes are often partial.

However, the existing literature provides a variety of insights into the PAMPs of overseas territories. Administrative reports⁹ highlight their potential for value creation, but also the competition from countries marketing products of equal quality at a lower price, and the isolation of stakeholders who “do not form a sector”.¹⁰ Vanilla (*Vanilla planifolia*) and ylang-ylang (*Cananga odorata*) are frequently studied¹¹, while the Caribbean Tramil network tests and acknowledges the traditional uses of medicinal plants in a public health perspective.

According to the RA 2020, 15 species are cultivated in the DROMs, on an agricultural used area (UAA) of 1,340 hectares. 13.8% of the farms in the French overseas departments and territories (3,688) produce PAMPs, with La Réunion in first place. In addition, the RA identifies 54 farmers producing of essential oils. These structures are of small

to medium economic size, with a standard gross production of less than 100,000 per year.

From PPAM to multi-use plants

The PPAM must be placed in a broader category, that of multipurpose plants. The PPAM nomenclature does not include several cultivated plants, processed plant organs and marketed products such as oil palms and tropical fruits (atoumo, maracudja, banana, etc.). The concept of multipurpose plants widens the scope of possible uses, responding to several functions: feeding, cleaning and perfuming the body; relieving certain human ailments; colouring; stimulating or relaxing; protecting plants and animals¹², functions that have not been taken into account in the various studies on PPAM.¹³

Multipurpose plants also play a part to the multifunctionality of agriculture. This broader scope fits well with a systemic approach to agricultural production, seeking reciprocal benefits between species and activities on a farm, in the framework of agroecological practices. Such an approach can increase the profitability of small areas, as the same plant allows for parallel transformations and uses. To illustrate this change of perspective, Figure 1 first describes the value chain logic of PPAM, then the more integrated approach associated with multipurpose plants.

In addition, the development of multipurpose plants implies agro-design activities (identification of inter- and intra-use factors). The latter are very likely to meet young farmers' expectations who want a job with diverse tasks. It can also create new occupations or contribute to the diversification of existing occupations.

The uses of these plants fall within various legal frameworks. According to Decree No. 2008-841 of 22 August 2008, the sale of medicinal plants is the monopoly of the pharmacist, with the exception of 148 plants that “may be sold by others”, because of their food uses and cosmetics. Once marketed, however, they cannot be the subject of therapeutic claims. For its part, the decree of 24 June 2014 defines the 546 species that can be marketed as food supplements. Valorisation in the cosmetic

9. Colas F., Thibault H.-L., 2021, *Quels leviers pour développer la bio-économie des produits biosourcés en outre-mer ?*, CGAAER ; Labbé J., 2019, *op. cit.*

10. Zaremski A., Amusant N., Zaremski C., 2022, *Bilan du colloque « Arbres et autres plantes de la cosmétopée »*.

11. DAAF Mayotte, 2017, *Conjoncture et évolution des prix des produits agricoles. État des lieux de la filière ylang à Mayotte*, Agreste, n° 74.

12. Boulogne I. et al., 2012, “Insecticidal and antifungal chemicals produced by plants: a review”, *Environment Chemistry Letters*, No. 10, pp. 325-347.

13. For example, FranceAgriMer's *Market Panoramas* for 2018, 2019 and 2020 only mention the health, beauty, wellness and food sectors for human populations.

field is easier, even if it is subject to a posteriori controls. The production facility must be registered with the French National Agency for the Safety of Medicines (ANSM), and the manufacturer must submit a Product Information Document (PID) before marketing.

Existing agrodiversity

Wild biodiversity is often considered as a source of new cosmetic ingredients or food supplements. However, developing sustainable businesses from wild plants often requires cultivating them. These plants are often from vulnerable environments and could be seriously threatened by increased exploitation. They are also likely to suffer from drought or deforestation, and therefore vulnerable, or even faced to intellectual property issues while traditionally used by various groups of people. Conversely, cultivated tropical plants are sufficiently diverse to allow multiple uses, avoiding some of these pitfalls. For example, the small business Biosavane markets 84 vegetable products in French Guyana. Some sixty plants are cultivated in Guadeloupe and at least 72 in La Réunion (RA 2020). These developments require the capitalization of local and exogenous knowledge and practices, and the reduction of sources of ecological, agronomic and economic hazards and vulnerability.

2-Activities, productions and stakeholders in the overseas regions

The stakeholders involved in the production and promotion of multipurpose plants are numerous and rely on a diversity of knowledge and end products.

Production and processing actors

First come the collectors. In French Guyana, commercial collection for urban population seeks to enhance local phytotherapeutic practices. Collectors use plants to make up for their difficulties in accessing conventional medicine or to prepare additional remedies. In the overseas territories, more than elsewhere, commercialisation of harvested products can be associated with an unfair appropriation of biodiversity resources and associated knowledge (biopiracy). This is why the Collectivité Territoriale de Guyane has shown its preference for economic sectors based on agricultural production.¹⁴

The second category of stakeholders includes agricultural producers, either individually or in groups of cooperatives. They produce, harvest, sort and store the plant raw material and sometimes carry out a first processing (drying). According to the RA 2020, most of the 3,688 farms growing

PAMPs in the DROM do not process them. These plants often constitute a minority part of production, alongside fruits, vegetables and tubers. Furthermore, 5.3% of these farms are certified as organic or are in the process of conversion, the vast majority being located La Reunion.

