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# Reaching last mile consumers: how mobile traders facilitate stable access to nutritious foods

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Food and nutrition security has grown from just the availability, accessibility, and utilization of food, to include the stability of access, the agency of people, and the sustainability of the food system overall. However, advancements in production alone have been insufficient, and stable access to nutritious foods, such as fish, remains an issue in many low and middle-income countries. Fluctuations and disruptions to food supply chains disproportionately impact rural low-income people who have limited purchasing power. While Indonesia is a top fish producer globally, with many Indonesians preferring it culturally and dependent upon it, undernutrition and stunting remain stubborn concerns. This research is based on ethnographic fieldwork following mobile fish traders who supply rural communities in North Sumatra, Indonesia. These mobile traders are essential to the food and nutrition security of consumers with few if any alternatives. However, this food system is subject to fluctuations and disturbances, whether predictable or unexpected, that traders must navigate. I argue that flexibility and physical mobility are key factors to facilitate stable access. Embodying these qualities, mobile traders are crucial actors in the food system, facilitating stable access to fish and other nutritious foods for rural low-income consumers. Thus, understanding how these traders manage the fluctuations they encounter along the chain is critical to food and nutrition security.

## KEYWORDS

access, fish, food and nutrition security, food systems, Indonesia, mobile traders, mobility, stability

## 1 Introduction

Global discourse on poverty reduction has recognized the importance of food; following on this “food and nutrition security” (FNS) and increasingly “food systems” are gaining traction as terms used in development discourse and interventions (Simmance et al., 2021). The Committee on World Food Security expanded the pillars of food and nutrition security to six key areas: availability, access, agency, stability, sustainability, and utilization (HLPE, 2020).

Decades of research on production has focused on productivist agricultural interventions. Such interventions have been around for some time and typically focus on the production aspect of food systems, with the logic that greater volumes or availability of food equate to FNS, as noted by Fabinyi et al. (2017). Massive strides in productivity, such as the green revolution and development of drought- and disease-resistant crops such as wheat, rice, and maize, have been vital to increasing the availability of food, particularly staples. Yet food and nutrition insecurity has persisted (Haddad et al., 2016).

However, discourse is beginning to shift from this narrative of “feeding the world” to one of “nourishing nations”, emphasizing the need for diverse diets and quality food rather than

an isolated focus on the quantity of food or calories consumed (Bogard et al., 2017; Golden et al., 2021; Hicks et al., 2019). Though food policy discourse covering terrestrial animals and crops has often overshadowed that of aquatic foods, research into the role of fish and other aquatic foods in human nutrition has been growing steadily, particularly as policy discussions broaden to include the nutritional quality of food (Béné et al., 2015).

Both the quantity and quality of food are important, but to be effective in producing FNS, people must also have regular or stable access to this food. Stable access to nutritious foods remains an issue in many low and middle-income countries, often, though not always, corresponding to specific points in agricultural production cycles. Lean or hungry seasons, such as *musim paceklik* in Indonesia, disproportionately impact poor people who have limited purchasing power regularly or at particular times of year, exacerbating inequality (McCarthy and Obidzinski, 2017). Having access to food includes that it must be affordable; even if culturally preferred foods such as fish are nutritionally dense, that does not mean they are affordable to everyone.

So now, while we know more about what foods are nutritious and (often) have sufficient volumes of them, the question remains, *how do we get nutritious food to the people who need it most?* A second challenge also comes into play—how to ensure this access to nutritious food is stable? Food price spikes and times of food scarcity, whether seasonal or sporadic, are just some of the disturbances or variables that can disrupt consistent access to nutritious food.

This is where access and distribution via food supply chains come in. Homing in on intermediaries in food supply chains, this paper asks: how do mobile traders play a role in providing hard to reach consumers with low price fish products? How stable is these consumers' access to these foods? What does this mean for interventions aimed at promoting FNS? Through an analysis of the practices of mobile fish traders and consumption patterns amongst hard-to-reach communities in North Sumatra, I argue that the very mobility of these traders is critical to facilitating rural low-income consumers' stable access to nutritious foods. With the FNS of many rural low-income consumers dependent on mobile traders, understanding how traders' mobility and flexibility of both credit and routes can underpin stable access to food can inform FNS policies and interventions, both broad and specific.

## 2 Methods

This research is based on 6 months of ethnographic fieldwork in North Sumatra from 2019 to 2020, complemented by regular WhatsApp communication, primarily text messages along with still photos and occasional video recordings from markets, with key informants in the four-plus years since then. While in North Sumatra, my time was spent observing and engaging with mobile traders, other fish vendors, and in a community where many were part of Indonesia's social welfare program, Program Keluarga Harapan (PKH). This physical presence allowed me to observe not just what people said, but how they said it, and to develop trusted relationships, key advantages of anthropological fieldwork (Fabinyi et al., 2010). It was because of these relationships developed in person that I was able to continue my research after the onset of COVID-19.

