



RESEARCH
PROGRAM ON
Water, Land and
Ecosystems

Food waste in educational institutions

IN SANTIAGO DE CALI

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Executive summary

Introducción

El desperdicio de alimentos es un problema importante por varias razones. Primero, de todos los alimentos en Colombia, un tercio se desperdicia, 9,76 toneladas. Con este monto, 8 millones de personas se podría alimentar.

Sin embargo, aún 4 millones de personas en Colombia están desnutridas, porque estos alimentos no llegan a ellos, y ellos fácilmente se podría alimentar si no habría tanto desperdicio. Además, un mejoramiento en la eficiencia en la cadena de alimentos podría reducir el inseguridad alimentario de los campesinos, ya que muchos de ellos viven de poco ingreso.

El desperdicio de alimentos pasa en varias etapas de la cadena alimentaria. Se aprecia que los consumidores contribuyen menos que del 16 por ciento al monto total de desperdicio de alimentos. Sin embargo, esto solo es el desperdicio directo. Cuando se desperdicia alimentos, también desperdicia todos los recursos, por ejemplo, energía, agua, recursos humanos que se explotó para producir este alimento y demás. Por eso, desperdicio en la última etapa de la cadena, tras consumo, hace un impacto más grande que el desperdicio que lo que se hace más temprano en la cadena. Además, el impacto ambiental del desperdicio de alimentos continua después de su eliminación, porque, primero, los residuos de alimentos toman mucho espacio en el relleno sanitario, y durante su descomposición emite gases de invernadero como metano.

Finalmente, los residuos de alimentos plantean una carga pertinente en los recursos de ciudades. Los totales residuos sólidos municipales en Cali era en 2014 52.673 toneladas por mes, y residuos orgánicos componen la parte más grande de los residuos: en el 2006 era el 59 por ciento. Puede imaginar que el transporte para y el mantenimiento de este relleno sanitario es un proceso grande y costoso, y ya que la población del Santiago de Cali está creciendo, el monto de residuos está creciendo también.

Las instituciones son un punto de partida para la realización de intervenciones encaminadas a reducir los residuos orgánicos en la ciudad, porque acá se sirve una gran cantidad de clientes en una única ubicación, resultando en un grande flujo de residuos concentrado. Una reducción en el desperdicio alimentario en este sector por lo tanto tiene gran efecto en la huella urbana acerca de alimentos y residuos. Además, si hecho bien, el efecto no solo será circunscrito al colegio. Nuevas generaciones están siendo educadas y el llevarlo a cabo en colegios podría dar una visión enfocada en la sociedad.

PAE

La definición del PAE es:

“Estrategia estatal que promueve el acceso con permanencia de los niños, niñas, adolescentes y jóvenes en el sistema educativo oficial, a través del suministro de un complemento alimentario durante la jornada escolar, para mantener los niveles de atención, impactar de forma positiva los procesos de aprendizaje, el desarrollo cognitivo, disminuir el ausentismo y la deserción y fomentar estilos de vida saludables.”

El ministerio de educación nacional cofinancia el programa alimentario. La selección, contratación e implementación del programa son la responsabilidad de las entidades territoriales, lo que lleva a la descentralización total. Entonces cada entidad territorial hace la priorización de las instituciones educativas y define el número de beneficiarios. En Cali todos los colegios públicos están en el PAE. Las entidades también contratan a los operadores en los colegios. Un Comité de Seguimiento Operativo Departamental o Municipal controla a el seguimiento y la ejecución del Programa y

propuesta de acciones de mejoramiento. En Cali, un equipo de PAE visita a todos los colegios regularmente para hacer los controles. Ellos controlan por ejemplo la higiene en la cocina y si los niños obtienen la comida que el menú prescribe.

El contenido del PAE es depende del horario de los colegios, y si tienen su propia cocina. Hay un complemento en la mañana, un complemento en la tarde, y un almuerzo. En algunos colegios se sirven los tres, en otros solo uno o dos complementos o un complemento y un almuerzo. Un nutricionista define el menú para todos los colegios en la ciudad que están en el PAE. Hay dos tipos de ración: los colegios que tienen su propia cocina sirven comida preparada en sitio. Los colegios sin cocina solo sirven complementos industrializados.

Metodología

Porque existe poca literatura sobre el desperdicio de alimentos en instituciones educativas en el contexto de Latinoamérica, este estudio es una primera exploración en este tema. Los resultados pueden dar un mejor entendimiento de los factores que podrían contribuir a la generación del desperdicio de alimentos.

La investigación estuvo hecha en cooperación con la Secretaria de Educación de la Alcaldía de Santiago de Cali. La visita se hizo con el equipo de PAE a los colegios que ellos tenían que controlar estas semanas. Entonces la selección de colegios que visité estaba depende de las visitas del equipo. Había una buena diversidad de colegios. Solo instituciones públicas están en el PAE, entonces solo instituciones públicas están en la muestra. En total 10 colegios fueron investigados.

Los métodos de observación y entrevistas se usaron para obtener datos tales como; los aspectos físicos, por ejemplo, platos, la cocina; y procesos, por ejemplo, el sirviendo, el comiendo y más; se fueron observados.

Las entrevistas se fueron haciendo con tres tipos de actores: los manipuladores de alimentos, estudiantes y en pocos casos empleados de la institución.

Resultados y discusión

El receso

Preparado en sitio

En las instituciones que sirvieron preparados, la mayoría tenía un espacio con mesas y sillas dónde las estudiantes podían consumir su comida. Un colegio lo no tenía, y los niños comieron en los salones.

Porque este espacio tiene cupo limitado, los grupos vinieron en turnos. Eso también previno filas largas.

Había diferentes maneras de servir. En unos colegios, los platos fueron preparados antes los niños entraron el restaurante. En otros colegios, solo preparan los platos cuando los niños entraron el restaurante.

Una otra diferencia era que, en algunos colegios, los platos estaban colocado en el mostrador, en otros se colocaron en las mesas donde los niños se sentaron, o irían sentarse.

La comida estaba sirviendo en platos plásticos y era servida con un solo cubierto, en este caso la cuchara.

Industrializados

En los recesos con industrializados que observé no había turnos. Todos los niños obtuvieron su comida en la misma hora. En algunos colegios, había un lugar de dónde se repartieron los alimentos. En otro colegio, unos estudiantes de cada grupo vienen para obtener una caja con los alimentos para sus compañeros de clase y las llevaron a la sala.

Tipos de desperdicio en instituciones

Desperdicio en la etapa del consumo se puede categorizar por su origen.

desperdicio de almacenamiento: fue difícil observar con este método porque solo visité cada colegio una vez. Pero encontré que la mayoría de las instituciones solo almacenaban comida en la nevera para uno, máximo tres días. Vi un incidente de carne que llegó el viernes para el lunes, pero no lo pusieron en la nevera, entonces lo pereció durante el fin de semana y finalmente al lunes se descompuso la carne.

desperdicio de preparación: este principalmente consiste en desperdicio inevitable, por ejemplo, cáscaras.

desperdicio de servicio y sobras son de comida que ya estaba preparada, pero nunca fue servida. Vi ollas y las cuales todas estaban bastante vacías después el receso. Los manipuladores dijeron que poca comida va a la basura de la cocina. También hay la posibilidad para los estudiantes de repetir si desean, eso contribuya a menos pérdidas.

Desperdicio de platos aparece la categoría que contribuya el factor más relevante de desperdicio en las instituciones educativas que fueron investigadas. Sin embargo, refiriéndose al contenido de los recipientes, los montones varían mucho entre instituciones. Ahora les contaré las razones.

Razones para desperdicio de alimentos

- Industrializados vs preparados en sitio: industrializados hacen menos desperdicio de alimentos, pero muchos residuos plásticos, entonces no considero industrializados una mejor opción, porque así crea otro problema.
- Apreciación de la comida: Los estudiantes y los manipuladores de la cocina se les preguntó sobre los gustos de los estudiantes. Ensalada, lentejas y jugo en leche se fueron mencionados el más. A veces la razón era solo gusto, pero también preparación y sirviendo podrían determinar la apreciación de la comida porque en los recipientes se encontró otros tipos de alimento también. Arroz por ejemplo nunca fue mencionado, pero estaba uno de los productos más desperdiciados. Por ejemplo, en un colegio muchos niños no comieron el pollo, pero una niña dijo que sí le gusta el pollo de su madre. O la combinación de alimentos puede ser una razón. Jugo en leche se fue apreciado menos que jugo en agua, y una trabajadora de la cocina dijo que los niños no les gustan las mezclas. A veces preparan un plato que es una mezcla de frijoles, queso y carne que muchos niños no les gusta, aunque sí les gustan esos ingredientes separados. Unas investigaciones dicen que también los emparejamientos pueden desempeñar un papel. A veces por ejemplo había dos alternativas en un plato, como arroz y pasta. También fresca fue mencionada en un colegio como una razón. Los estudiantes dijeron que la comida fue preparada demasiado temprano, y resultó que el jugo que estaba cortado de la leche, o ensalada seca. También la temperatura podría influir el sabor, porque en las instituciones donde se prepararon los platos antes de llegada de los estudiantes los platos a veces esperaron bastante tiempo de sus consumidores, y probablemente estuvieron fríos durante este tiempo.
- Hábitos dietéticos: a veces algunos estudiantes no comen el complemento en la mañana porque ya comieron mucho en casa, y faltan apetito.

- **Herramientas:** en unos casos, la comida fue servida en platos profundos. En esos platos, la comida mezcla más fácil, y como dije antes, muchos estudiantes no les gusta comida mezclada. Además, la cuchara no es siempre conveniente para comer todos los alimentos. Vi unos niños comiendo su carne con sus manos.
- **Distracción:** muchos niños estaban inquietos y parecían con afán. Varios niños fueron observados andando por el mostrador para disponer su plato mientras todavía comiendo los demás. Obvio, algunos niños no terminan su plato completamente por este afán, haciendo desperdicio de alimento en su plato. En el colegio donde los estudiantes comieron en los salones, los niños jugaron en este salón también, y puede imaginar que puede ser una distracción para los niños todavía comiendo.
- **Tiempo para el receso:** en los colegios donde sirvieron industrializados, los estudiantes tenían el receso en la misma hora, pero a veces causaba filas largas. En un colegio vi muchos estudiantes comiendo comida de las tiendas escolares en lugar del complemento del PAE, porque no quisieron esperar tanto tiempo. En otro colegio donde se sirven preparados, unos estudiantes no pudieron terminar su comida porque su próxima clase ya empezó, y por eso siempre estaban con afán. Entonces no tenían suficiente tiempo para el receso.
- **Recursos de comida alternativos:** la mayoría de las instituciones que visité tenían tiendas escolares en sus terrenos. Esas sirven como un recurso de comida competitivo para los estudiantes. Por ejemplo, cuando tenía tiempos de espera largos, los estudiantes eligieron en lugar de comprar comida de las tiendas. Un colegio era diferente que los otros colegios porque sirvió el complemento industrializado en el final del receso. Pero el resultado fue que los niños corrieron a las tiendas cuando empezó el receso, aunque recibieron el complemento en el final del receso.
- **Falta de sentimiento de responsabilidad:** los manipuladores estaban siempre positivos sobre sus esfuerzos de reducir el desperdicio, y los estudiantes tampoco se sintieron no tan responsable porque, como un estudiante dijo: el colegio no muestra que desperdicio es algo malo, y eso justifica sus desperdicios.

