SUPPLEMENTARY MATERIAL

SECTION S1 – Interview Guide

ROADMAP 1 – HOME

IDENTIFICATION AND SOCIAL FACTORS

Name:

Age

Training

Address (street, neighborhood)

Telephone

e-mail

Type of residence (house, apartment, farm)

Family Income (no. of minimum wages)

Number of people who benefit from the informed family income

MOTIVATIONS, DIFFICULTIES, AND OPERATIONAL CONDITIONS

Where and when did you hear about composting?

Where and when did you hear about composting?

Was the first contact with composting important in putting it into practice?

How long have you been composting?

What is the composting technique/method used?

What types of waste are incorporated into the compost?

What are the activities of the operation of the composting system (e.g., feeding, turning, monitoring, etc.)? And how much time, on average, per week is spent on this?

Considering the feeding interval of the composting system and the volume you usually place (if you use a container, consider this volume as a reference), what is the approximate volume of waste incorporated into the system per week?

How much compost is produced per cycle? How long is this cycle?

What is the destination of the compost produced?

Did you have (or do you have) any problems or difficulties in composting? If yes, what were (are) the problems? How did you overcome it?

What difficulties prevented you from continuing in cases of intermittence or discontinuity of the composting practice?

RESOURCES

Did/do you have expenses with the implementation/maintenance of composting? If so, what is the approximate value and why? Do you think it's too much/too little/reasonable? How could it be reduced?

From 1 to 5, with 1 being a little effort and 5 a lot of effort, what is the level of effort spent on composting in your perception?

Have you ever had or do you have any problems or difficulties in selling/donating compost?

SNOWBALL

Do you know another person/group/institution that practices composting in São José dos Campos? If yes, inform name/institution and contact (phone and/or e-mail, if any).

ROADMAP 2 – INSTITUTIONAL/COMMUNITY

IDENTIFICATION

Institution/Community:

Role/Position:

How long have you been working in this institution with composting:

Training:

Address:

Telephone:

Email:

Characterization (for condominium): area, number of houses, inhabitants.

MOTIVATIONS, DIFFICULTIES, AND OPERATIONAL CONDITIONS

What led to the initiative to implement composting in the institution/community?

How long has the composting project been in existence?

How many people are responsible for operating the composting system?

What is the background of the person(s) responsible for the composting system?

What is the composting technique/method used?

What types of waste are incorporated into the compost? And where does the waste come from?

What are the activities of the operation of the composting system (e.g., feeding, turning, monitoring, etc.)? And how much time, on average, per week is spent on this?

What is the amount of waste (per type) incorporated into the composting system?

How much compost is produced per cycle? How long is this cycle?

What is the destination and purpose of the compost produced?

Did you have (or do you have) any problems or difficulties in composting? If yes, what were (are) the problems? How did you overcome it?

What strengths keep the practice active in the institution/community?

(for condominium/community) How do residents participate in composting?

RESOURCES

Did/do you have expenses with the implementation/maintenance of composting? If so, what is the approximate value and why? Do you think it's too much/too little/reasonable? How could it be reduced?

From 1 to 5, with 1 being a little effort and 5 a lot of effort, what is the level of effort spent on composting in your perception? (Use this question only if it is possible to ask other people responsible for handling if any)

Have you ever had or do you have any problems or difficulties in selling/donating compost?

SNOWBALL

Do you know another person/group/institution that practices composting in São José dos Campos? If yes, inform name/institution and contact (phone and/or e-mail, if any).

ROADMAP 3 – Commercially-oriented initiative

IDENTIFICATION AND SOCIAL FACTORS

Institution/Company:

Role/Position:

Time working with composting at this institution:

Training:

Address:

MOTIVATIONS, DIFFICULTIES, AND OPERATIONAL CONDITIONS

What led to the initiative to implement the enterprise?

How long has the institution/company been active?

How many people are responsible for operating the composting system? How long?

What is the background of the person(s) responsible for the composting system?

What is the composting technique/method used?

What types of waste are incorporated into the compost? And where does the waste come from?

What are the activities of the operation of the composting system (e.g., feeding, turning, monitoring, etc.)? And how much time, on average, per week is spent on this?

What is the amount of waste (per type) incorporated into the composting system?