To capture the movement of fish, the mobility of mobile traders, and the food supply chain, much of my fieldwork involved physically

following mobile traders along their routes starting from the market. Leveraging my own mobility, I joined them as they started their day in the early morning at the marketplace, accompanying them as they purchased different fish and goods from various sellers. Then I followed them on a separate motorbike, talking with them and their customers at each stop. This allowed me to directly observe how these traders operate and to speak with their customers and observe their homes, many of which prominently display printed signs indicating their inclusion in PKH (see Figure 1).

In addition to physically following five mobile traders, I observed and interacted with many other seafood market intermediaries, such as toke, wholesalers, and other mobile traders, both at the market itself and stops along the road. As discussed by Sheller and Urry (2006), this mobile ethnography allowed me to participate in the traders' patterns of movement and observe as it intersected with the lack of mobility of many of their customers. While my proficiency in Bahasa Indonesia, the most common language in North Sumatra, increased significantly during my fieldwork, I always had a research assistant with me when following mobile traders. This not only helped with my communication and understanding of people, but also the assistant would drive the motorcycle I was on and be an extra person for safety.

To better connect with the consumers in the area, I spent several non-consecutive weeks living in a *desa* (rural village) with enough households in the PKH program to warrant the formation of 12 PKH sub-groups, one for each of the 12 *dusun* (hamlet or sub-village). These sub-groups meet more frequently than all the PKH households in the *desa*. I attended the larger *desa* group where all the PKH members receive their tri-monthly cash assistance and regular mentoring meetings for 10 of the 12 sub-groups. With the verbal consent of the members present, I recorded the meetings, which I later transcribed and translated with the assistance of a local research assistant. Attended by mostly women, the meetings were led by the wife of the PKH coordinator for the *desa* and covered topics such as stunting and keeping children in school. Following this lesson, snacks would be shared, and I was able to speak with the participants as a kind of focus group. These discussions provided insight into daily food practices, such as where people purchased food from and preferences between fish, chicken, tempeh, and tofu.

While my initial research plan had been to spend 9–12 months in North Sumatra, like so many others, my plans were upended by the COVID-19 pandemic that forced me to leave Indonesia. Fortunately, by this point I had established relationships with multiple traders, and we were able to continue to communicate via WhatsApp. While still in Indonesia, one mobile trader had been particularly instrumental in my research; we spoke in greater depth about the mobile trading system in that area and he connected me to other traders, helping to answer their questions about who I was and what I was doing there.

After my departure, we remained in contact, and he was able to follow up on research questions and send updates about the situation on the ground and how traders, consumers, and the local market systems were going. This continued engagement benefitted us both. I was able to transfer him money each month (equivalent to several days of research assistant work) giving him another source of income at a critical time. He was able to share with me information of prices and availability of fish in the market, how his



FIGURE 1

Sign indicating participation in Indonesia's social welfare program, Program Keluarga Harapan (PKH). Posted on the exteriors of participants' homes, Keluarga Sangat Miskin means "Very Poor Family/Household." The identifying information in this photo has been blacked out for privacy reasons. Photo by S. K. Suri.

customers were adjusting their food purchases, and what he and his fellow mobile traders came across in their day-to-day work,<sup>1</sup> painting a rich picture of how traders were coping with this unprecedented disruption.

Together, the data from both my fieldwork in country and regular remote communications, illustrates how diverse nutritious foods, particularly fish, can reach the last mile to low-income, hard-to-reach communities. By understanding both the strengths and weakness of this mobile trading system, we can better inform policies or interventions aimed at improving food and nutrition security.

## 3 Results

### 3.1 Context

#### 3.1.1 Why fish? Fish as a nutritious food

Fish, particularly small-sized fish, are not only a high-quality source of protein, but also a key source of omega-3 fatty acids and micronutrients such as iron, zinc, and vitamin A (HLPE, 2017; Kawarazuka and Béné, 2011; Reksten et al., 2020). This is especially important for people with limited access to diverse nutritious foods, particularly women and young children in low and middle-income countries (LMICs) (Béné et al., 2016; Bogard et al., 2015; Byrd et al., 2021). Therefore, fish are a critical, for some irreplaceable, contribution

to FNS, particularly for the poor in LMICs (Bavinck et al., 2023; Belton and Thilsted, 2014). However, fish have often been missing or underrepresented (relative to terrestrial food production) from major interventions in this space until more recently (Béné et al., 2015; Fisher et al., 2017).

One challenge to this is the diversity of species within aquatic foods. Often lumped together under the catchall 'fish,' this belies the vast range of species, market value, nutritional value, environmental footprint, social aspects of the production methods, and more (Byrd et al., 2021; Hallström et al., 2019). Small-scale fisheries are so characterized by diversity (including but not limited to seasonality and fishing methods and gear types that often target multiple species) that it has hindered comprehensive data collection at scale until recently (WorldFish, FAO, & Duke University, 2023).

National fisheries policies often promote increasing the production of fish; however, the types of fish targeted tend to be determined by those of a high market value and export-oriented, which can have the effect of reducing the availability of fish in local markets (Thilsted et al., 2016). This priority on economic value limits the potential to prioritize nutritious food for poor consumers, particularly those with limited access to alternative options. Fish are one of the most widely traded food commodities globally, accounting for as much as 40% of total trade value for some countries (FAO, 2016). The trade of fish brings opportunities, but to sustain diets, we must examine this trade with a nutrition-sensitive approach.