Recomendaciones

De las conclusiones, vienen unas recomendaciones. Tengo recomendaciones para inversiones privadas, políticas, y para futuras investigaciones.

Inversiones privadas

Separación temporal comer y jugar: Ahora, el receso empieza para los estudiantes con obtener el complemento o almuerzo, y cuando lo terminan, pueden jugar. Entonces los niños comen muy rápido, o no terminan todo que está en sus platos, para que seguir jugando, y así haciendo desperdicio. Recomiendo tener una separación temporal entre comer y jugar. Entonces fija un tiempo para el complemento, por ejemplo, una media hora. Asegurase que el tiempo es suficiente para comer. Los niños pueden jugar después esta media hora. Entonces no tiene razón de comer muy rápido, porque todos los niños en la clase empiezan el receso de jugar en el mismo tiempo, entonces solo tienen que esperar más si terminan de comer más temprano. Otro beneficio es que los niños probablemente están más tranquilos, porque no están con afán. Eso es también agradable para el supervisor. Si eso no es posible, al menos una separación espacial entre comer y jugar, entonces los niños no comen y juegan en el mismo espacio, como el salón, y distraer en uno al otro.

Servir: Para prevenir que la comida se vuelve fría, solo servir cuando los niños entran el restaurante, no más temprano. Si eso no es deseable porque causa más presión, por ejemplo, sirve la comida en platos de un material diferente que plástico, porque la comida se queda caliente más tiempo en por ejemplo platos de cerámico o aluminio.

Herramientas: para mejorar la experiencia de comer, las herramientas podrían ser mejoradas. Los platos deberían ser planos para prevenir el mezclado de la comida. La cuchara no es adecuada para comer por ejemplo grandes trozos de carne, entonces podría complementar los cubiertos con cuchillo y tenedor. Si eso no es posible por la seguridad, prepara la comida así podrían comerla con una cuchara, entonces por ejemplo sirve la carne en trozos pequeños.

Más puntos de recolección para comida industrializada: para prevenir filas largas para el complemento, haz dos o más filas. Así el tiempo de espera es más corto y los estudiantes no compran alimentos de las tiendas en lugar del complemento.

Políticas

Aumentar conciencia y responsabilidad de los niños: muestra a los niños porque reducir desperdicio es importante y ellos mostraran influencia en eso. Por ejemplo, con incluir desperdicio en programas de educación, o una campaña.

Provee oportunidades de realimentación y participación: da colegios, operadores, manipuladores, estudiantes y padres la oportunidad de dar realimentación sobre el PAE, por ejemplo, sobre el menú. Podría ser por ejemplo con cuestionarios o reuniones una vez por año. También se considera importante de incluir actores en actualizaciones del PAE, y por ejemplo el diseño del menú, como manipuladores de alimentos. Con esas medidas es probable que ineficiencias que pueden causar desperdicio de alimentos estarán notadas más temprano.

Futuras investigaciones

Esta es una investigación para explorar la situación en colegios de Cali y a los factores los cuales podrían causar desperdicio de alimentos. Pero para realmente demostrar las relaciones falta investigación que pruebe esos factores en unos casos y observa el cambio del monto de desperdicio de alimentos por un tiempo más largo. Si una de las recomendaciones será implementada, la futura investigación puede mirar si realmente el montón de desperdicio reduce.

Contents

Executive summary	2
Expresiones de gratitud	8
1. Introduction.....	10
1.1. Background.....	10
1.2. Aim and objectives	11
1.3. Report structure	11
2. Literature review	13
2.1. Reasons for food waste	13
2.2. Food waste numbers	15
2.3. Interventions	16
3. Policy context	18
3.1. National waste policies.....	18
1.1. PRAES.....	18
1.2. PGIRS	18
1.3. Bills against food waste	18
1.4. PAE.....	18
4. Methodology	20
4.1. Study design	20
4.1.1. Sample	20
4.2. Data collection.....	20
4.2.1. Desk research	21
4.2.2. Observation	21
4.2.3. Interviews	21
1.1. Data analysis.....	21
5. Results	22
5.1. Actors.....	22
5.1.1. National government	22
5.1.2. Local government	22
5.1.3. Catering operator	22
5.1.4. Catering staff	22
5.1.5. School	22
5.1.6. Pupils	22
5.2. Description of cases.....	22
5.2.1. Prepared on site	23
5.2.2. Industrialized complement.....	23

5.3.	Origin of waste	23
5.4.	Type of complement	24
5.5.	Type of food waste	24
5.6.	Reasons for wasting food	24
5.6.1.	Appreciation of the meal	24
5.6.2.	Quantity of food	25
5.6.3.	Eating tools	25
5.6.4.	Distraction	25
5.6.5.	Supervision	25
5.6.6.	Break time	25
5.6.7.	Presence of alternative food sources	26
5.6.8.	Serving	26
5.6.9.	Opinions about food waste	27
6.	Discussion	28
7.	Recommendations	30
7.1.1.	Private investments	30
7.1.2.	Policy	31
7.1.3.	Further research	31
	Literature	32
	Appendix 1: Enrollment in education in Santiago de Cali in 2015	34
	Appendix 2: Observation Schedule	35
	Appendix 3: Interview questions	38
	Entrevista administración del colegio	38
	Entrevista administración del operador de comidas	39
	Entrevista personal de la cocina	41
	Entrevista estudiantes	42

Expresiones de gratitud

Me gustaría agradecer a mi supervisor Guy Henry y Sara de CIAT para regalarme la oportunidad de hacer mi pasantía en este proyecto en Cali, organizar las reuniones y llevarme a todos ellos. Fue muy especial conocer Cali y Colombia, y además aprender sobre el sistema educativo y la situación del desperdicio de dicha ciudad.

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1. Introduction

1.1. Background

The region of Latin America is abundant in resources, of which many food products. The region is a global exporter of food products. Hunger does not need to exist in the region when one looks at the quantity of food produced in the region: this is enough to feed its entire population. still, there is hunger in the region (FAO 2014). When one looks at Colombia, 8.8 percent of the population, about 4 million people, is undernourished (WHO 2016). One reason is ‘the paradox of hunger and waste’: one third of the total available amount of food in the country becomes waste before it reaches the mouths of the people who need it (Semana 2016). In Colombia, 9,76 tons of food of the food in the country is wasted each year, accounting for one third (34%) of the total available amount of food, which puts it at the global average (Semana 2017; FAO 2017a; FAO 2017c; Departamento Nacional de Planeación 2016; Gustavsson et al. 2011; FAO 2014). This could feed about 8 million people, double the number of undernourished persons and about the population of Bogotá. An improvement of the efficiency in the food chain which reduces food losses would bring down the costs of food and so increase the access of consumers to food, resulting in less people living in food insecurity. Furthermore, on the side of the producers a reduction in food insecurity could be established when food losses are reduced, as many of them live from little income.

1.1.1. Definition

Food losses and waste have different causes, and for this reason usually a distinction is made between ‘food loss’ and ‘food waste’. The Food and Agriculture Organization (FAO 2014, 3) defines food loss as “the decrease in the availability of food apt for human consumption along the entire food supply chain. Food loss occurs mainly in the earlier production, post-harvest, storage and transportation segments, due to the malfunctioning of the food production and supply system or its institutional and policy framework. “The losses arising from the decision to throw away food that is still edible” (FAO 2014) are called ‘food waste’, and takes mostly place at the final stages in the food chain. These are the wholesale and retail sales, prepared food services and at the consumption level. Behavioral factors are the main cause of food waste (Rezaei and Liu 2017; Papargyropoulou et al.

Food losses and waste in different stages in the food chain in Colombia

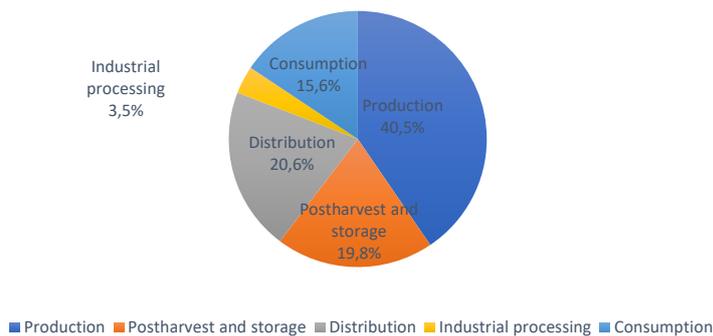


Figure 1 Source: Departamento Nacional de Planeación (2016)

2014).

1.1.2. Effects of food losses and waste

Figure 1 shows that the latter stage contributes less than 16 percent to the total amount of food losses and waste in Colombia. However, this figure only shows the direct waste of food. When food is lost, it means also a waste of all the resources (energy, water, manpower etc.) that were exploited to produce the food item. Due to these negative externalities, waste of food in the final stage of the chain, so after consumption, has a relatively higher environmental impact than losses of food earlier in the chain (Papargyropoulou et al. 2014; Betz et al. 2015; WRAP 2011).

Moreover, the environmental impact of food waste continues after its disposal. Biomass solid waste takes up much space on landfills, and as the organic material decomposes, it releases greenhouse gases like methane. Methane has 25 times the global warming potential of CO₂. The longer it lays, the higher the amount of emissions. Furthermore, because of this decomposing process the quality of the product goes down as time passes, which makes reuse or recycling more difficult (Papargyropoulou et al. 2014). Apart from the environmental effects of landfilling biomass waste, it also threatens public health as there is the risk of contamination of water bodies and attracting disease vectors (Vergara and Tchobanoglous 2012; Buzby and Hyman 2012).