How much compost is produced per cycle? How long is this cycle?

What product type is marketed according to the purpose (Organic compost/ Organic fertilizer/Substrate/Soil Conditioner)?

What is the destination of the compost produced (place and buyer profile)?

Did you have (or do you have) any problems or difficulties in composting? If yes, what were (are) the problems? How did you overcome it?

What are the strengths that keep the enterprise active?

RESOURCES

What is the estimated cost of implementing and maintaining the process per amount of produced compost (value and description)?

What is the selling price of the compost?

What is the price charged for the organic waste treatment service?

Have you ever had or do you have any problems or difficulties in selling/donating compost?

SNOWBALL

Do you know another person/group/institution that practices composting in São José dos Campos? If yes, inform name/institution and contact (phone and/or e-mail, if any).

SECTION S2 - Roadmap for Commercial Establishments

ROADMAP 4 – COMMERCIAL ESTABLISHMENT

Does the establishment sell products from composting/vermicomposting?

→ If not, finish. Account as an agricultural, commercial establishment that does not market compost/vermicompost.
→ If yes, continue.

Type of product marketed:

- Organic compost/ Organic fertilizer/Substrate/Soil Conditioner

Origin of the marketed product:

- Supplier:
- Location (city/state):
- Amount (monthly):

Average price practiced:

Average monthly sales (units):

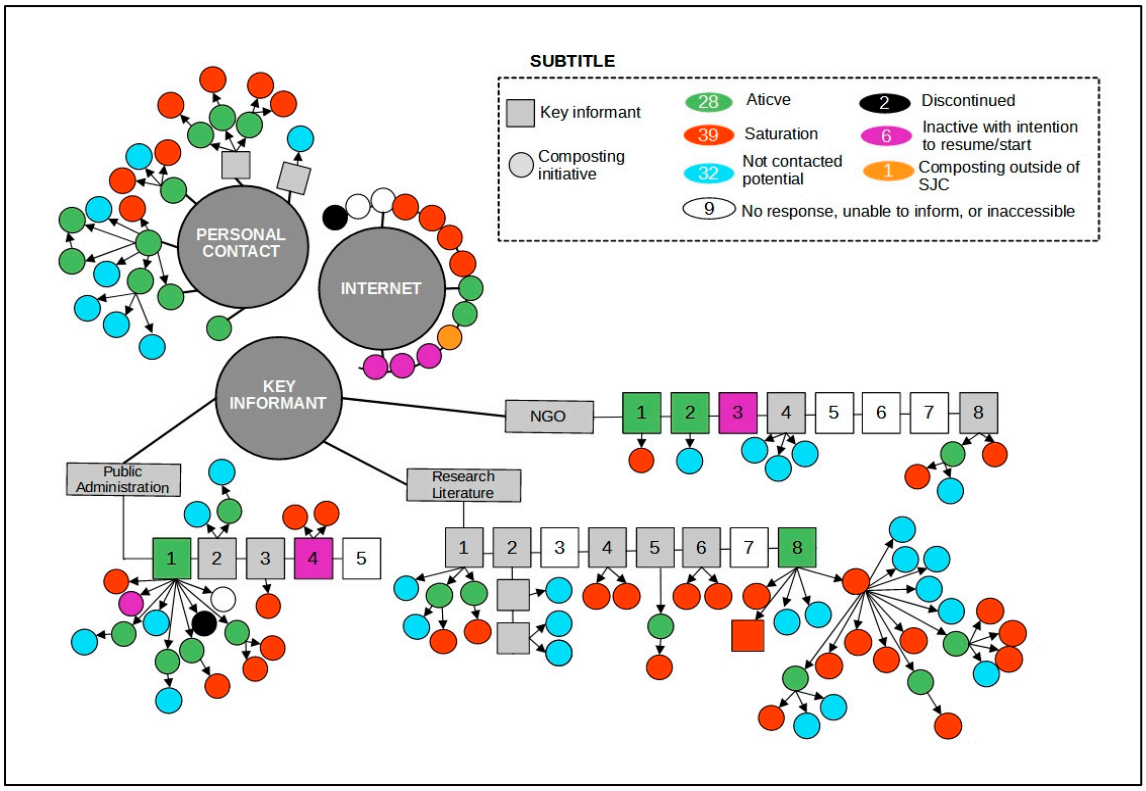
Main destinations of the product:

- Buyer profile: individual; legal person.
- Location (city/state):

Source and amount (volume or mass) of raw material:

- Plant Waste:
  - Amount:
- Animal Waste:
  - Amount:

SECTION S3 – Snowball Networking



Subtitle:

NGOs: 1 – Centro de Estudos da Cultura Popular, 2 – Fundação Vale Paraibana de Ensino, 3 – Instituto Sorri, 4 – Amigos da Biblioteca de São Francisco Xavier, 5 – Instituto Alpha Lumen, 6 – Instituto Impactar, 7 – Associação Fomento Arte e Cultura, 8 – Celebeiros.

Public administration: 1 - SEURBS, 2 – Health Department, 3 – Education and Citizenship Department, 4 - Urbam, 5 – City Maintenance Department.

Research institutes: 1 - Unifesp, 2 - Univap, 3 - IFSP, 4 - ITA, 5 - Cemaden, 6 - Univap, 7 - Unip, 8 – Unesp.

SECTION S4 – Socioeconomic Data of home composting initiatives

N	Age	Education	Training	Composting site	Zone	*Per Capita* Income *
1	38	Complete Higher Education	Environmental Engineering	House	Urban	0.75
2	44	Graduate	Chemical Engineering	House	Urban	8.33
3	32	Complete Higher Education	Environmental Engineering	Apartment	Urban	2.00
4	60	High School	-	House	Urban	1.38
5	39	Graduate	Civil Engineering	Apartment	Urban	8.00
6	40	Complete Elementary	-	House	Rural	1.67
7	35	Graduate	Biology	Apartment	Urban	7.50
8	22	Incomplete Higher Education	Biotechnology	Apartment	Urban	-
9	57	Complete Higher Education	Biology	Apartment	Urban	7.00
10	25	Complete Higher Education	Biotechnology	Apartment	Urban	3.50
11	47	Complete Higher Education	Agronomy	Public Place	Urban	2.33
12	48	Complete Higher Education	Letters	House	Urban	2.50
Average	40.58	-	-	-	-	4.09

- *Per capita* income in national minimum wages, effective in 2021.

SECTION S5 – Influencing factors

1. Education

Education for composting occurs through a search on internet sites, participation in workshops, courses or training, awareness, accessibility, and disclosure. Searches on internet sites are driven by a curiosity about the subject, need for fertilizer, or to complement information required to solve problems with the practice. The search on its own can be diffuse, exhaustive, and not bring correct information, as reported by Interviewee 21:

> We searched a lot on the internet. We saw, but (...) the opinion was very dispersed; many things were coherent, and many things were not, like everything we see in agroforestry (...). We always read a lot of lies, (...) even those boring videos of the guy teaching a student of agronomy and environmental engineering; sometimes you see it. It's a boring, heavy subject. (...) We see a lot to try to understand these processes. (...) A lot of our struggle is trying to find coherence between what we are doing and what people do. (Interviewee 21)

Education can be considered a key factor [1] since the attitude toward composting at home is positively associated with the perception of the individual's level of knowledge about home composting and understanding of specific aspects of behavior in terms of convenience and possible problems [2].

In this study, the operational difficulty at the beginning of the practice was recurrently reported by household interviewees. A beginner may have some kind of support or monitoring of the process, especially in the first months, when there are greater chances of operational problems occurring (Report by Interviewee 9).

> But people still don't understand what the composting process is. They need to understand why we need to segregate at source; we need to do all the logistics, and we need to teach people how to compost. (...) The technique needs to be very well founded and strictly followed because if not, we get lost, you know, we get lost. So, this is very interesting, what people want to do, but they want to do it anyway. They don't understand that there is a process to be done. (Interviewee 9)

Disclosure of information can occur through digital media, leaflets, or face-to-face. The language should be simple and accessible to different audiences, according to Interviewee 19:

> ...my suggestion, for composting to be successful, is that you really study the environment where you want to go with this work. Equip yourself with a lot of information, correct ways (...) You have to speak in a language that everyone understands, be something simple, and that has a positive effect" (Interviewee 19).