#### 3.1.2 Why Indonesia

With extensive coastlines and as the second-largest capture fish producing country globally, fish are a key component in the FNS of Indonesians, particularly the rural poor outside of Java (FAO, 2020; Needham and Funge-Smith, 2014). Fish make up more than half of the nation's animal protein consumption; a 2019 study ranked

<sup>1</sup> I regularly stressed in our interactions that his safety was the utmost priority and not to risk additional exposure to COVID-19. The amount I paid him as my research assistant was consistent from month to month, thus limiting any financial incentive to go outside of what he would do otherwise.

Indonesia first for nutritional dependence on their coastal and marine ecosystems, factoring in the population size (FAO, 2020; HLPE, 2014; Selig et al., 2019). In line with the FNS pillar of agency, fish is a culturally preferred food in much of Indonesia outside Central Java (Needham and Funge-Smith, 2014). In addition to fish's importance for FNS, they are also an important source of export revenue. National fisheries policies reflect this, with much emphasis on high-financial value species.

Though Indonesia has its share of large urban centers such as Jakarta, Surabaya, Bandung, and Medan, almost half of the population is considered rural (ADB, 2021). Many LMICs face nutrition-related challenges, but Indonesia "is the largest country with a severe triple burden of malnutrition," (de Pee et al., 2021, p. 2). Indonesia ranks second for largest "within-country inequalities in malnutrition rates" and first for "greatest levels of disparity in wasting" (Development Initiatives, 2020, p. 47). Though progress has been made, approximately 30% of children under age five suffer from stunting (ADB, 2021). Declining dietary diversity and micronutrient deficiencies contribute to undernutrition in Indonesia and have been highlighted as potential areas for policy intervention (de Pee et al., 2021; Nurhasan et al., 2021; Vermeulen et al., 2019).

In western Indonesia, the province of North Sumatra produces 11% of the volume of Indonesia's domestic capture fisheries, 12% by monetary value (BPS-Statistics Indonesia, 2020; FAO, 2020). The province is socio-economically diverse, including urban hub Medan and rural Langkat, which borders Aceh, the neighboring province. Undernutrition in children continues to be a stubborn concern in both. A 2018 study focusing on primary-school children in Medan and Langkat found over 38% of children to be stunted (Lestari et al., 2018). In Langkat, rates of stunting and wasting in toddlers was measured at 31.5 and 5.7%, respectively (SSGI, 2021). While all the provinces of Sumatra spend a greater share of their income on food expenditure than the national average, North Sumatra has the third (rural areas) and fourth (urban areas) highest shares across the nation (BPS-Statistics Indonesia, 2023).

While this research could be done in multiple areas of Indonesia, the province of North Sumatra presented a particular blend of characteristics that make it well-situated to explore these connections between undernutrition, consumption preferences of rural low-income consumers, and fish access and production. Due to logistical and funding constraints, this specific research question was only looked at in North Sumatra; however, similar research was carried out under the same project in Madura and Sumba and in related projects in South and Southeast Asia and Sub-Saharan Africa.<sup>2</sup>

### 3.1.3 Consumers and traders

While a few chain supermarkets are present, most consumers purchase food from informal local markets or marketers. Local

open-air markets are common across the country and can be found in urban and peri-urban areas. Typically busiest in the early morning, these physical spaces comprise multiple market stalls, occupied by individual retailers and often separated into wet and dry areas (see Figure 2).

These multi-vendor marketplaces are busiest in the morning and often closed by the early afternoon. As early as three or four in the morning, these stalls are bustling. The first clients of the day are often traders or other retailers; they buy fish, vegetables, and other food goods in bulk to resell. Individual consumers typically arrive a bit later and buy smaller quantities for their own home consumption.

However, not all consumers want or are able to go into these bustling markets. Despite the greater selection of products and vendors, even people living very close by preferred the convenience of buying from either mobile traders or smaller stationary retailers (*warung* or *kedai*) outside the market. Going to the market hub is not a viable option for consumers located further away, leaving them dependent on *warung* and mobile traders, though the former is only available to those in somewhat more populated areas. These typically rural or peri-urban consumers are often low-income, work in seasonal agriculture, and many receive assistance through the PKH social welfare program. Sometimes referred to as "people living in poverty", these last mile consumers are geographically hard to reach and have limited means to pay for food, thus understanding how food reaches them holds potential lessons for Indonesia and beyond (Bavinck et al., 2023, p. 2; Steenbergen et al., 2019).

The traders buying for resale from the larger markets buy from multiple sellers, however they usually stick to those with whom they have an established relationship. This allows the trader to pay for the fish the day after having taken it, known as the *bongkar pasang* (in rural areas) or *bongkar muat* (in urban areas) system. The individual consumers who shop at the larger market are less likely to have a credit relationship with these sellers and thus typically pay cash directly for their purchases. However, it is possible for consumers to develop a credit relationship with their local *warung* or mobile trader. For poor households with limited or irregular cashflow and those in sparsely populated areas, the mobile traders are sometimes their only accessible option to purchase diverse perishable foods.