Then come the producers-transformers. Some of them are gathered together into organizations. For example, the Bourbon essential oils cooperative processes and markets part of La Réunion's production of PAMPs, as does the Habemus papam company for the manufacturing of plant infusettes. Elsewhere, the players are more fragmented. Guyana and Guadeloupe do not currently have any organizations structuring the production of PAMPs, even if the Guyana plant sector trade association is applying for membership.

The last category includes processors, manufacturers of cosmetic or food products, such as PhytoBokaz in the West Indies or François Rossolin in La Reunion. A study led by the GADEPAM association shows that they account for 14% of the market players involved in the PAMPs sector in French Guyana. Finally, some people, dissatisfied with the quality and quantity of supplies, are involved in agricultural production to overcome these difficulties.

Diversified small-scale production

At least 50 species have two or more uses. Those listed in Table 1 are emblematic of their territories and the source of a wide range of end products.

Among them, dietary supplements such as atoumo syrup (*Alpinia zerumbet*) and arrow root (*Maranta arundinacea*) stand out, driven by a very dynamic market. A second category of interest is oil, which can replace those imported from hexagonal France or neighbouring countries.

However, final products from overseas regions mobilize modest means of transformation, with the equipment varying according to the territories. La Réunion provides advanced distillation, infusion manufacturing tools (drying, packaging and bagging) but, like Guadeloupe, it does not profit from suitable extraction facilities. Martinique owes its best level of equipment to the publicly funded Pôle agroressources et de recherche de Martinique (PARM).

Production volumes and economic outputs are also modest, according to the interviews

14. Dejouhanet L., Pinton F., « Les producteurs-cueilleurs de plantes aromatiques et médicinales (PAM) en France hexagonale et en Guyane : convergences, singularités et enjeux », article to be published.

Tableau 1 - A few plants used in cosmetics, food, human and animal wellbeing, plant protection

| | Plant | Part of the plant transform |  |  |  |  |  | Finished products (in store*) |
|-------------------|--|--|--|---|---|---|---|--|
| La Réunion island | Turmeric <i>Turmeric longo</i> | Root : central part "mother" and "Small fingers" | ✓ | ✓ | ✓ | | | Spices*, vinegar*, essential oil*, powder*, day cream* and serum* |
| | Geranium <i>Pelargonium Rosat</i> | Stem, leaf | ✓ | ✓ | ✓ | | | Food syrup*, essential oil*, flavoured extract*, day cream* |
| | Ambaville <i>Hubertia ambovilla</i> | Stem, leaf | ✓ | ✓ | ✓ | | | Infusette*, essential oil* |
| Martinique | Broken <i>Lippia Alba</i> | Stem, leaf | ✓ | | ✓ | | ✓ | Infusette*, flavouring extract for food use* |
| | Atoumo <i>Alpinia zerumbet</i> | Stem, root, flower | ✓ | ✓ | ✓ | | ✓ | Essential oil*, food syrup*, herbal tea* |
| | Indian wood <i>Pimenta racemosa</i> | Leaf, berry | ✓ | ✓ | ✓ | | | Food syrup*, oily macerate*, powder*, infusette* |
| Guadeloupe | Galba <i>Calophyllum antillanum</i> | Seed | ✓ | | ✓ | | | Vegetable oil*, massage gel*(in French) |
| | Lemongrass | Sheet | ✓ | ✓ | ✓ | | ✓ | Infusette*, essential oil* |
| | Banana <i>Muso</i> | Fruit, trunk | | ✓ | ✓ | ✓ | | Feed supplement*, jam, animal welfare pellets |
| Guyana | Wassaï <i>Euterpe oleroreo</i> | Fruit pulp | | ✓ | ✓ | | | Food supplement* Fresh pulp, frozen, zeodratized powder, vegetable oil, pulpe ice cube (food ingredients) |
| | Cinnamon <i>Cinnamomum verum</i> | Bark, leaf | ✓ | ✓ | ✓ | | | Essential oil*, hydrolate*, infusette*, food syrup* |
| | Awara <i>Astrocaryum vulgare</i> | Fruit | | ✓ | ✓ | | | Food supplement (superfruit powder)* |
| Mayotte | Ylang-Ylang <i>Cananga odoroto</i> | Flower | ✓ | | ✓ | | | Essential oil*, food syrup* |

Source: authors.

conducted. For example, the average yield of vanilla cultivation in Mayotte is 180 kg/ha, whereas it can reach 800 kg/ha in Madagascar. The local resale price is very variable and lower than the world price. In most cases, the cultivation of PAMPs alone does not guarantee the farmer an income covering his family needs.