The decision to practice composting depends strongly on understanding and acceptance, as education alone is not enough to change behavior [3],[2]. This can be verified in Interviewee 18's report: "You explain everything, but you don't put it on. It's just curiosity, but there was no awareness." In this study, when education was considered a trigger factor, infrastructure, pro-environmental behavior, and social influence were mainly involved.

2. Infrastructure

The composting site or the waste collection point must be easily accessible. All these places must be perceived as clean, organized, and odorless (Interviewee 16). Logistics must be well established; therefore, the partners must understand and accept the composting process (Interviewee 9). Personnel must be trained, and roles must be clear. Adverse conditions can inhibit new participants in the system.

> ...you have to paint your peacock chicken. If not, no one will see. Because garbage is a bad thing, isn't it? (...) There's nothing dirty here; it can't have

> a smell (...) This must always be beautiful. This is how we will sell the image (Interviewee 16).

The realization of the practice was favored by the availability of space added to the surplus of vegetable residue generated on-site "The composting that I am doing is because there is a lot of residues left from the leaves that we clean. Then you have to give a destination" (Interviewee 2); or when there was a need to produce fertilizer for insertion in pots, vegetable gardens or in an agroforestry system: "At home, it also made sense to have some compost for me to use in my vegetable garden" (Interviewee 15).

3.2.3. Influence and Social Norm

Based on the interviewees' reports, social influence was identified as the willingness to compost spontaneously, based on exchanges with peers, influence from friends or close people, and interest in observing unknown people performing the practice. In these situations, behavioral change is instigated by other people without coercive authority [4]. We highlight relevance as a trigger of social influence, corresponding to 62% of citations in this case study.

The concept of social norm, characterized by culturally exercised control without legal imposition [5], is evident in environments where composting naturally occurs in daily life. Achieving a social norm for source separation or community composting requires spreading a behavioral change from the bottom up [6] and breaking the current paradigm of the concept of garbage. The report of Interviewee 25 portrays this issue:

> ...it's been like a culture spread naturally, without us forcing anything, without having any document from top to bottom, from the secretary or directors, now it's going to be like this, and it has to be (...). You know that situation ruled with an iron fist? It is not. People are becoming aware. So it's been a good trend that's catching on (Interviewee 25)

3. Economic Factors

The economic factors identified that associated with: winning gifts for those who participate in the collection plan or collaborate in some way with the project, the reduction of expenses with the destination of the residue or purchase of fertilizer, the payment of the initial investments, and the financial return with the waste treatment service or with the sale of products.

While the interviewees frequently mentioned the economic issue, it was not reported as a predictor of composting since few of them took the factor into account when deciding to adopt the practice. Some stated that they had no financial return from the project, only work and personal expenses, but they did so because they believed that the return was related to the socio-environmental benefits that the project brings.

> It was never anything like that, material that held. For example, I'm saving money by not buying land at the store. Either because I'm not littering the street or for any material benefit. That (...) for us, it never paid off. Quite the contrary, we even had energy expenditure and work. But what held and still holds today is this feeling of experiencing something that is within the familiar scope. In the case of a school, it was a small school; you are doing something that is not handing the problem over to the mayor to solve or for society itself to do its own thing. It is trying, in some way, to create this sustainable awareness within one's own experience, within one's own life. And that later reflects on everything you will do (Interviewee 17).

4. Feedback

Based on the reports of the interviewees in this research, feedback is the monitoring of the process *in loco* and the return of the performance in the result. It includes reports with the amount of composted waste and environmental mitigations obtained through practice, return workshop to present the composting process and share the compost, when

the participant was involved in the action of segregating at the source, and the creation of a group to monitor activities and report difficulties and desires of those involved in the system in search of continuous improvement, considering their perception.

> It's an ongoing process, you know that. It's keeping track, it's not trivial. And if you don't have that time, you lose work, you know? Because you're in the middle of the process, but if you don't follow up and don't give feedback (...), the person ends up getting discouraged and stops doing it, and that's it. Then it went back to square one, back to what it was before (Interviewee 14).

5. Habit

People with less time available in their routine are less likely to participate in a composting scheme [2]. While the intervention can promote participation, transforming behavioral intentions into habits requires complementary strategies [7], guaranteeing the project's continuity and offering feedback to the interviewees.