Lastly, food waste causes high economic costs because of all the wasted resources “to produce, store, transport, and otherwise handle something that does not ultimately meet its intended purpose of feeding people”, plus the land needed to landfill it (Buzby and Hyman 2012, 526). Food waste in the retail and consumption stage poses a relevant burden on the resources of cities. The total municipal solid waste in Cali was in 2014 52.673 tons per month. Organic waste makes up the largest share of this waste: in 2006 this was 59 percent (Alcaldía de Santiago de Cali 2015). Over the whole of Colombia 65 percent of the total municipal solid waste consists of organic waste (Oviedo-Ocaña et al. 2012). The total municipal organic waste in Cali is collected in Rozo in the municipality of Palmira, before it is transported to the landfill in Guabal in the municipality of Yotoco, which is located 62 kilometers from the city center of Cali. One can imagine that the transportation to and the maintenance of this landfill is a big and costly process, and as the population of Cali is growing, the amount of waste is increasing too (Alcaldía de Santiago de Cali 2015).

The institutional catering industry is an ideal starting point for interventions, because a high number of customers is served here at a single location, resulting in a large concentrated food waste stream. A reduction in food losses in this sector therefore immediately has a great effect on the urban footprint regarding food and waste (Derqui and Fernandez 2017; Wilkie et al. 2015). Moreover, if done right, the effect will not only be limited to the school. New generations are educated here and giving them a good example in school could have a trickle-down effect in the whole future society.

1.2. Aim and objectives

The objective of this research was to assess the factors behind the generation of food waste in the educational system of Cali, to understand the sustainability of the management of food and consumption practices. In addition, the project identifies opportunities for the prevention of food waste in the educational system in Cali. Creating regional food systems and a more circular urban metabolism increases food security, thereby increasing its adaptive capacity to higher level processes like climate change and globalization.

1.3. Report structure

The report is structured as follows: first an overview of research related to the topic found in literature is given. Next the methodology of this study is explained in chapter 3, including a short

explanation of policies in the context of the educational system in Cali. The results are described in chapter 4, followed by the discussion of them in the next chapter.

2. Literature review

Food waste at the consumption stage in the food chain has been a popular topic in the field of nutritional science. Most of the research in this field took place in food service institutions like hospitals, elderly homes and schools, as they host a vulnerable part of the population about whom most concerns about their health exist (Engström and Carlsson-Kanyama 2004; Derqui and Fernandez 2017). Waste in the consumption stage can be further categorized into stages of origin (Engström and Carlsson-Kanyama 2004). The nutrition studies mainly focused on *plate waste*, the residue from consumers' plates, as this is the food that the consumers were intended to eat. The rest of the waste originate from food that is never served to consumers. *Storage losses* occur due to improper storage; *preparation losses* are mostly seeds, peel, etc. from fruits and vegetables; *serving losses* is what is left on serving dishes, in canteens and bowls; and *leftovers* is food that is prepared, but never served.

Betz et al. (2015) note that within food waste one can distinguish avoidable food waste and unavoidable food waste. Avoidable food waste is the waste of food that was edible in the past "but can no longer be consumed because of shelf-life regulations, quality requirements, hygiene rules, technical methods or consumption habits" (p.219). Unavoidable food waste is "parts of food never intended for consumption such as bones, shells or banana skins" (p.219).

2.1. Reasons for food waste

Many reasons have been found for the waste of food in food service institutions. From literature reasons could be categorized in four groups: operational determinants, situational determinants, behavioral determinants and lastly human resources issues (WRAP 2011; Derqui and Fernandez 2017).

2.1.1. Operational determinants

Operational determinants deal with management practices (Liu et al. 2016; Derqui and Fernandez 2017; WRAP 2011). These reasons are specifically related to the food. One of the reasons found is inaccurate estimations of the number of customers. Food in food service institutions like schools is usually served on a buffet. Most of the institutions don't have an ordering system, so they must make estimations on the number of customers they will receive every day, to know how much food they need to prepare and to waste at least as possible. In several cases inaccurate estimations were found to cause food waste before serving. One reason for this is changes in menu cycles. A new menu also means that new estimations on the consumption of the food must be made. In the beginning of the menu cycle the popularity of food items is fairly unknown, and there might be too much of an item which turns out to be unpopular and is wasted. Regular changes in menu cycles therefore can cause more food waste (WRAP 2011; Engström and Carlsson-Kanyama 2004). Another reason for the food surplus could be what Falasconi et al. (2015) call 'physiological unserved food': excess food cooked to ensure customer satisfaction. For example, the restaurant wants to ensure some extra portions for the customer who might request for additional food or to offer a variety of food on the buffet without running out on one item. However, here we encounter the importance of the categorization made previously regarding the origin of food waste in food service institutions. Even though ensuring choice for the customer on the hand can cause *unserved food waste*, paradoxically the WRAP study found that 'not getting the meal option of choice' was mentioned as a factor contributing to *plate waste*, because people might not like the food and therefore not eat it. In addition, allowing second helpings might cause more *unserved food waste*, because restaurants prepare bigger quantities. On the other hand, in the WRAP study the disallowance for second helpings was identified as a cause for food waste. So it seems that once institutions allow second

helpings, they also increase their margins on the amount of food to prepare (WRAP 2011). The serving of second helpings would only have a negative effect on food waste if the institution allows second helpings only in the case of excess food from serving and leftovers but does not adjust its acquisition policy to it. Also, larger schools seem to produce less food waste per pupil than smaller schools because of economies of scale (WRAP 2011).

Another 'operational' factor is the lack of flexibility in the menus (WRAP 2011; Falasconi et al. 2015; Marlette et al. 2005). Procurement specifications and portion sizes, combinations and preparations of food are in some cases very rigid. A few authors found that some food pairings are responsible for more waste of food (Falasconi et al. 2015; Ishdorj et al. 2015; WRAP 2011). Falasconi et al. (2015) saw for example that in some Italian schools pizza and bread, which are alternative products, were served together. They noticed also a lack of flexibility and tools to adjust the menu and inefficiencies in the system. Also in the WRAP (2011) study, the researchers found that a lack of feedback opportunities contributed to food waste. In cases where it *was* present, the amount of food waste was reportedly smaller.

Other 'operational' reasons for food waste in schools are a lack in the provision of information to students about the daily menu options (WRAP 2011); legislation on food safety and nutrition (WRAP 2011; Papargyropoulou et al. 2016; Cerutti et al. 2017), unattractive presentation of food and (Falasconi et al. 2015); limited opportunities for re-using unserved food (WRAP 2011).

2.1.2. Situational determinants

A second group of factors responsible for food waste are not specifically related to the food, but to the infrastructures and equipment that shape the environment where food is consumed. These situational factors are thus related to place or time (WRAP 2011; Derqui and Fernandez 2017). Causes of food waste in this category are an unpleasant canteen environment (WRAP 2011); lack of storage facilities (Engström and Carlsson-Kanyama 2004) and practical difficulties with eating the food, for example unsuitable cutlery (WRAP 2011). Serving lines and lay-out of the buffet are also factors contributing to food waste. For instance one serving line can cause long queues, which means that people spend a long time waiting for their food during lunchtime, and as a result they have to rush to finish their food, in which not everyone succeeds, with *plate waste* as a consequence (Lazell 2016; WRAP 2011; Qusted et al. 2013). On the other hand however, here we see again how reducing waste at one stage can counteract waste reduction in the other, Derqui and Fernandez (2017) found that schools that have more than one serving line produced more food *waste from unserved food*, because food is displayed at every serving line until the end of the service time, and the more serving lines the more food is displayed and wasted eventually. Also, the layout of the buffet was indicated as a cause of food waste, but then especially for specific food items. In Italian schools bread was usually placed at the beginning of the serving line, so students used to take bread before knowing what and how much they were going to get from the rest of the menu. Hence bread was a major source of waste in these schools (Derqui and Fernandez 2017).

2.1.3. Behavioral determinants

While the previous causes of food waste can be for a large part attributed to the supply side of food, so the catering service, the behavior of individual consumers plays also an important role in the generation of food waste in food service institutions (Derqui and Fernandez 2017; WRAP 2011). Kitchens can however learn to adapt their supply to the demand of the consumers or try to change consumer behavior.

One obvious factor that makes food waste is the preferences of the customers. Food could be unpopular because customers do not like the taste of the food (Lazell 2016; Lorenz et al. 2017; Dinis

et al. 2013; Liu et al. 2016; WRAP 2011). Or, like mentioned before as a cause of waste, they do not like the food combinations on the plate. According to some staff in British schools, it was not always like this. Children have become fussier about food. Apart from taste, appearance of the food plays a role too. The food on the plate can look unappealing to some people (WRAP 2011).

Disliking the food can be an effect of people's dietary habits. Falasconi et al. (2015) even cite the lack of attention to dietary habits as one of the most relevant causes of food waste. For example a lot of efforts to make children eat healthy food are hampered by rejection of the food by the children because they are used to eat fast food at home instead of freshly prepared, healthy dishes (WRAP 2011). A disturbing factor are also the snacks sold at school cafeterias, vending machines and school stores, which usually have a high caloric content that affects the energy balance and often leads to a loss of appetite at lunchtime, and therefore rejection of the meal (Falasconi et al. 2015; Marlette et al. 2005).

Time is before mentioned as a factor influencing food waste. School children often prioritize playing with friends over eating lunch. They rush to finish their food, so they have more time for recess. Indeed, a few studies found that scheduling recess *before* lunch significantly reduced the amount of plate waste by students. Students do not feel the pressure to finish lunch quickly, so they can go to the playground. Taking recess after lunch also seems to cause stomach discomfort and dizziness, which might be another reason for children to limit their food intake before recess (Getlinger et al. 1996; Smith and Cunningham-Sabo 2014).

For older children priorities might lay in other aspects, for instance money. When students are short on money, they rather spend it on a cheap snack than a full meal, resulting in *waste of unserved food* (WRAP 2011). On the other hand, when money is seemingly abundant, for example when students just received their job money, it is tempting to spend more on food than one can eat, resulting in more *plate waste* (Lazell 2016).

There is also a lack of awareness of their waste behavior among students. In general, students are not aware of the amount of waste they generate and therefore are not prone to change their behavior (Lazell 2016; Principato et al. 2015; Engström and Carlsson-Kanyama 2004; Qusted et al. 2013).

2.1.4. Human resources

Derqui and Fernandez (2017) in addition identified human resources issues as a last determinant for food waste. They state that school top management plays a crucial role in the generation of canteen food waste. The school that made school meals part of its pedagogical mission, showed a much lower amount of plate waste than the schools that considered it as just a fringe service offered to the children's parents. The school whose managers showed high awareness of sustainability issues allocated more resources to educating the children on finishing their food through different types of activities. One example is canteen supervision. Schools with effective supervision on the leftovers on pupil's plate showed lower rates of plate waste. It can therefore be concluded from this study that staff awareness, and then especially awareness of the school's management is an important factor in the reduction of food waste (WRAP 2011; Betz et al. 2015; Derqui and Fernandez 2017).