Local knowledge and innovation

In overseas societies, the use of plants to supplement medicine, for well-being or cosmetic purposes, is widespread¹⁵: the development of multipurpose plants is based on constant interactions between different registers of knowledge. These are mobilised in various ways, to test them for scientific validation or to make them known and ensure their conservation. For example, the Bio Stratège company echoes scientific work on the possible toxicity of crab grass (*Lantana camara*), which is used traditionally in French Guyana.

The density of these interactions is due to three factors: the insular nature of the territories (apart from French Guyana), which favours relationships between individuals and groups; a strong presence of public research (Cirad, CNRS, Ifremer, INRAE, IRD); and a tightly woven network of organizations and agricultural policies that provide a framework for agriculture. The link between insularity and the density of local knowledge is not new: for example, facing food insecurity, Melanesian populations have taken advantage of natural ecosystems comprising a large number of plant species and the low density of individuals favouring an exhaustive use of plants.¹⁶

The mobilization of this knowledge in the production and processing of multipurpose plants sometimes contributes to innovation. For example, in order to overcome the resistance of parasites to chemical molecules, researchers have successfully tested the effects of cassava leaves on pathologies affecting sheep¹⁷, through the Tramil network's studies. Nevertheless, this multilateral dialogue on local knowledge is based on a small number of market players with limited financial resources.

Three risk areas in the value chain

The first difficulty encountered by the multipurpose plant producer is the frequent lack of knowledge about markets. The outlets are uncertain and temporary, particularly in the cosmetics industry: in general, the ingredient that carries the active properties of a cream is used in it for a maximum of 5 years. Furthermore, the choice of species to be cultivated must take into

account the prevention of health risks and manufacturer's duties. In this context, the farmer is reluctant to take risks with new productions, and agricultural specialization seems perilous.

A second risk concerns the ability of producers to supply a customer. Yields may be irregular and harvesting phases may not be mastered, thus compromising the shaping of odorous materials.

Finally, production does not always comply with the quality requirements of markets. Stakeholders have different views of what product quality is or should be, and there is a lack of shared standards systems.¹⁸ Yet, product quality conditions any transaction and grants or degrades the producer's market power.

*

Multipurpose plants contribute to the diversification of overseas agriculture and its modernization by encouraging the implementation of agro-processing equipment and to its greening as "service plants" to replace synthetic inputs for the protection of plants and animals.

In order to develop how they contribute to a sustainable overseas agriculture in the future, and in particular to greater value creation on farms, three areas of action are priorities. First of all, local knowledge is underestimated. It is based on experience and adaptation to a specific socio-ecological environment and should therefore be identified and developed. Each form of local knowledge coexists with other knowledge regimes, lay or expert. In order to avoid any appropriation, it would be advisable to first uncover their internal logic and their dynamics: stakeholders involved, tools, gestures, representations, etc., which form their own system. It would then be necessary to consider the way in which they fit together with other forms of knowledge and know-how (particularly techno-scientific).

In addition, the mobilization of knowledge while marketing products could strengthen the interest of regional or French consumers in overseas products and thus constitute a factor of non-cost competitiveness. This local knowledge could also be formalized and taught to young people.

In order to minimize their dependence on downstream players, producers should be supported in the development of value-added ranges, aiming at market opportunities.

This would be done in the context of diversification rather than specialization, and could be summed up, labelled and promoted by official quality signs that value the terroir and processing, while ensuring compliance with health standards.¹⁹ Local

knowledge could then contribute to the value of farms as intangible assets.

The third and final area of possible action is about agricultural and agroforestry technical itineraries. If better controlled, these would encourage a better yield per hectare, while the sharing of the purchase of processing equipment would reduce production costs.

In any case, integrating multipurpose plants in search for a greater competitiveness of overseas agricultural and food systems would be relevant. For smallscale farms, these plants could be used for two purposes: agro-ecologically in crop associations, and economically (or for an economic point of view) with significant added value for the viability of these farms.

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15. Tareau M.-A., 2019, *Les pharmacopées métissées de Guyane : ethnobotanique d'une phytothérapie en mouvement*, PhD thesis, University of Guyana. See also a podcast from the *Journal du CNRS*: <https://lejournald.cnrs.fr/audios/le-jardin-extraordinaire-de-la-pharmacopée-guyanaise>

16. David G., 2021, « Petit voyage océanien autour de l'île en tant qu'hérésie géographique », *L'Information Géographique*, 84, p. 25.

17. Marie-Magdeleine C. et al., 2020, "Nutraceutical properties of *Leucaena leucocephala*, *Manihot esculenta*, *Cajanus cajan* and a foliage blend in goat kids infected with *Haemonchus contortus*", *Scientific Reports*.

18. Dejouhanet L. et al., 2022, "Building a value chain with a wild plant: lessons to be learned from an experience in French Guyana", *Environment Science & Policy*, 138, pp.162-170.

19. Boisvert V. et al., 2007, « Valorisation économique des ressources et nouveaux marchés », in Aubertin C. et al., *Les marchés de la biodiversité*, IRD.

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