Building a habit is a process; it takes time to accept it and requires continuous awareness work (Interviewee 14). However, once the habit is established, the chances of permanence increase [1]: "Because I think the difficult thing is to implement, that whole thing. After things start to work, it goes slowly, but it goes..." (Interviewee 23). One of the reasons may be the change in the perception of effort spent throughout practice. Although it was not a specific question of this work, some interviewees stated that they perceived more significant effort at the beginning of the implementation and less in the interview period (years late).

6. Pro-Environmental Behavior

In this study, pro-environmental behavior involving interest in the environmental area or concern for the environment was associated with the individual's training in an educational context. It was considered a low predictor for participation in composting, supporting Edgerton *et al*. [2].

7. Trust in the System

Trust in the system involves the credibility of the population in the government, perceived when it supports initiatives through infrastructure, workshops, and monitoring [7],[5]. Interviewees in this research indicated a lack of support from public authorities and indignation at the non-treatment of PSOW:

> On the initiative of the community itself (...) that is happening. From the community itself, from popular people, it has nothing to do with the city hall mentoring someone... to help, to maintain it better (Interviewee 18)

Despite being identified as a negative aspect in this study, trust in the system did not inhibit the action of local stakeholders but encouraged them to manage their own PSOW, as reported by Interviewee 7.

> It's not enough for me to separate solid waste at home, what is composting, and what is recyclable, and think that the government is solving it. Because I also already had data that the government was landing all of this in the landfill. (...) if I am delegating to a third party and the third party is not doing it, it is my responsibility to do it or charge them to do it (Interviewee 7)

This report shows that subjects aware of the actions and the environment in which they are inserted actively seek a solution to the problems encountered and have the potential to induce actions by the public authorities.

References

[1] Karkanias, C., Perkoulidis, G., & Moussiopoulos, N. (2016). Sustainable management of household biodegradable waste: Lessons from home composting programmes. *Waste and biomass valorization*, *7*, 659-665. https://doi.org/10.1007/s12649-016-9517-1

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[5] Knickmeyer, D. (2020). Social factors influencing household waste separation: A literature review on good practices to improve the recycling performance of urban areas. *Journal of cleaner production*, *245*, 118605. https://doi.org/10.1016/j.jclepro.2019.118605.

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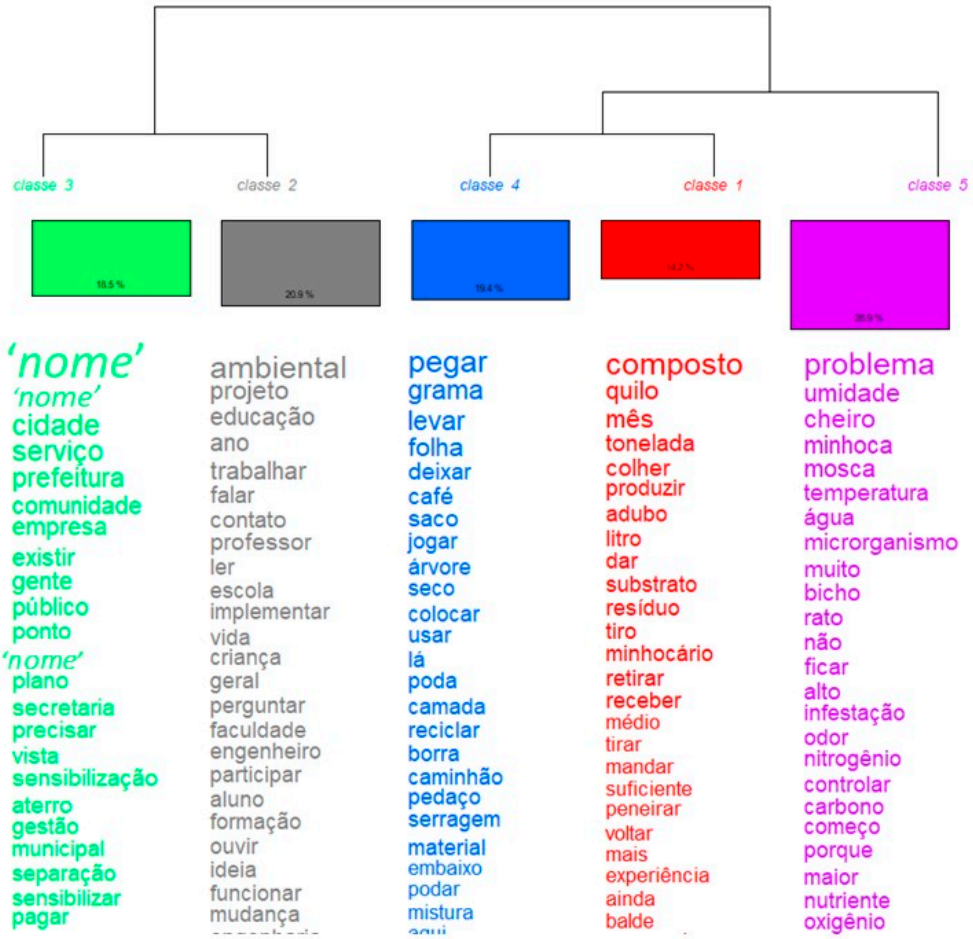
[7] Sewak, A., Kim, J., Rundle-Thiele, S., & Deshpande, S. (2021). Influencing household-level waste-sorting and composting behaviour: What works? A systematic review (1995–2020) of waste management interventions. *Waste Management & Research*, *39*(7), 892-909. https://doi.org/10.1177/0734242X20985608.