2.2. Food waste numbers

As mentioned before, most studies to food waste in food service institutions like schools focus on the nutritional value of the wasted food. These studies usually include a quantitative analysis on the amount and composition of the food wasted. Studies are carried out in different countries. Due to the different cuisines the composition of the food waste is also different. Unfortunately, this means

that studies make different categorizations of the different types of food waste too, which makes them difficult to compare. Some similarities are found though. Food waste in the UK and in Spain is in both countries between 40 and 100 grams per pupil (Derqui and Fernandez 2017; WRAP 2011). A study in Sweden and a study in Italy found similar results about the amount of food that is lost from the total food prepared: between 15 and 18 percent (Engström and Carlsson-Kanyama 2004; Falasconi et al. 2015). A study in the United States found much higher percentages that are between 24 and 35 percent. However, this study is from the 90s, so it is not clear if waste in schools in the US is indeed higher than in Europe, or that the factor 'time' is also of influence (Getlinger et al. 1996). What the studies all do have in common is that vegetables account for the biggest group of food waste in schools. The figures however vary widely, from 25 percent in primary schools and 36 percent in secondary schools in the UK, 30 to 33.6 percent in the US, 42 percent in China to 64 and 65 percent in Portugal (WRAP 2011; Dinis et al. 2013; Liu et al. 2016; Smith and Cunningham-Sabo 2014). Staple food, like grains, is another category with is responsible for a large amount of waste, around 43 to 46 percent of it is wasted, with an exception for the UK, in which schools only waste 8 to 9 percent of the bread (WRAP 2011; Dinis et al. 2013; Liu et al. 2016; Smith and Cunningham-Sabo 2014). Fruit waste diverts between 18 and 24 percent in UK's and Portuguese schools to 47.4 percent in US secondary schools (study from 1997) (WRAP 2011; Dinis et al. 2013). An outlier is an Italian school in the study of Falasconi et al. (2015), which only saw 1.51 percent of its fruit wasted. This can be explained by its policy of encouraging students to take the fruit that is not consumed at lunch to eat it later in the day.

2.3. Interventions

This 'fruit policy' at the Italian school is already one example of an intervention that can be taken to reduce the generation of food waste in schools. More recommendations have been made on how to reduce food waste in food service institutions, and some studies have tested them as well. It is acknowledged by many scholars though that effects are greatest when integrated strategies of interventions are applied, and all actors with a stake in the issue agree on this strategy (Wahlen et al. 2012; Falasconi et al. 2015; Liu et al. 2016; Smith and Cunningham-Sabo 2014; Derqui and Fernandez 2017). The different factors identified that influence the generation of food waste – operational, situational, behavioral and human resources – could help in this case to design initiatives that address all these different aspects of the problem of food waste to result in an integrated strategy. It should also consider the conflict that can exist between waste reduction measures in different stages, as mentioned before.

Operational solutions proposed are for instance on-site food preparation instead of ready-made meals to keep the food fresh longer (Liu et al. 2016); daily estimations of customers and food demand (Falasconi et al. 2015; Derqui and Fernandez 2017); adjust menu to taste, appetite and avoidance of alternative products (Falasconi et al. 2015) and; reduction of rigidity in policies (Falasconi et al. 2015).

An example of a solution addressing the situational situation that influences food waste generation is trayless dining. Trayless dining limits the amount of food that students can carry, so they won't take too much (Babich and Smith 2010). Other solutions are improving storage facilities (Derqui and Fernandez 2017); optimizing the number of serving stations (Derqui and Fernandez 2017); scheduling recess before lunch and make lunch obligatory and with supervision (Smith and Cunningham-Sabo 2014; Wilkie et al. 2015; Betz et al. 2015) and; make a buffet from the leftovers (Engström and Carlsson-Kanyama 2004).

When one knows about the behavioral factors that influence food waste generation at a school, for example which food pairings are much appreciated, and which are not, one could design

interventions on this as well. So for example make specific pairings of products that are popular (Ishdorj et al. 2015), or it is even a possibility to plan the order of the menu on acceptance rates, for example start with a 'difficult' first course and make the main course 'easier' regarding acceptance (Derqui and Fernandez 2017).

Apart from adjusting to the students' acceptance of food, one could also try to adjust students' acceptance of food. This could be done by raising awareness on food waste and diet. Often there is a lack of a feeling of individual responsibility when it comes to food waste. Waste is an issue that must be taken care of by the authorities, is the general opinion. Also, consumers might think they do not have the power to make a reduction in waste, or the 'perceived behavioral control' is low, as it is called in the theory of planned behavior. Mondéjar-Jiménez et al. (2016) found that this has an indirect influence on the intention to reduce waste, but also a direct influence on waste behavior. To increase awareness about consumers' responsibility and influence on the generation of waste, waste could simply be made a topic to discuss in class. Showing the weight of the waste on the plate is another intervention to make the student aware. Interventions that do more to address the individual responsibility of consumers include them in the waste management (Betz et al. 2015; Mondéjar-Jiménez et al. 2016; Babich and Smith 2010). This could be very simple, for example letting the students separate their leftover food themselves for disposal in bins for different types of waste. More drastic measures make the waste near to a burden for students. One school for example composted the waste, and the students carried the buckets with their own organic waste (Engström and Carlsson-Kanyama 2004).

Also raising awareness among personnel should be part of an integrated strategy, as part of the human resources category of interventions. Wahlen et al. (2012) found out that addressing the responsibility and identity of catering staff supports professional pride in the kitchen and subsequently increase their commitment.

When a solid integrative strategy to reduce food waste is applied by the school, its effect can reach further than only the school. Mondéjar-Jiménez et al. (2016) found that youth are receptive to subjective norms in waste behaviour. A good example set by the school therefore "can positively influence youths to reduce food waste who will in turn set a good example for their offspring" (p.16).

3. Policy context

3.1. National waste policies

Historically, Colombian government was not much involved in waste management, as this was perceived a private task of private garbage collection services. However, the high economic costs, along with other negative effects of waste, which were mentioned before in chapter 1, motivated the Colombian government to review the current national waste policy. The current *Política Nacional para la Gestión Integral de Residuos Sólidos* gives the minimal environmental requirements from minimization at the source to disposal. In the latest policy the focus is more on the former, as an ambition to work towards a 'circular economy' is expressed in the document as well. The policy is based, as the name already reveals, on integral management. It proposes a strategy to municipalities to link different departments of the government, the production sector and educational institutes in the management of waste.

1.1. PRAES

Regarding the latter, workshops and meetings are organized for teachers which are linked to the *Proyectos Ambientales Escolares (PRAES)* (Alcaldía de Santiago de Cali 2015; Planeación 2016). PRAES are "pedagogical projects that promote the analysis and the comprehension of the problems and local, regional and national environmental potentialities, and generate spaces of participation to implement solutions according to the natural and sociocultural dynamics" (Altablero 2005). Teachers are stimulated to design environmental school projects in cooperation with social organizations in the environmental sector. With these, schools can demonstrate their guiding role (Altablero 2005; Alcaldía de Santiago de Cali 2018).

1.2. PGIRS

Every municipality in Colombia should have their own 'Política para la Gestión Integral de Residuos Sólidos' (PGIRS) and are obligated to follow it and keep it up to date. The mayoralty of Santiago de Cali has formulated fourteen PGIRS programs. Among its plans are educational campaigns, though the focus is especially on reuse of waste. 'Zero waste' is however an ambition of the policy makers, including the prevention of waste in the city (Alcaldía de Santiago de Cali 2015).

1.3. Bills against food waste

When it comes to food waste, two national laws have been proposed by the hunger-free parliamentary front in 2016. The first is the creation of the 'Programa Alimentario Nacional Contra el Desperdicio de Alimentos', PANDA. The aim of this program is to search for measures and obligations for producers, processors, distributors and consumers of food with the goal to reduce the percentage of food waste in the country. Another law has been added that has the goal to preserve the life and health of children suffering from malnutrition.

The second law applies a different strategy with the same goal and actors. It focuses on awareness raising, training, mobilization and responsibility, in which different political levels will be involved. consumption is prioritized as the final destination of food losses.

The laws have been approved in a second debate in congress and are currently under revision by different committees (FAO 2017b).

1.4. PAE

To understand food waste generation in schools in Colombia, it is necessary to explain the PAE program, the 'Programa de Alimentación Escolar'. It's definition sounds:

“government strategy that promotes the access with permanence of children, adolescents and youth in the official educational system, through the provision of a food supplement during the school day, to maintain the attention levels, positively impact the learning processes, the cognitive development, decrease absenteeism and desertion and promote healthy lifestyles” (Ministerio de Educación Nacional 2015).

In Cali all public schools are included in the PAE. The food the children in these schools obtain from the PAE is dependent on the schedule of the schools, and if they own their own kitchen. There is a morning complement, an afternoon complement and lunch. Some schools serve all three meals, in others only one or two.

There are two types of meals: the schools that own a kitchen serve food they prepared on the site. The schools without a kitchen serve industrialized complements. The latter do not serve lunch, because lunch is always prepared on the site.

4. Methodology

4.1. Study design

Because there exists limited literature about the subject of management of food and its contribution to the generation of biomass solid waste in educational institutions, especially in the context of Latin America, this study served as a first exploration on this topic. Qualitative research is the obvious approach to find the answers to these questions, as it allows to ask about the 'how' and 'why' of an unexplored phenomenon. The results can help in giving a better understanding of the factors that might lead to the generation of waste from food prepared and consumed in educational institutions. However, direct relations between amounts of food waste and these factors cannot not be identified with this type of research. For that, further quantitative research with more control on external factors is needed. As such, the research does not intend to be representative or provide conclusive evidence.

4.1.1. Sample

Santiago de Cali counted in 2015 157.899 students in primary education and 167.686 students in secondary and media vocational education. These students were enrolled in 912 primary schools and 586 secondary and media vocational schools, spread over its 22 comunas (Alcaldía de Santiago de Cali 2017) (see appendix 1).

The secretary of education of Santiago de Cali has a team of professionals that visits public schools under the PAE program. These people visit every week, almost every day, the educational institutions in the city to check their compliance to the program. The empirical research of this project is conducted in cooperation with the Secretary of Education. Joining the functionaries on their visits gave the researcher permission to enter the public schools and carry out the investigation.

The empirical research is carried out in two weeks, from 19 February 2018 to 3 March 2018. The institutions in the sample are based on the schools that the functionaries of the Secretary of Education visited in that period. No criteria are therefore designed for the selection of the schools in the sample, this is completely based on the institutions in the schedule of PAE team. Furthermore, it needs to be noted that all schools in the sample are *public* schools, private institutions are not in the PAE program and do not feature in the sample.