Mobile traders, in Indonesia referred to as *pedagang along-along*, *pedagang keliling*, *papa lele*, among other terms, use motorbikes to carry goods for sale to different villages, stopping frequently along the way at usual points and for folks that flag them down *ad hoc*. They keep to regular routes, trying not to overlap with too many other mobile traders, particularly in the more rural areas. Some start their routes as close to a few minutes from the market, while others travel as far as an hour or more into the neighboring district (*kecamatan*) before making their first stop.

Their motorbikes are outfitted with extra storage to enable them to potentially carry up to 100 kg of goods (see Figure 3). Most of the mobile traders also carry an assortment of vegetables and other perishable foods, though fresh fish has the highest profit margin. These modified motorbikes are nimble, allowing the traders to go not just farther, but to maneuver along steep, narrow, and rough paths where cars and larger vehicles are unable to pass. As seen in studies of mobile traders in Vietnam, mobility is part of

<sup>2</sup> See Jyotishi et al. (2021) for more on household dependence on mobile traders in Chennai and Bangalore. See Bavinck et al. (2023) which incorporates material from many of these case studies. The Dried Fish Matters project focuses on South and Southeast Asia. The Small Fish for Food project focuses on Sub-Saharan Africa. The Fish for Food project focused on India and Ghana.



FIGURE 2

Photos from the local market in Langkat showing (A) the fish section of the market, (B) traders selecting fish, (C) a chicken seller, and (D) a market stall selling dried fish. Photos by Tedi.



FIGURE 3

Different mobile trader motorbikes. The raw fish and chicken is carried in the styrofoam boxes. An assortment of vegetables and some tofu, tempeh, and other items are attached all around the bike and its attached storage. All loaded up with food from the market, it can be hard to see the motorbike itself. Photos by S. K. Suri.

traders' strategy to reach where others do not or cannot (Van Luong, 2018).

### 3.1.4 Fish and food supply chains

To describe the pathway of food from production to consumption, several similar terms are often used: food supply chains,<sup>3</sup> food value chains, and less frequently, food commodity chains. There are nuances to each. For example, the use of 'value' emphasizes that each step adds (typically monetary) value to the product in some way, such as through processing (Fanzo et al.,

2017). However, in a food environment where most food is unprocessed or only processed on a basic level, such as to dry, salt, or smoke fish for preservation, this emphasis on monetary value is not as relevant as the actual pathway by which foods reach the consumer. The term food supply chain allows for emphasis on the actual supply of foods, decentralizing how the price changes at each step. Additionally, it is also the term most commonly used by the High Level Panel of Experts on Food Security and Nutrition (HLPE) (HLPE, 2020, 2022).

Food supply chains typically start with production and end with consumption, reading left to right. This framing corresponds with how agri-food system interventions often focus on increasing the volume or quantity of food produced. I deliberately flip the food supply chain diagram of Downs and Fanzo (2016) (see Figure 4) to emphasize the supply of foods that specifically reach the consumer as opposed to different endpoints, e.g., for export or as an input to animal

<sup>3</sup> I prefer food supply chains but when referencing research that uses the term food value chains, I have kept this phrasing to preserve the original author's intent.

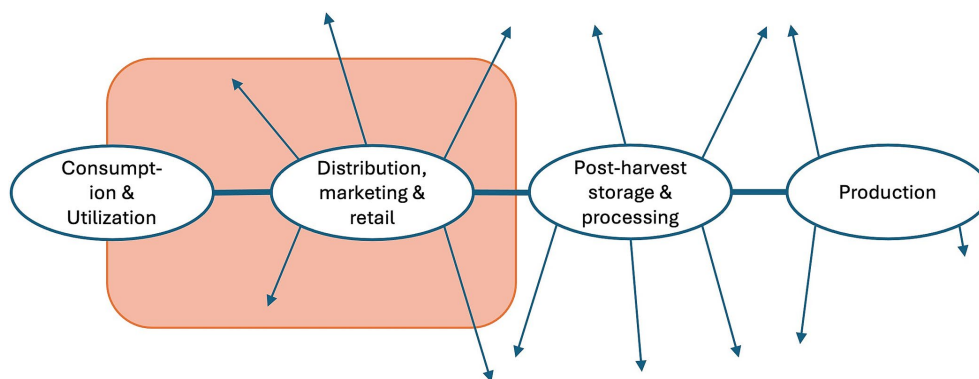


FIGURE 4

This food supply chain has been adapted from Downs and Fanzo (2016). The chain has deliberately been flipped to show the consumer on the left instead of the right, and the midstream segments have been consolidated into two nodes instead of four. The shaded box indicates the focus area of this article. The various arrows radiating from the nodes are to show that the actual chain is unlikely to be so straightforward but is likely to have other actors or interactions and movement. Most arrows do not directly connect to the consumption node; the arrows remaining inside the box without directly connecting to the consumption node represent pathways that may indirectly support local FNS.

feeds.<sup>4</sup> The FNS of rural low-income consumers is directly dependent on the foods that are actually accessible to them; increases in production volumes that have different end points are, at best, indirectly relevant to their FNS.