[8] Manomaivibool, P., Srivichai, M., Unroj, P., & Dokmaingam, P. (2018). Chiang Rai Zero Waste: Participatory action research to promote source separation in rural areas. *Resources, Conservation and Recycling*, *136*, 142-152. https://doi.org/10.1016/j.resconrec.2018.04.002.

SECTION S6 - Descending hierarchical classification (DHC)



Class 3		Class 2		Class 4		Class 1		Class 5	
x²	**word**	**x²**	**word**	**x²**	**word**	**x²**	**Word**	**x²**	**word**
85.53	´name'[1]	141.25	environmental	207.38	to get	270.49	compost	125.61	problem
85.24	´name'[1]	83.63	project	141.17	grass	149.61	Kilo	68.62	moisture
80.31	city	60.40	education	124.60	to take	145.65	month	66.95	smell
69.89	service	58.96	year	117.41	sheet	66.84	Ton	62.73	worm
56.20	city hall	55.70	to work	66.88	to leave	65.52	to harvest	59.90	fly
47.46	community	51.67	to speak	63.73	coffee	49.01	to produce	49.25	temperature
44.30	company	46.29	contact	59.54	bag	48.00	fertilizer	46.57	water
44.05	to exist	42.78	teacher	54.22	to throw	43.56	Liter	46.11	microorganism
43.13	people	40.19	to read	54.12	to tree	42.41	to give	44.64	very
42.77	public	34.76	school	53.51	dry	41.52	substrate	42.56	animal
39.04	point	34.08	to implement	52.51	to place	41.01	residue	39.90	rat
38.38	´name'[1]	32.72	life	45.13	to use	39.39	Shot	38.59	no
37.81	plan	32.16	child	41.33	there	37.42	worm farm	38.31	to stay
35.89	secretary	31.87	general	39.40	pruning	36.63	to remove	36.62	high
34.02	to need	31.78	to ask	37.37	layer	36.29	to receive	35.41	infestation
34.00	view	31.78	college	36.13	to recycle	32.53	average	32.75	odor
34.00	awareness	31.78	engineer	35.55	sludge	30.31	to remove	32.75	nitrogen
33.24	embankment	30.86	to participate	35.44	truck	30.18	to send	32.75	to control
30.05	management	29.11	student	33.34	chunk	30.00	enough	32.73	carbon
29.64	municipal	28.34	training	32.98	sawdust	28.02	to sift	28.66	start
29.55	separation	28.23	to hear	32.68	material	26.88	to go back	27.87	why
29.34	to sensitize	26.73	idea	32.14	below	25.72	More	27.49	bigger
26.93	to pay	26.72	to work	32.00	to prune	25.69	experience	27.26	nutrient

[1] Individuals and institutions mentioned during the interviews and displayed in DHC were hidden from the results. To indicate their position, they were expressed in the figure as '*name*.'