As mentioned in 3.1.5., not all schools serve the same meals. The schools visited in the sample therefore also not all served lunch for example, while others did. Moreover, when more than one school was visited in a day, different processes were observed. At some the preparation, at others the serving and consumption of the complement in the morning, at others the lunch... Also, the type of meal they served differed, as explained before some schools served industrialized food in the morning, while others served prepared food. Only the complement in the morning and the lunches were observed, the complement in the afternoon is not observed in any of the schools in the sample.

In total 13 public schools are visited, but three institutions are left out of the analysis since the visits of those three were that short that no process could be well observed, which means that a total of 10 institutions was left for analysis.

4.2. Data collection

Based on the research questions and the factors identified in the literature influencing the generation of food waste in education institutions, a set of questions was made. Based on these questions three methods seemed suitable to answer these questions.

Commented [JH1]: I recently added this information, which I got from the website of the Alcaldía de Cali.

A part of the data is derived from desk research into policy documents. The data collected during the visits to the institutions comes from observation of different aspects and processes of food preparation and consumption, and from interviews with actors involved in these processes.

4.2.1. Desk research

Desk research is done into policy documents from the national and local political level in Colombia. These documents provided insights into the waste policies and policies regarding school food in Colombia. With the help of these documents a few of the research questions already could be answered. The PAE program for example has a large influence on the factors related to the generation of waste in educational institutions in Colombia.

4.2.2. Observation

An observation schedule was designed that lists the factors for observation ([appendix ...](#)). Observation was carried out on physical aspects and on processes. The equipment, workers, storage and food preparation process in the kitchen were observed to understand where, what, how and why food losses from the kitchen occurred. The kitchen and the pans were also checked after all pupils were served, to estimate the amount and type of serving losses and leftovers. The look of the canteen, the serving process, eating process, pupils and plates were observed to identify the factors contributing to plate waste. Lastly, observation of bins was carried out to get a sense of the amount and types of food wasted. The findings were thoroughly documented. In addition, pictures were taken of bins and other objects to support the results.

4.2.3. Interviews

Other questions, especially those asking for the reason behind certain practices, could better be answered with interviews. Since the visit was not announced, not in all institutions the same actors and the same number of them are surveyed, because this was dependent on the presence and availability of the actors.

Three different types of actors were interviewed: catering staff, school staff and pupils of the institution. For each actor interview questions were designed, though some questions were repeated for different actors ([see appendix 3](#)). These actors could all provide different types of information. The interviewees were asked for permission before the interviews were conducted. The answers were written down as in most cases the school environment did not allow for recording.

1.1. Data analysis

The data was organized in different themes and the most important findings are described in the next chapter.

5. Results

5.1. Actors

the role of the different actors in the management and generation of food and waste is shortly explained here.

5.1.1. National government

The National Ministry of Education partly finances the PAE. It also sets up the requirements and guidelines for the PAE.

5.1.2. Local government

Nevertheless, the rest of the financing and most of the other tasks are decentralized. The selection, contracting and implementation of the program are the responsibility of the territorial entities. Every entity defines a number of beneficiaries and select the educational institutes that will be included in the PAE. A Departmental or Municipal Operative Monitoring Committee checks the institutes on execution of the program and proposes actions for improvement if necessary. They check for example on hygiene and if the menu is properly followed (Ministerio de Educación Nacional 2015). A nutritionist defines the menu for the whole territorial entity, so a pupil in a city or town receives the same food as all the other pupils in the city or town.

5.1.3. Catering operator

The catering operators are contracted by the territorial identity, in this case the mayoralty of Cali. They must comply to the standards of the PAE and it hires the catering staff. The catering operator is responsible for the delivery of the food items that are in the PAE menu to the schools every day.

5.1.4. Catering staff

Catering staff is responsible for the preparation and serving of the meals that are described in the PAE menu. They also must comply to the standards regarding for example food safety and hygiene.

5.1.5. School

The school hosts the catering staff to provide food to the pupils and participates in the PRAES.

5.1.6. Pupils

The pupils receive the food from the PAE. They do not have a choice in the type of food they get.

5.2. Description of cases

A very diverse set of schools comprises the sample. The number of pupils in a school ranges from 45 to 3000 and everything in between. 3 of the 10 schools serve industrialized food in the morning complement, the other 7 prepared the complement in the canteen. 5 schools were also observed during the preparation and serving of lunch.

The characteristics of the institutions in the sample are listed below.

	Number of pupils	Morning complement (industrialized/prepared)	Lunch (yes/no)
School A	128	Prepared in school	Yes
School B	611	Prepared in school	Yes
School C	45	Prepared in school	No
School D	65	Prepared in school	Yes
School E	2770	Industrialized	No
School F	800	Prepared in school	No
School G	790	Prepared in school	Yes

School H	120	Prepared in school	Yes
School I	681	Industrialized	Yes
School J	918	Industrialized	yes

5.2.1. Prepared on site

In the institutions where prepared food was served, the majority had reserved a room with tables and chairs where the students could consume their food. Usually this room was connected to the kitchen, so the food could easily be served through an open window that connected the two spaces together.

Because there was only limited space in this room, groups entered in turns. That way also long lines were prevented. One school did not have this room, and its students consumed the food in the classrooms.

Different ways of serving the meal were observed. In a few schools the plates were already prepared before the children entered the dining room. In other schools the plates were only prepared once the children entered the canteen.

Another difference was that in some institutions the plates were put on the counter, so children only had to collect a plate and return to a table to eat. In other schools the catering staff already put the plates on the tables, so children could pick a spot directly and did not have to go by the counter first.

The food was served on plastic plates with only a spoon.

5.2.2. Industrialized complement

In schools that served industrialized complements, all children got their break in the same timeslot. The food was thus not served in turns. In some schools, the food was distributed in one place. In one case the food was just handed out from the boxes. In another school this process was much more organized with lines and a supervisor that let the children through to collect their food in turns. They walked along a designated path to reach the window where they got each item of the complement from the catering staff. In another school, a few pupils for every group came to collect a box with the food for their group that they took to the classroom.

5.3. Origin of waste

The waste in the schools can be categorized by its origin. Though not every category could be observed in equal intensity, a few conclusions can be drawn.

Storage losses is one category that was difficult to observe with the chosen methods of single short visits. Some institutions only stored the food for the day, while others stored for instance for three days food. One incident of storage loss was observed. This institution was visited on a Monday, and before the weekend, on Friday, meat for the Monday was arrived. However, this meat was not stored in the fridge, and therefore all meat reserved for the day was spoiled. In all other institutions though, food seemed to be stored in the right place.

Preparation losses was observed in most institutions that serve prepared food. This is unavoidable, because when food is prepared not all parts are eatable.

Serving losses and **leftovers** are two categories in which no excessive waste of food was observed. A teacher mentioned that a few years ago in the school the amounts of waste were much higher, but this has drastically gone down. Experience of the operator and the catering staff could explain the fact that amounts of food cooked are now better fit to the number of children consuming it. The

pans observed after serving were empty or almost empty. This means that more or less all the food is served to the children. Staff reported that it is possible for the pupils to receive a second helping if desired. This contributes to lower amounts of serving losses and leftovers as well. The observed food items for which pupils were observed returning to the counter for a second helping were cheese and a second glass of juice.

This leaves the category of **plate waste**. Based on the observations and interviews, plate waste counts as the biggest contributor to food losses in the investigated educational institutions. However, according to the content of the bins, the amounts vary greatly between institutions. The reasons for this are discussed in [paragraph 5.6](#).

5.4. Type of complement

From observation the industrialized complement created less food waste. This could be explained by the character of food, referring to its ability to be preserved, which means that it is possible to save it to eat it later. A few pupils were observed who put the apple, which was part of the morning complement, in their bag, probably to eat it later in the day. Also, the industrialized food that was not distributed among the pupils in the morning was often saved for the afternoon complement. Due to food safety requirements this is more difficult for the prepared complement. However, in the schools who served industrialized complements the bins were full of plastic waste from the packing of the complements, creating another waste problem.

5.5. Type of food waste

Bins were checked to see which foods are wasted most. The item observed to be wasted most was rice, which goes with every prepared meal. Other items in the bins were: potato, white beans, spaghetti and juice in milk. However, this was mostly just more or less a reflection of the meal of the day, without the meat. Therefore, we cannot conclude that these items are not appreciated, it could be due to a lack of appetite. However, it is safe to say that meat is appreciated more than the items found in the bin.

From observation of the serving process of industrialized food, fruit was the least chosen food item by students. The leftover fruit could potentially end up as waste, but this could not be observed.

5.6. Reasons for wasting food

Several factors were identified that may have an influence on the generation of food waste in schools.

5.6.1. Appreciation of the meal

Pupils and catering staff were also asked about the food preferences of the pupils. From the interviews with the catering staff the following food items were derived as being chosen the least: salad, lentils and juice in milk. Children agreed with the salad and the juice in milk.

Some foods were just not appreciated because of taste, like salad, but for other food items it could also depend on the way it was prepared. In one school it was observed that a lot of children choose not to take the chicken. When asked about it, one girl said that she loved the chicken her mom cooked at home. However, she did not like the chicken in the school lunch. Also juice in milk was not appreciated by everyone, contrary to juice in water. Beans, cheese and meat were in general popular food items. However, a mix of those three in one dish was much less appreciated, according to a catering staff member. Lastly, freshness was mentioned as a reason for not appreciating the food by students in one institution. The food was prepared too early which resulted for example in salad of dried out leaves and juice separated from the milk in the glass. The latter moreover causing stomach

pain, according to the students. for this reason, they often choose to get their food outside of the school.

5.6.2. Quantity of food

Children never complained about too much food. If they made plate waste, it was for other reasons. The contrary, a few pupils said that the food was not sufficient for their appetite. Though in most schools the amount of food was adapted to the age of the children, in a few schools this was not the case. It was therefore also in one of these schools that a group of pupils in the highest grade that was interviewed complained about insufficient food. They also noted that returning for a second helping was not a possibility, while catering staff claimed the opposite.

In the cases the students' appetite was lower than the amount of food, it was not blamed on the amount of food, but on external factors. In different institutions was mentioned by pupils and catering staff that the complement in the morning was not consumed completely due to a lack of appetite. This complement is meant as breakfast for the children. However, some children already eat a lot for breakfast at home and therefore do not have appetite for the morning complement.

5.6.3. Eating tools

The prepared food was served on plastic plates and with spoons. Sometimes the food was served on deep plates. The menu consists of different separate food items; for example, rice, lentils, salad and chicken. However, in the deep plates, the food easily mixes during eating.

Furthermore, the spoon is not always suitable for the type of food on the plate. Sometimes bigger pieces of food with a hard structure, for example meat or plantain, need to be cut into smaller pieces to be able to eat it properly. A spoon is not fit for this job. Several children instead used their hands to eat the meat. Though it is not tested if these factors influenced the eating experience, it might have a (negative) effect on it.