Many interventions considering the seafood consumer look at how environmental or food safety concerns from consumers in the Global North (e.g., Europe) influence the production practices of high-monetary-value fish in the Global South (e.g., Asia) (Doddema et al., 2020; Ward and Phillips, 2008). This has contributed to the popularity of global certification schemes such as MSC or Fair Trade in modern food supply chains, though these tend to promote the production of high price fish for wealthier consumers.

Fewer interventions have focused on how more local or traditional fish supply chains function, the role these fish play in people's diets, and the potential harms from the instability of that supply. The mobile traders of Langkat form part of the traditional food value chain, moving products from primarily small-scale fisheries and smallholder farmers to rural low-income consumers dispersed throughout the surrounding areas. While traditional food value chains like this can facilitate affordable access to micronutrients, these chains are also more susceptible to seasonal variations that can limit year-round access (Fanzo et al., 2017).

4 A key input into the rapidly growing aquaculture sector is fishmeal and fish oil that largely comes from small pelagic or forage fish, often referred to as "trash fish", most of which are of sufficient quality for direct human consumption (Alder et al., 2008; Cashion et al., 2017a; Tacon and Metian, 2009). This dense source of nutrients provides key lipids, including fatty acids, to feeds for farmed fish, poultry, pigs, and household pets such as cats and dogs (Isaacs, 2016). Cashion et al. (2017b) estimate that reduction into fishmeal and fish oil uses a sixth of all production from marine capture fisheries; this figure increases to more than a quarter when considering marine capture production used for all non-direct human consumption purposes (Cashion et al., 2017a). The proportion of fish used for non-human consumption can be much higher in some fisheries, such as Peruvian anchoveta where 98% of production goes into fishmeal and fish oil (Majluf et al., 2017).

Relative to fish supply chains serving urban or export markets, the fish carried by the mobile traders is typically at a low price-point with consumers buying small amounts rather than wealthier markets where there are consumers buying larger quantities of more expensive fish. The cheaper fish, smaller volumes, and greater distances to reach people living in poverty make the last mile less profitable and more expensive to operate. Case studies of how these traditional or local food value chains operate help to form a more complete picture of distribution systems that are effective in places where more industrial systems do not reach (Bavinck et al., 2023; Béné et al., 2016; Steenbergen et al., 2019).

### 3.2 Case

Tedi<sup>5</sup> worked as a security guard before switching to working as a mobile trader around 2010. In his mid-forties, he works 6–7 days per week as a mobile trader, as he has for the past 10-plus years. Whatever does not sell out (*sis*a) along his route, he puts out for sale in front of his home. It's not uncommon for folks to run small shops out of their homes, selling shelf-stable items like sachets of laundry soap, salt, and packaged snacks. Tedi's shop usually has fresh fish and vegetables from the market, making it popular with people who work at a factory nearby and are unable to buy these perishable goods in the morning from the market or mobile traders.

At the local market, where Tedi gets the bulk of his goods, he handpicks the fish, buying from different sellers depending on the price, quality, and availability each day. Having a day to pay for the goods (the *bongkar pasang* system) is usually ample time to sell the fish, though he must pay for all the fish he's taken, whether sold, unsold, or spoiled. Frequently, he also has some fish or crab from local fishers who bring it to his house at night. Buying directly from the fisher is a bit cheaper, but the selection limited. He has contacts for some local specialties, such as a shrimp paste cake (*belacan*) frequently

5 All names used are pseudonyms.

used in local cooking, and sometimes gets these directly from the producer, both ensuring high quality and saving money.

Arriving at the market before 4 am, he weaves through the different parts of the market, collecting chilies, leafy greens, tomatoes, shallots, tempeh, tofu, and more from the different sections, making frequent trips back to his motorbike to load it up and sip his coffee from the stall next to it. Much of this morning time is spent in the fish section, settling payments from the day before and seeing who has which fish of what quality at what price. Usually totaling around 50 kilos of fish (*ikan*), he selects a mix of local favorites such as mackerels, sardinellas and tilapia (e.g., *ikan cuking*, *ikan tongkol*, *ikan gembung*, *ikan nila*, and *ikan biji nangka*). He typically pays between IDR 10–24 k per kilo (roughly EUR 0.67–1.60<sup>6</sup> per kilo), depending on species and quality; to this he adds IDR 4–6 k per kilo (roughly EUR 0.27–0.40 per kilo) as his profit margin. These bags of fish along with chunks of ice are piled into the Styrofoam cool boxes on the back of his motorbike. Chicken is more expensive and does not sell as well as fish; the 10 kilos he buys of it go into these same cool boxes. Whatever fish or meat that does not fit into the cool boxes gets strapped on top, along with long beans and leafy greens. Pre-portioned bags of noodles, tofu, and dried fish hang off nails around the side, and tomatoes and chilies fill woven baskets straddling the back wheel.