5.6.4. Distraction

An important contributor to plate waste in many of the school canteens was the distraction children had, especially from other kids. In most schools in the sample children received the meal before recess. Especially young children were restless and rushed during eating and eager to go out to play. Various children were observed walking already to the counter to deposit their plate while still eating the last parts of the meal standing up. They did not even take the time to finish their plate at the table. Obviously, a lot of children did not completely finish their plate because of their rush, creating plate waste as a result. One of the schools lacked a room reserved for eating, so children took the prepared food to the classroom to eat it in there. Since the school also did not have much space to play, and the central square was bathing in sunlight, most children played in their classroom after finishing their meal. However, it is imaginable that this distracts the children that are still eating.

5.6.5. Supervision

Luckily in most schools the children were accompanied by a supervisor during the break, who was often the teacher. Not in all schools the supervisors were able to check on all the children. Nevertheless in a few cases, the supervisor was very strict on checking upon the children finishing their plate. One group of children even showed their empty plate to the teacher before they were allowed to leave the dining room. Good supervision was therefore preventing plate waste.

5.6.6. Break time

In schools that served industrialized complements, all children got their break in the same timeslot. In school E many pupils were spotted with food from the kiosks, instead of the (free) complement. pupils confessed that the long waiting time in the line is the main reason was for them to buy kiosk

food instead. It must be noted that in this school there was a great offer of alternative food, 10 kiosks were counted. Unclear is if the offer of alternatives is a cause, or an effect of the high demand for their food products. Anyway, if the amount of industrialized food is adapted to the whole student population of the school, there is a good chance that a great amount of food is left uncollected and ends up as waste.

In the schools that served prepared meals groups followed each other up in turns. Though pupils did not lost time waiting in line here, sometimes the time they got to eat was too short. A new group was already waiting and pressured the previous group to finish up quickly. A student regretted that he had never time to finish his food because his next class was almost starting, so he was always in a hurry during the first break. Resulting in plate waste that would be avoidable when more time was scheduled for the break.

5.6.7. Presence of alternative food sources

Though not all, but many of the schools in the sample had, apart from the canteen, also kiosks on their grounds. These could form a competitive food source for the pupils. Especially when there was a reason the waiting time for the PAE-complement was long, children instead chose to buy snacks from the kiosk. The long lines in school E mentioned above is one example. Another example comes from school F, in which during the visit the cheese, that was supposed to be part of the morning complement, did not arrive with the other items. The kitchen personnel choose to wait for it and postpone the serving, because the catering company promised to deliver it soon. However, it was about 1.5 hour later the delivery came, and it did not include cheese, but little breads. In the meantime, many children had bought snacks from the kiosks in the schools. When the complement was finally served, not all the pupils showed up, as they had already filled their bellies with kiosk food.

School J was different than the other schools in the sample in the sense that it served the industrialized complement at the end of the break time. As a result, when the bell rang, children ran out of their rooms immediately to the kiosks to buy snacks. At the end of the break, a few pupils came by the kitchen to collect a crate with complements that they took to the classrooms. It is not clear if students consumed less of the complement due to receiving the complement at the end of the break. The students returning carried crates that were almost empty. It is possible the crates were filled with less food, adapted to the lower appetite of the pupils, or it could affect their appetite at lunchtime.

5.6.8. Serving

In a few schools the plates were already prepared before the children entered the dining room, hereby ensuring a fast process, avoiding lines in front of the counter. In some schools the plates were put on the tables for the pupils, while in other cases the children had to collect their plate themselves. The benefit of the former is that there are no children walking around causing chaotic and distracting situations. In both methods however, food was sometimes waiting for its customer for more than 10 minutes. By the time the children start eating the food has probably already gone cold. This could negatively influence the taste experience of the children, increasing the chance they leave plate waste.

That problem was avoided in schools where the food was only served once the pupils had entered the dining room. In some schools the pupils were served on the counter and took their plate to their spot. The benefit of this method of serving is that children can indicate their preferences. If they for example do not want the salad, the catering staff will not serve salad on the plate. This way, less

plate waste is produced. However, it can result in more serving losses because prepared food is not served.

5.6.9. Opinions about food waste

Kitchen personnel was almost without exception positive about the amount of waste generated from their kitchens, saying that it is minimal. Regarding the waste coming out of the kitchen, this is mostly correct. However, the plate waste produced by the pupils was sometimes not in accordance with the catering staff's statements that the children "usually eat everything they receive". The catering staff was positive about their efforts to prevent food waste and did not perceive it a problem at the schools.

When pupils were asked about their feelings when they left food on their plate, they all were aware that they were creating waste with that behavior. However, one pupil noted that although she knows it is bad, the fact that the school does not seem to be concerned about it, she feels less bad about it and she can justify with it the fact that she wastes food. This confirms the finding of Mondéjar-Jiménez et al. (2016) that subjective norms are important in waste reducing behavior.

6. Discussion

Meant as a first exploration on the topic of food waste in schools in the Colombian context, this research has served this purpose. A diverse set of schools is visited, giving a good overview of the habits in kitchens and canteens that could influence the generation of food waste. In this section, the most important findings from this research will be discussed.

Although the PAE program of the national ministry of education homogenizes a large part of the school food provision in Cali, for instance the menu and the scheduling of the breaks, still small variations exist between institutions in the way they organize the different processes from cooking to serving the food. But apart from good and bad practices in these individual schools, also aspects of the PAE program that induce food waste generation are identified.

When looking at the characteristics of food waste in schools, a few conclusions can be drawn: it consists mainly of prepared food; its origin is plate waste and; some food items are wasted more than others. Let's look a little closer at these aspects:

Industrialized food caused less food waste due to its ability to be preserved. Hence when the focus is solely on food waste, the industrialized complement scores better than the prepared complement. However, in the schools who served industrialized complements the bins were full of plastic waste from the packing of the complements. From a general environmental and economic viewpoint, it is therefore certainly not justifiable to choose industrialized complements over the prepared complement. We instead prefer to focus on the reduction of food waste from prepared food, instead on replacing it with industrialized food, creating another waste problem.

The largest part of avoidable food waste in schools originates from plate waste, food that pupils leave after eating. Serving losses, leftovers and storage losses seem less relevant in Colombian school kitchens. Probably due to experience, catering companies can make accurate estimations of the number of customers they have to serve every day. This was confirmed by the pupils, who stated that the amounts of food they received was good, or even not enough for them. It can therefore be concluded that 'physiological unserved food' not a factor explaining food waste in schools in Cali. The reported incidents in which losses in the kitchen were made, were due to miscommunications between the catering company and the kitchen staff, which resulted in delayed arrival of food or inappropriate storage of food.

Which leaves plate waste as the major contributor to food waste in schools in Cali. Lentils, juice in milk and salad were mentioned as items least appreciated by the pupils. Fruit was the least chosen food item in the industrialized complement. Though they were also found in the bins, other items like rice were wasted too. Thus, the composition of plate waste was often just a reflection of the meal, though without the meat, meat was less observed in the bins. This is already an indication that 'individual preferences' is not the only factor contributing to plate waste in schools in Cali.

In some cases, children could indicate their preferences for food when they were served on the counter. But since we concluded above that taste=waste often not applies, it is questionable if giving pupils a choice in the food they receive reduces the amount of food waste. It shifts the food waste partly from plate waste to serving losses, so from the canteen to the kitchen. On the one hand, it might make predictions on food demand easier, eventually creating less food waste. On the other hand, plate waste was still observed in this school. Maybe there are food items children would not choose on their plate if they had the opportunity to choose, but since they are already on their plate they eat them anyway, for example the salad.

Another behavioral factor was pupils' dietary habits, which is in accordance with Falasconi et al. (2015). Children had less appetite during the morning complement because they had already eaten too much at home.

Even if it is not individual preferences ('behavioral factor') that determines pupils' appreciation of the food, its preparation and serving ('operational factors'), influencing the taste, maybe do. It is possible that the pairing of food items on the plate played a role as well. A traditional Colombian meal always contains rice. In some cases, rice was accompanied by an alternative on the plate, for example potato or pasta. Pairing of two competitive food items may influence the appreciation of the meal. Also, the temperature may influence the taste experience, as in some canteens the plates were prepared well in advance, so food cooled off while waiting for its consumer. These could all be factors contributing to a higher appearance of food waste.

SEMANA 3	MENÚ No. 11 LUNES	MENÚ No. 12 MARTES	MENÚ No. 13 MIÉRCOLES	MENÚ No. 14 JUEVES	MENÚ No. 15 VIERNES
LACTEOS Y DERIVADOS	JUGO DE GUAYABA EN LECHE	JUGO DE MANGOC CON LECHE	CHOCOLATE CON LECHE	JUGO DE TOMATE DE ARBOL EN LECHE	JUGO DE LILLO
ALIMENTO PROTEICO	HUEVOS REVUELTOS CON PLÁTANO	FAJITAS DE CARNE DE RES (CADERITA)	SANDWICH DE POLLO EN JULIANAS CON LECHUGA Y TOMATE (POLLO, PAN BLANCO BLANDITO)	CARNE DE CERDO EN BISTECK	FRIOLES GUISADOS Y CARNE DE RES (CADERITA) CON QUESO
CEREAL O ACOMPAÑANTE	ARROZ BLANCO Y PAPA CAMPESINA (COCIDA Y DORADA)	ARROZ CON FRIJOLES		ARROZ VERDURA Y PAPA ORCILLA AL VAPOR	ARROZ BLANCO Y AREPA PARA
FRUYA	SANDIA O PATILLA		MAYO		

Figure 2 PAE week menu for the prepared morning complement. source: own picture.

Situational factors that could influence the eating experience negatively were also observed. For example, in deep plates separate food items mix more easily, also if this is unwanted. Mixed food is less appreciated by some pupils. Also, when a food item that is not appreciated by a pupil mixes with another food item the pupil does like, it might reject the latter too because of the 'contamination' with the former. Furthermore, spoons were not always the appropriate tools to eat specific food items on the plate. Though it is not clear if the lack of appropriate tools demotivated other children to renounce from eating the specific food item at all in the schools in the sample, according to the WRAP (2011) study, it can contribute to food waste.

Time is considered a crucial factor for pupils in the generation of plate waste in schools, or better, the lack of time. In accordance with Getlinger et al. (1996), this time restriction was sometimes self-imposed, as children were rushed by the prospect of playing with friends after finishing food. supervision tried to control this urge a little, but this had mixed results. Sometimes this urge was strengthened by situational factors, for example when the two activities eating and playing took place in the same space, making it more difficult to focus full attention on eating. The presence of alternative food sources in the school competed with the food provided in the PAE-program, and

especially in cases when there was a line for the latter, time worked against it and many children choose instead for food from the kiosks. In other cases, there was a real deficiency of time, when the number of groups was bigger than the time scheduled for the break. Whatever the reason, this lack of time resulted in plate waste.

Even though everyone was aware food waste existed at the schools, no one felt responsible for it. Catering staff was almost exclusively positive about their own efforts to reduce food waste, and stated, however correctly, that food waste was mostly plate waste generated by pupils. Pupils acknowledged that they made plate waste, but in their turn felt less responsible for it because the school and the catering staff did not give off the message that food waste is a problem, which justified their behavior for them.

It is clear that in schools in Cali not one factor is responsible for food waste, but operational, behavioral, situational and human resources factors are all present, and sometimes reinforce each other.

7. Recommendations

Since schools produce a quite stable and concentrated waste stream, interventions in schools will have a great effect on the total amount of consumption waste. Moreover, interventions on schools could have a greater effect on biomass solid waste reduction in the long term than interventions in other sectors. Educational institutions raise a new generation of people. If they are showed and educated about sustainable waste management, they might take home this knowledge and perceive it as the norm and apply it in their own households later. Consequently, interventions in educational institutions might eventually also affect the generation of household waste in a positive way, and possibly also in other sectors in society. Therefore, it is also important that interventions are not just 'single loop learning' processes, based on repetition and routine, but involve 'double loop learning' too. Double loop learning means that the existing practices, routines, rules and norms that induce the behavior of food wasting are *questioned* as well, which goes a step further than only changing these. It creates a better understanding of the causes of consequences of this behavior, and therefore has a better change of changing values regarding waste, resulting in longer term effects (Koppen and Leeuwen 2016).

Recommendations are made for private investments, policy, and for further research.

7.1.1. Private investments

Now, the break starts with that the pupils eat their complement or lunch, and when they have finished it, they are permitted to leave for their free time. Therefore, the pupils at as fast as possible, or do not finish their plate so they can start their recess earlier, making plate waste. It is recommended to have a **temporal separation between eating and recess**. So, set a fixed time for the complement, for example half an hour. Make sure that this is sufficient time for the children to eat. The pupils can only start their recess after this half an hour. This way there is no reason to eat fast because all pupils start the recess for playing at the same time, so when one finishes quickly he or she only must wait more time. Another benefit of this is that the pupils are probably quieter because they are not in a hurry. That is pleasant for the supervisor. If this temporal separation between eating and playing is for any reason not possible, it is recommended to at least have a spatial separation between the two activities. This means that children do not eat and play in the same space, distracting each other.

To serve the food fresh, a proper **planning** is required. Cold served food like juice mixed with milk or salad or should not be prepared too early since that it will not be fresh anymore during serving.

Moreover, there is a higher health risk too when perishable food stands too long. Secondly, to prevent that the food cools off, only serve when the pupils enter the canteen, not earlier. If this is not possible, serve the food on plates of a different material than plastic, because the food will stay warm for a longer time on plates of for example ceramics. Plates should also be flat, to prevent mixing of the food. A step further is to serve the food on plates with sections that separate the food. Not only the plates, but a general improvement of the **tools** will make the eating experience more comfortable. The spoon is not convenient to eat. However, perhaps for security reasons this is not a possibility. If so, it is recommended to instead adapt the food to the cutlery, instead of the cutlery to the food. This means serving more chewy food in smaller pieces, so it is possible to consume without having to cut it.

To prevent long lines for the industrialized complement, it is recommended to **expand the number of serving stations to more than one**, so at least two lines can be made and waiting time is shorter. It is expected that this makes it more attractive for the students to collect a complement, instead of buying food from the kiosks. Another possibility is to not serve all grades at the same time, but let the pupils arrive in turns in schools with the industrialized complement, just like in the schools with the prepared complement.

7.1.2. Policy

Awareness is the first step to change. Mondéjar-Jiménez et al. (2016) already found that subjective norms play a role in waste reducing behavior, so as an authority, the school should show its pupils that it rejects food waste and that the students have an individual responsibility in this too. This could be done for example by including food waste in **educational programs**. Another way is to start a governmental **campaign** targeted on schools and pupils.

Even though many responsibilities are decentralized in the PAE program, the decentralization stops at local government bodies. Individual actors have little voice in the design of the program. For example, the menu, which is designed by a nutritionist and is homogenized for a whole city or town. Schools, operators, catering staff, pupils and their parents do not participate in it. However, they execute the program, so they notice any inefficiencies that could cause food waste. With their feedback these inefficiencies could be solved earlier. Moreover, they may have ideas about the best solution, that also serves their interests. An annual questionnaire or meeting are examples of ways to allow **participation of stakeholders**. The opportunity to give **feedback** could also be included with the regular visits of the PAE team, by asking catering staff and school staff not only about their compliance to the program, but also about their thoughts about different aspects of the program. Wahlen et al. (2012) found that addressing the responsibility of catering staff supports professional pride in the kitchen and increase their commitment.

7.1.3. Further research

This study served as a first exploration on the situation regarding food waste in schools in Cali. However, to get more reliable results about the relations food waste and the factors causing it, future research could test the factors quantitatively and observe the change in the amount and composition of the food waste for a longer time with a smaller sample. In addition, the recommendations of this research could be implemented in a few cases to test their effectiveness on the amount of food waste.

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Appendix 1: Enrollment in education in Santiago de Cali in 2015

Variables	Comuna																				Total average		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		21	22
Primary education																							
Number of institutions	30	26	17	33	29	54	41	37	19	24	34	27	85	11	53	43	33	33	44	53	26	20	885
Number of students	40	41	30	55	51	94	61	71	27	53	57	47	13	20	10	74	18	10	48	17	47	15	153
	9	6	1	9	8	1	7	7	9	4	5	9	7	9	5	8	4	5	4	1	8	9	.96
	1	9	5	3	3	5	8	5	3	9	7	6	6	3	5	8	7	0	9	5	8	8	17
	9	6	1	9	8	1	7	7	9	4	5	9	7	9	5	8	4	5	4	1	8	9	3
Secondary education																							
Number of institutions	18	16	6	2	2	3	1	2	9	1	2	1	6	7	3	2	7	3	2	1	3	2	540
Number of students	41	51	40	98	57	81	82	37	96	52	10	16	32	18	64	29	94	94	28	17	15	162	
	5	6	1	3	4	4	2	3	0	1	6	8	2	6	6	4	7	6	5	6	8	4	.49
	4	4	7	7	1	9	9	6	3	6	4	0	4	2	0	5	0	2	0	6	3	8	5
	1	8											1	8								5	5

Table 1 source: Alcaldía de Santiago de Cali, 2017

Appendix 2: Observation Schedule

1.		Date
2.		Name of institution
3.		Location of institution
4.		# students in institution
5.		Start time of observation
6.		End time of observation

A. Before break – preparation and cooking

Location	Object	Topic	#	Methodology
Canteen	Interior	Look of the canteen	7.	Arrangement of the tables
			8.	Efforts to make it look nice
Kitchen	Food	Menu	9.	Types of food prepared (fruit, vegetables, meat etc.)
			Kitchen	Food preparation
	11	When food is wasted and cause of food waste during preparation		
	12	Protocols quality control		
	Workers	Uniform	13	# of workers
			14	Description of clothing of workers
			15	Content of the fridge for the same day, or also for the previous or next day?
	Bins	Waste separation	16	Number of different bins
			17	Mixing of waste
		Food waste	18	Type of food (vegetables, meat etc., avoidable, unavoidable)
19			Fresh or prepared	
Storage	Storage places	Food storage	20	Share type of total
			21	Location of storage
			22	Sufficient space?
			23	Type of storage (freezer, fridge, not-cooled)

B. During break – serving and consumption

Location	Object	Topic	#	Methodology
Canteen	Break	Time of break	24.	Start time of break.
			25.	End time of break.
	Line	Start waiting time	26.	Time random student joins line.
Buffet	Buffet	Serving stations	27.	Number of pick up points for food
		Time serving	28.	Time same random student receives food
		Second serving	29.	<ul style="list-style-type: none"> • Yes or • No
		Lay-out buffet	66.	<ul style="list-style-type: none"> • Order of food items in buffet.

		Choice of menu	30.	Which products do students choose?
			31.	Which products do students not choose?
	Plate	Portion size	32.	<ul style="list-style-type: none"> • Same size? • Or different sizes dependent on a factor (i.e. age)? • Or different sizes when wanted?
		Menu composition	33.	Type (vegetable, meat etc.)
			34.	Share of type of total
		Plate waste	35.	When leaving: food left or not?
Canteen	Students	Time eating	36.	Time same random student starts eating
		Stay after finishing food	37.	<ul style="list-style-type: none"> • Stay in the canteen after finishing food • Or leave?
	Signs	Waste management communication	38.	Check for information signs showing students how to handle waste
		Menu information	39.	Check for information signs showing the menu of the day
	Supervisor	Canteen supervision	40.	Supervisor present?
			41.	This person checks on finishing food?
Serving tray	Presence of serving tray	42.	Do students carry their food on a serving tray? Yes/no	

C. After break

Location	Object	Topic	#	Methodology
Kitchen	Kitchen	Cleaning tools	43	Description of the tools used to clean the tools used for cooking and eating with.
			44	Type of food
		Food waste	45	Share of type of food in total
			46	Prepared or fresh
	Bins	Food waste	47	Type of food
			48	Share of type of food in total
49			Prepared or fresh	
Buffet	Serving dishes	Food waste	50	type of food left
			51	share of type of food left in total
Storage	Food storage	Food storage	52	Location of storage
			53	sufficient space for storage?
		Leftovers	54	Fresh food
			55	Prepared food
			56	<ul style="list-style-type: none"> • Disposed or • Stored?
Canteen	Interior		57	arrangement of the tables

	Look of the canteen	58	efforts to make it look nice
Canteen	Recess	59	<ul style="list-style-type: none"> • Recess after break? • Or before break?
Plates	Food waste	60	Types of food left
		61	Share type of food in total
Bins	Food waste	62	Estimation of amount of food
		63	Types of food in bin
		64	share type of food of total

Appendix 3: Interview questions

Entrevista administración del colegio

Introducción

Buenos días,

Somos estudiantes de la Universidad del Valle. Yo soy Jolien y hago una investigación al desperdicio de alimentos en colegios en Cali con la meta de reducirlo. Porque mi español todavía no es tan bueno, Carolina me ayuda con las entrevistas.

La entrevista es anónima y será alrededor quince minutos.

¿Está bien si grabo esta entrevista para escuchar más tarde?