As the sun starts to rise around 6 am, Tedi and the other mobile traders finish loading up their motorbikes and head off to start their routes. Tedi's first stop is around 10 min from the market. After wedging in a stick to support the weight of his fully laden bike, he unpacks some of the fish and his scale in preparation. This is a regular stop, and several women emerge from the nearby houses to inspect the foods on his bike. Though multiple *along-along* pass this way, one woman says she only buys fish from Tedi; if he does not have the fish she wants, then she'll go to the market to get it. Her husband is a carpenter and has several employees, so she buys a kilo of fish each day to feed them all lunch. Another woman buys from the *along-along* if she does not need too much, going directly to the market on days she needs more. Another woman pulls up on her own scooter to buy chicken for a Sunday family dinner. A man also pulls up on his scooter; both say it's faster and closer to buy from the *along-along* than go to the market. If they cannot get what they need from an *along-along*, then they'll go to the market, but their preference is the mobile trader. Around 10 people have come to buy from Tedi in the 15 or so minutes he's been here.

Without packing everything back up, Tedi straps down the loosest items and hops back on his motorbike. This makes sense when you see how frequently he is flagged down, more than 25 stops across the span of 5–6 h. Some people who live further along his route ride up on motorbikes or bicycles to catch him “before he's run out of all the good stuff.” While inspecting the contents of Tedi's cool box, a man tells me, “Indonesian people, if you have not eaten fish, you have not eaten.”

After a few stops along the main road, he turns down an unpaved path to a grouping of several houses. This is one of several small areas (a group of up to 5 homes) where he is the only mobile trader who passes through. The people who live at this clearing often buy from him, but if they miss him or cannot get what they want from him, they

will go to the road to find another *along-along* or go the market. Later we stop by several houses next to the railroad tracks; most the people who live here are poor and qualify for the government's social welfare scheme, PKH. The households here tend to have more people, particularly children, to feed, but the volume of fish purchased is less. The women here say that the fish they buy depends on the money they have; whereas previous customers described eating fish 5–7 days per week, here they buy fish only 4–5 times per month. One woman tells me that if they do have money, then they buy the smallest and cheapest fish. At this particular stop there are other *along-along* who pass through, but several of the customers only buy from Tedi because he extends credit to them. One woman tells me that if Tedi does not come through or give her credit, she cannot afford fish; instead, she gets tempeh or tofu at the warung.

Talking to customers along these routes, numerous people said that the mobile trader was their only means of purchasing fish. Of these, many also said that they were only able to buy fish because of the credit their particular mobile traders extended them. Without that credit, they would reduce their consumption of fish and replace this with tofu and tempeh, which are much less nutritionally dense. Households receiving government welfare typically display a sign with the PKH program name prominently displayed. From my observation, the frequency of these signs greatly increased the farther traders got from the market.

### 3.3 Descriptive analysis

#### 3.3.1 Disruptions to the food supply chain

The above paints a typical picture of this phase of the fish supply chain; however, like all supply chains, this one is also susceptible to fluctuations and disturbances, ranging from the small or predictable, to the large and unexpected. For example, some of the more regular or expected fluctuations relate to seasonality, including lunar cycles (the price of fish goes up around the full moon as it's more difficult to catch) and the 3–4 main seasons of the year (the price of fish goes up when the waves are high as it's more difficult for fishers to go out to sea).

Given Langkat's proximity to Aceh, excess production coming from their northern neighbor also affects both the availability and prices of fish in Langkat markets. When the supply of freshly caught fish is low, deep-frozen fish from as far as Malaysia enter the market. Known locally as *ikan paket*, this fish is both lower quality and lower in price; it's not a typical first choice option but supplements the otherwise low volume of fish available.

Less predictable fluctuations can include over- or underestimating the volume of fish that can be sold in a day. Mobile traders use their experience and understanding of their customers' needs to determine how much of which fish to buy each morning, but this does not always align with what customers end up buying. Overestimating can result in direct losses as fish quality degrades quickly with little cold storage for preservation. While there's no direct loss from underestimating the volume of fish people want, there is an indirect loss of potential profits.

Consumer purchasing power is another variability, with cashflow varying by both the agricultural season and the tri-monthly cash disbursements for PKH recipients. Traders will often extend credit to trusted clients to manage these fluctuations, though they are limited by their capital and eventual repayment. This extension of credit is

<sup>6</sup> Conversion rate of EUR 1 = IDR 15 k, which was the rough average at the time of fieldwork in 2019–2020.

essential for many consumers, such as when Tedi's customers explained how at times they would not be able to eat fish without the credit they received from him. While this is a strategy to retain customers, the debts aren't always repaid. One trader described keeping track of debts in a book his wife referred to as a *buku dosa*, or sin book.

All the traders I spoke with listed issues with credit repayment as a key difficulty. Tedi explained that the debt from customers is one of the biggest obstacles he faces, limiting him from growing his business. While most of his customers pay at the time they purchase, he extends credit to a limited number of them. Some pay him back in as little as a week, while others take a month, and others never repay him. He has personally set a maximum of IDR 500 k (~EUR 33) that he will extend to any family before cutting them off. By December 2019, he was extending credit to 5 families and had already cut off 6–7 families earlier that year; in 2018, he had to cut off double that number. Not all mobile traders extend credit to their customers, but doing so expands their customer base and allows families to continue to buy fish even when they have little to no money.