Información general

1. Fecha:
2. Nombre del instituto:
3. Ubicación del instituto:
4. # estudiantes en instituto:

Alimentos

5. ¿Cuántos **recesos** hay y cuánto dura cada uno?
6. ¿Cuántos **estudiantes** hay por receso?
7. ¿Hay también un **recreo** por los niños?
 - a. ¿El recreo es **antes o después** comer?
8. ¿Qué **tipos de comidas** se sirven por cada receso? (¿**industrializados o preparados**?)
 - a. ¿**Almuerzo** también?
9. ¿**Quién es responsable** del suministro de alimentos?
 - a. ¿Se cocina en la **misma** institución o se contrata con una empresa **externa**?
10. ¿Hay política específica para el **abastecimiento y preparación** de alimentos en el colegio?
 - a. En caso afirmativo, ¿Qué **políticas locales o nacionales** influyen?
 - b. ¿Cuál es el **contenido** de la política? ¿Cuáles son los **requisitos** específicos?
 - i. ¿Hay **política de compra de alimentos**?
 - ii. ¿Hay **política para la preparación**?
 - iii. ¿Hay **política de almacenamiento**?
 - iv. ¿Hay **política de consumo**?
 - v. ¿**Otras** políticas?
 - c. ¿Quiénes participan en la definición de la política?
 - i. ¿El servicio de **catering**?
 - ii. ¿**personal de la cocina**?
 - iii. ¿**otros**?
 - d. ¿Cómo se les **informa** a los estudiantes sobre el manejo de alimentos en el colegio?
 - i. ¿y a quién?
 1. ¿**Personal**?
 2. ¿**Estudiantes**?

11. ¿Los estudiantes reciben **información previa** sobre el menú del día? ¿Cómo reciben la información?
 12. ¿Alguien **supervisa** si los estudiantes consumen todos los alimentos?
- Desperdicio
13. ¿Hay **separación** de residuos en el colegio?
 - a. ¿En cuántas categorías se separan los residuos?
 14. ¿Qué considera **qué es** un desperdicio de alimentos?
 15. ¿Hay **política específica** sobre el manejo de los residuos sólidos y la prevención de desperdicio de alimentos?
 - a. ¿Cuál es el **contenido** de la política? ¿Cuáles son los **requisitos** específicos?
 - b. ¿Quiénes están **involucrados** en el diseño de la política?
 - i. ¿El servicio de **catering**?
 - ii. ¿**personal de la cocina**?
 - iii. ¿**otros**?
 - c. ¿Cómo se **informa** sobre la política y la gestión de los residuos del colegio?
 - i. ¿y a **quién**?
 1. ¿**Personal**?
 2. ¿**Estudiantes**?
 16. ¿Le gustaría decir algo más?

Entrevista administración del operador de comidas

Información general

1. Fecha:
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4. # estudiantes en instituto:

Introducción

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La entrevista es anónima y será alrededor quince minutos.

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Alimentos

5. ¿**Cuántos** **recesos** hay y cuánto dura cada uno?
6. ¿**Cuántos** **estudiantes** hay por receso?
7. ¿Qué tipos de comidas se sirven por cada receso? (¿**industrializados** o **preparados**?)

- a. ¿Almuerzo también?
8. ¿Hay política específica para el **abastecimiento y preparación** de alimentos en el colegio?
- a. En caso afirmativo, ¿Qué **políticas locales o nacionales** influyen?
 - b. ¿Cuál es el **contenido** de la política? ¿Cuáles son los **requisitos** específicos?
 - i. ¿Hay **política de compra de alimentos**?
 - ii. ¿Hay **política para la preparación**?
 - iii. ¿Hay **política de almacenamiento**?
 - iv. ¿Hay **política de consumo**?
 - v. ¿**Otras** políticas?
 - c. ¿**Usted tiene voz** en el diseño de los menús?
9. ¿Cómo se **informa** los estudiantes sobre el **menú del día**?
10. ¿Cuáles comidas son los **preferidos** por los estudiantes?
- b. ¿**Por qué**?
11. ¿Cuáles comidas son los alimentos **menos apetecidos**?
- c. ¿Qué **alimentos desperdician** más los estudiantes?
 - i. ¿Por qué?
 - d. ¿Conoce las razones por las que los estudiantes no consumen estos alimentos? ¿Cuáles son?
12. ¿Qué **pasa** con la comida que no se consume en un día?
- e. ¿Se **deshace** o se **almacena**?
 - i. ¿Qué se hace con esta comida posteriormente?
 - 1. ¿Se **reutiliza** o tiene destinación diferente?
13. ¿Hay alguna regulación de la cantidad de comida que puede consumir un estudiante?
- f. ¿Todos los estudiantes reciben **la misma cantidad** de comida?
 - i. ¿Pueden **pedir más** en su plato?
 - ii. ¿Pueden volver por un **segundo turno**?
 - iii. ¿Depende de algún **factor**?
 - 1. ¿Cuál?

Desperdicio

14. ¿Los residuos sólidos se **separan**?
- g. ¿En cuántas **fracciones**?
 - i. ¿Cuáles **fracciones**?
15. ¿Qué considera **qué es** un desperdicio de alimentos?
16. ¿Qué **piensa** usted de la cantidad **del desperdicio** de alimentos del colegio?
17. ¿Usted considera el desperdicio de alimentos un **problema** de este colegio?
18. ¿Usted cree que el desperdicio de alimentos podría ser **prevenido o reducido** en este colegio?
19. ¿Usted cree que es **importante** reducir desperdicio de alimentos?
- h. En caso afirmativo, ¿**Por qué** lo cree?

20. ¿El colegio tiene **política específica** de los residuos a que debe cumplir?
- En caso afirmativo, ¿Cómo está usted **informado** de esta política?
 - ¿Cuál es el **contenido** de la política? ¿Cuáles son los **requisitos** específicos?
 - ¿Usted **participó** en el diseño de esta política?
21. ¿**Qué hace usted** para prevenir el desperdicio de alimentos?
22. ¿Usted cree que **podría hacer algo/más** para disminuir el desperdicio de alimentos?
- ¿**Qué** puedes hacer?
23. ¿Le gustaría decir algo más?

Entrevista personal de la cocina

Información general

- Fecha:
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- Ubicación del instituto:
- # estudiantes en instituto:

Introducción

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¿Está bien si grabo esta entrevista para escuchar más tarde?

Alimentos

- ¿Los estudiantes usualmente **consumen** todo de que obtienen?
 - ¿Si no, por qué **no**?
- ¿Qué productos se desperdician el más?
 - ¿Cuáles son las **razones** por la cual los estudiantes no toman la comida?
 - ¿Cuáles comidas son las **menos apetecidos**?
- ¿Cuáles comidas son los **preferidos** por los estudiantes?
 - ¿**Por qué**?
- ¿**Qué pasa** con la comida que no se consume en un día?
 - ¿Se **deshace** o se **almacena**?
 - ¿Hay suficientes **recipientes** y **espacio** para almacenar sobras de comida?
 - ¿Si se almacena, que pasa con la comida **más tarde**?
 - ¿Se **reutiliza** o tiene destinación diferente?
 - ¿influye la **política del colegio**?
 - ¿influye la **política local o nacional**?
- ¿Hay alguna regulación de la cantidad de comida que puede consumir un estudiante?
 - ¿Todos los estudiantes reciben la **misma cantidad**?

- i. ¿Pueden **pedir más** en su plato?
- ii. ¿Pueden volver por un **segundo turno**?
- iii. ¿Depende de un **factor**, por ejemplo, edad?

10. ¿Los estudiantes **se quedan** en el restaurante después de terminar de comer?
11. ¿Recibió usted alguna **capacitación** relacionada con la preparación y conservación de alimentos?
- a. ¿Cuáles de los aspectos relacionados a continuación incluyó la capacitación?
 - i. ¿**Técnicas** de preparación?
 - ii. ¿**Higiene** en la preparación?
 - iii. ¿**Conservación** de los alimentos?
 - iv. Formas de **preparación** (recetas)
 - v. ¿**Otros**? ¿Cuáles?

Desperdicio

12. ¿Hay **separación** de residuos en el colegio?
- a. ¿En **cuántas** categorías se separan los residuos?
13. ¿Qué considera **qué es** un desperdicio de alimentos?
14. ¿Qué **piensa** usted de la cantidad **del desperdicio** de alimentos del colegio?
15. ¿Usted considera el desperdicio de alimentos un **problema** en este colegio?
16. ¿Usted cree que el desperdicio de alimentos **se** podría ser **prevenido o reducido** en este colegio?
17. ¿Usted cree que es **importante** reducir desperdicio de alimentos?
- k. En caso afirmativo, ¿**Por qué** lo cree?
18. ¿Usted sabe si hay una **política específica** para el manejo de los residuos en el colegio?
- l. En caso afirmativo, ¿Qué **sabes** sobre esta política?
 - m. ¿Cómo está usted **informado** de esta política?
 - n. ¿Usted **tenía voz** en el diseño de esta política?
19. ¿**Qué hace usted** para prevenir el desperdicio de alimentos?
20. ¿Usted cree que **podría hacer algo/más** para disminuir el desperdicio de alimentos?
- a. ¿**Qué** puedes hacer?
21. ¿Le gustaría decir algo más?

Entrevista estudiantes

Información general

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Introducción

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Antes de comer

5. ¿Cree que se ve **sabroso**/rico?

Durante/después de comer

6. Tiene/Tenía **hambre**?

a. ¿**Por qué** (no)?

7. ¿Le **gusta** la comida?

a. ¿**Por qué** (no)?

i. ¿(No) le gusta lo que hay en el **plato**?

1. ¿O hay **algunas** cosas que (no) le gusta?

2. ¿**Qué** le gusta y qué no le gusta?

8. ¿Qué piensa usted de la **cantidad** de la comida?

9. ¿Cuándo no está conforme con la comida, a quien puede **decirlo**?

a. ¿Lo **hace**?

10. ¿Come **todos los días** en el restaurante del colegio?

a. ¿**Por qué** (no)?

11. ¿Qué come en su **casa**?

a. ¿La comida en tu casa es **diferente** a la comida del colegio?

12. ¿Usualmente **consume todo** lo que le sirven?

a. Sí no, ¿**qué no consume**?

13. ¿Qué **piensa** cuando consume toda la comida que le sirvieron y deja **sobras** en el plato?

14. ¿**Cómo** cree que en el colegio se desperdicia comida?

a. ¿Crees que **podría hacer algo** para prevenir desperdicio?

i. ¿**Qué** puedes hacer?

15. ¿**Participa** en la **definición** de los alimentos que va a consumir?

16. ¿**Participa** en alguna actividad relacionada con el **manejo de los alimentos** en el colegio?

General

17. ¿Cuántos **años** tiene?

18. ¿En qué **grado** está?

19. ¿Le gustaría decir algo más?