Aside from small disturbances, the fish supply chain sometimes undergoes big and unexpected shocks of diverse origin. Before COVID-19, traders described the outbreak of pig cholera in the fall of 2019 as the biggest disruption they'd had since the 2004 tsunami. Over 9,000 pigs died in the outbreak, and pig farmers were forced to cull their livestock, the carcasses of which were often dumped into local waterways (CNN Indonesia, 2019). The potential contamination of the fish in those same waterways extended beyond just possible transmission of the disease; as a majority Muslim country, the fact that it was pig carcasses meant that possible mixing of fish and pigs could render the fish forbidden, or *haram*. Usually, Aceh sends large amounts of fish, particularly *ikan tongkol*, to their southern neighbor, but they stopped; there was also a large drop in consumer demand as people shifted to other proteins such as tempeh, tofu, or for those who could afford it, chicken. As word of the contaminated waterways in North Sumatra spread across the country, demand for fish from this area reportedly dropped by 80%, forcing traders and fishers out of work (Gunawan, 2019).

Traders who could pivot into other livelihoods, a common strategy in agriculture and fisheries related work. One trader reported how he normally had a side-job working in construction, but during the pig cholera, shifted to only construction until the fish situation had changed after several months. For other traders, it is not uncommon to make a permanent pivot into other work.

### 3.3.2 Access and distribution

The case of Tedi demonstrates how important mobile traders are to facilitating access to fish for last mile consumers. Access is one of the core pillars of FNS; it typically refers to affordable access to safe nutritious foods in sufficient quantity for consumers (Misselhorn et al., 2012). However, it is important to specify access to what, for whom, and how. Ribot and Peluso (2009) reflect on the relationships and related power dynamics that facilitate or hinder the ability to access. Building on this Fabinyi et al. (2019) use access analysis, access dynamics, and access mechanisms as connected to social relations specific to fishers. For consumers, particularly those along the last mile, to have access to diverse nutritious foods, this access must be facilitated somehow. This is where the traders and other in-between actors come into play. This in-between space includes actors who

process, trade, and/or retail fish. These actors must navigate the buying, handling, and selling of highly perishable products to markets serving consumers who are unable to afford high prices, yet who are highly reliant on them for their FNS (Bavinck et al., 2023).

But in order for traders to facilitate this access for consumers, they must first have access to the foods themselves. This access can be direct or indirect (e.g., through entitlement, loans, etc.) or fraught, as in the case of female fish traders trading sex for fish in multiple countries across sub-Saharan Africa (Béné and Merten, 2008). It is also influenced by identity markers such as gender and ethnicity, and social relationships (Weeratunge et al., 2010). Lentisco and Lee (2014, 2015) review women's access to fish, dividing these actors into the categories of primary, secondary, and tertiary users.

In this case, consumer access to affordable, diverse nutritious foods, particularly fish, is facilitated by the very mobility and knowledge of these mobile traders. As key intermediaries, they know both the markets and the rural consumers they serve. In Langkat, mobile traders who sell fish and other perishable foods from their motorbikes along regular routes, are critical to facilitating access to nutritious foods, particularly rural low-income households that are geographically and logistically distant from formal or stationary marketplaces. That is, many consumers are dependent upon mobile traders to have the opportunity to purchase fish and the credit to pay for it. The details about Tedi's customers illustrate who accesses fish through this channel, and perhaps more importantly, who is ONLY able to access fish this way. The maneuverability of mobile traders into and around these hard-to-reach consumers and the flexibility around offerings and payment terms are critical to rural consumer access to diverse nutritious foods.

## 4 Discussion

### 4.1 Mobility and flexibility

The traders at the focus of this research are characterized by their mobility and flexibility. They use their motorbikes laden with Styrofoam coolers to carry perishable goods across the terrain, transporting fish to places far from the sea. As autonomous businesses, they have the flexibility to decide where they go, how much of which products they carry, and to which of their clients they extend credit and how much.

The mobility and flexibility of the traders contrasts with the relative immobility of many of their clients, the consumers (Adey, 2006). Though some of these consumers have other options and means to access diverse nutritious foods, many do not. For some, the timing and location of their work does not allow them to go to the marketplace when it's open, so they buy from the trader who comes to them. Though mobile traders can arrange flexible payment terms from wholesalers in the main markets, individual consumers are expected to pay at the time of purchase. However, many, particularly seasonal agricultural workers and people who are part of the PKH social protection program, often wait months to get paid. This leaves them with regular periods of scarcity, lacking the cash to pay for goods upon purchase, but still needing to purchase food for daily consumption. People without the stable cashflow to directly purchase foods in the market, often then rely on the credit extended by mobile traders (with whom they have established a



relationship) to purchase nutritionally dense and culturally preferred foods such as fish. This dependence of low-income households on mobile traders has been observed in other places such as southern India (Jyotishi et al., 2021).

Going beyond just the differences between who is or is not mobile, Massey uses the term power geometry to get at the “power in relation to the flows and the movement” (Massey, 1994, p. 149). Massey’s discussion emphasizes how “the mobility and control of some groups can actively weaken other people” (Massey, 1994, p. 150); however, in this Indonesian case, rather than the mobility of the mobile traders coming at the expense of that of the consumers, the mobility of the mobile traders facilitates the stability of consumers’ access to fish and other nutritious foods.

In his study of Bangladesh street food vendors, Etzold (2017) discusses the translocality of different social relationships to describe how migrants leverage and retain social relationships from where they have come to where they have migrated. Though the main direction of migration is from rural to urban, “circular patterns of mobility” are reproduced as migrants periodically return to their place of origin (Etzold, 2017, p. 53). The Indonesian mobile traders perform a similar kind of translocality, though in the opposite direction, going toward more rural areas rather than toward more urban.

## 4.2 Stability through mobility

To achieve FNS, people need more than just access; they need regular or stable access to diverse nutritious foods. Not only do they need these foods today, they also need them tomorrow, next week, and next month. While the continuity of access to these foods is critical to FNS, this is often out of sync with production seasons and/or people’s ability to pay for these foods. The flexibility of mobile traders provides a kind of equilibrium in the face of different fluctuations. At the market with their clientele in mind, they select an assortment of foods at different price points and to meet the different preferences. Then for customers who are unable or prefer not to go to the market, they bring these foods to them. The credit traders extend to customers has a hugely stabilizing effect for the many with limited or irregular cash flow; its significance was frequently reiterated by both customers and traders. In the face of sudden shocks, such as an outbreak of pig cholera or global pandemic, traders often pivot into other livelihoods, partly or full-time. This stability of consumer access to diverse nutritious foods is directly dependent on the flexibility of mobile traders.

## 4.3 Policy implications

Though the case of mobile traders in North Sumatra is highly localized, there are learnings that can inform higher-level policies or interventions aimed at promoting FNS. There have been calls to incorporate local case studies, which “are better able to capture the complex and multi-dimensional nature of the pathway through which fisheries and aquaculture effectively contribute to poverty alleviation, economic growth, and food and nutrition security” (Bavinck et al., 2023; Béné et al., 2016, p. 187; Fabinyi et al., 2017; Steenbergen et al., 2019). With fish often overlooked in global policy discussions around

undernutrition until recently, a case about stable access to fish for last mile consumers is particularly relevant to achieving FNS for all.

As many food systems modernize, the roles of powerful actors, such as large companies, are increasing (Allegretti and Hicks, 2022), but it will never be profitable for these big companies to reach into remote areas with a consumer base that largely lives in poverty. Though it may be challenging to work with a bunch of independent small businesses, as opposed to a few large corporations, these mobile traders are vital to reaching last mile consumers who are unable to access the monopolized system and who are dependent on the nimble individual traders that come to their door and extend them credit. If policies or interventions focus too much on engaging big companies, this is at the risk of excluding these rural consumers, who do not have the mobility to regularly access food this way (Allegretti and Hicks, 2022; Massey, 1993).

Beyond simply recognizing their importance, policies could aim to maintain or enhance the flexibility of mobile traders, such as bolstering or increasing their ability to extend credit. Then, when there are shocks or disruptions, responses can be appropriately contextualized to bolster the generally functioning local system already in place rather than re-inventing the wheel. Building on what already works and is locally accepted can strengthen the resilience of local food systems and dampen potentially negative ripple effects from sudden shocks such as the COVID-19 pandemic (Bassett et al., 2022).

Given the clear role mobile traders have in facilitating stable access to nutritious foods, policies targeting the FNS for rural low-income consumers need to recognize the importance of these highly mobile and flexible actors (Bavinck et al., 2023; Steenbergen et al., 2019). This could entail incorporating them into policy interventions, such as leveraging their networks for the delivery of food aid, as was done in some areas of Indonesia during COVID-19 (Bassett et al., 2022). This enabled food aid to get to many consumers who would have otherwise been very difficult to reach. This also meant that mobile traders could continue working, albeit in a reduced way, which dampened their need to pivot into other livelihoods. Mobile traders must navigate different kinds of fluctuations, which many do by temporarily shifting into other livelihoods (such as fishing, construction, opening other businesses, etc). However, for some this shift ends up becoming permanent. Policies and interventions that bolster the continued operation of mobile traders can help keep mobile traders at work during fluctuations, thus maintaining an important distribution link to last mile consumers.

## 5 Final remarks

The case of mobile traders in North Sumatra, Indonesia illustrates how the very mobility of these traders is critical to facilitating rural low-income consumers’ stable access to fish and other nutritious foods. In reaching consumers who are unable to access more modern markets, these traders warrant specific consideration in high-level discussions on food and nutrition security. Through studying how they operate and the difficulties they encounter, policies and interventions can be better adapted to local conditions and as such better support local communities. To further develop this understanding, future research could identify target communities, perhaps those with stubborn rates of undernutrition or other challenges, and work backwards up the supply chain from there.

Advantages of this approach include focusing on foods that are locally preferred and starting with existing food supply chains that work (at least to some extent) or can potentially be bolstered. This can then be complemented by lessons learned in other cases and places, but it centers the existing local system first. While this may not be the best approach in all contexts, it could lead to more locally embedded and resilient food systems in many.

## Data availability statement

The original contributions presented in the study are included in the article, further inquiries can be directed to the corresponding author.

## Author contributions

SS: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing.

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## Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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