

# Does mobile telephony enable smallholders secure better market prices?

## The case of rice growers in the Gagnoa and Yamoussoukro departments in Côte d'Ivoire.

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### Abstract

Digital technologies are viewed today by many observers as new catalysts for economic growth in the Global South. This is particularly true of mobile telephony, whose rise has been perceived as a driver for the development of small-scale farmers' economic activities, a critical component of these regions' economies. Referring to economic theory and considering that these smallholders have limited access to information, organizations such as the World Bank and FAO present mobile phones as tools likely to improve their economic situation. This argument is based on the idea that better access to information should enhance their bargaining power and decision-making capacity, thereby enabling them to secure better market prices. This article offers a critical theoretical and empirical analysis of this argument. It is divided into two parts. The first part revisits the academic debate on the effects of mobile telephony on the market income of smallholders. Based on a review of impact studies and other quantitative research, we show that no systematic causal relationship can be established between access to mobile telephony and smallholder incomes. Putting this corpus into perspective with knowledge derived from qualitative research highlights the importance of factors related to market structure and organization in analyzing the effects of mobile phones. The second part addresses the following question: Does mobile telephony enable rice growers in Côte d'Ivoire to obtain better market prices? This question is original since prior impact studies have predominantly focused on relatively homogeneous goods. However, rice, in addition to being one of the most consumed cereals in Côte d'Ivoire, is characterized by its heterogeneity. The proposed analysis combines macroeconomic, microeconomic, and sociological approaches. At the macroeconomic level, we highlight the segmentation of the local rice market, an important factor reducing the effective size of demand addressed to rice growers. On the microeconomic and sociological levels, the approach is based on data from field survey carried out in localities in two regions of the country. Through a descriptive analysis of the organization of rice production and marketing in these two survey areas, the study shows that rice growers lack the bargaining power and arbitration capacity typically associated with mobile phone use. In a context marked by a proliferation of initiatives promoting digital technologies in agricultural and agri-food systems in the Global South, this article underscores the need to integrate such technologies into a broader reflection that considers the structures and organizational forms of production and trade.

### Keywords

Digital technologies, mobile phone use, trade arbitration, economic sociology, rice farming, Côte d'Ivoire

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*“Not accepting a story” means that the representations it offers of how things actually work are false on at least one important point: either we do not understand the story, or we know it is false because certain facts stubbornly refuse to fit into it. When this happens, and we cannot evade the problem or finesse it, we must try to change the story. (Becker, 2013, p. 48)*

## Introduction

The term “digital economy” generally refers to two broad sets of realities. The first pertains to information and communication technologies (ICTs). These include products and services derived from computing, telecommunications, electronics, and audiovisual sectors (Courmont & Galimberti, 2018; OECD, 2024). This perspective, rooted in a statistical approach, views the digital economy as a sub-sector of the broader economy. However, many scholars argue that this definition is insufficient as it fails to capture the scale of changes brought about by the spread of ICTs throughout the economy and society. The idea is that the reduction of certain costs—communication, transaction, and coordination—enabled by the digitization of information significantly reshapes how goods are produced, sold, and consumed (Goldfarb & Tucker, 2019). To characterize the scale of these changes, economists speak of “General Purpose Technology” (GPT), which denotes technologies with multiple applications that, as they spread throughout the economy, open up a new field of opportunities (Carlsson, 2004). From this second perspective, the term “digital economy” specifically refers to the “digitization of the economy” and is intended to designate a complex set of realities. This encompasses both the rise of new activities and the increasing integration of ICTs into so-called “traditional” economic sectors (Bukht & Heeks, 2017).

Building on this second approach, which aligns with the 1990s debates around the “new economy”, many observers view digital technologies as catalysts for economic growth in the Global South. This is particularly evident with mobile telephony, whose rapid expansion has been seen as a driver for developing the economic activities of small-scale agricultural producers. According to economic theory and recognizing that smallholders often have limited access to information, international organizations such as the World Bank (2012) and FAO (2020) present mobile phones as tools capable of improving their economic conditions. This argument is based on the idea that by giving them access to information, mobile phones should strengthen their bargaining power and arbitration capacity in order to secure better prices on the markets. In this regard, FAO (2020, p. 116) explains that digital technologies, particularly mobile telephony, reduce information and transaction costs while promoting the integration of small producers into markets. This argument is variously taken up and often intuitively framed by a number of authors (Heeks, 2018; Huet, 2021). It is, for instance, articulated by geographer and Africanist Sylvie Brunel during a program on France Culture<sup>1</sup>:

There is one big problem, and you all know it if you have worked in Africa. It is the state of the roads, the state of the tracks, especially during the rainy season—it is complicated. Previously, farmers were constantly being ripped off because they had to wait in their villages; intermediaries would arrive and then they would be offered to buy the crop at a given price, which was not necessarily the best because they lacked information. But now, with the use of their phones, they know the prices and are informed.

This article offers a critical analysis, both theoretical and empirical, of the argument that mobile telephony serves as a tool to improve the economic situation of smallholders in the Global South<sup>2</sup>. This reflection is particularly relevant because small-scale farmers and so-called “informal economy” actors constitute a major component of the economies of the countries in the global south, in both urban and rural areas. Furthermore, in regions where mobile telephony has seen remarkable success, numerous initiatives

1 “Les rencontres de Pétrarque 2021” broadcast on July 7, 2021 on the theme: “Is Africa the new Start-up Nation?”. <https://www.radiofrance.fr/franceculture/podcasts/le-temps-du-debat-d-ete/l-afrique-est-elle-la-nouvelle-startup-nation-2499934>.

2 The author would like to express his gratitude to the anonymous reviewers whose comments and suggestions on a preliminary version of this paper have greatly helped to improve its quality.

have been launched in recent years to promote its use in agricultural and agri-food systems (GSMA, 2020; Tsan et al., 2019). However, as highlighted in a FAO report (2015), these initiatives have not yet achieved their intended outcomes. At a time when an extensive body of literature questions the relevance and sustainability of such initiatives (Aker et al., 2016; Baumüller, 2018; Ezeomah & Duncombe, 2019; Galtier et al., 2014), it seems necessary to revisit a fundamental question: how do smallholders use their mobile phones, and what effects does this have on their incomes?

This paper seeks to provide insights into this question. It is structured into two parts. The first part revisits the academic debate around the effects of mobile telephony on the market incomes of smallholders. Drawing on a review of impact studies and other quantitative research, we demonstrate that no direct causal relationship between mobile phone access and farmers' incomes can be systematically established. This observation is put into perspective with knowledge from qualitative research to emphasize the importance of factors linked to market structure and organization in analyzing the effects of mobile telephony.

The second part attempts to answer the following question: does mobile telephony enable rice farmers in Côte d'Ivoire to obtain better prices? This question is original in so far as the studies carried out to date have mainly focused on relatively homogeneous goods. However, rice, in addition to being one of the most consumed cereals in Côte d'Ivoire and more generally in Africa, is characterized by its heterogeneity. The proposed analysis combines macroeconomic, microeconomic, and sociological approaches. At the macroeconomic level, we highlight the segmentation of the local rice market, an important factor reducing the effective size of demand addressed to rice growers. On the microeconomic and sociological levels, the approach is based on data from field survey carried out in localities in two regions of the country. A description of the organization of rice production and marketing in these study areas is presented in order to examine the bargaining power and arbitrage opportunities available to rice farmers. A number of contextual factors are highlighted. These include the scarcity of resources, the geographical concentration of trade, the absence of storage infrastructure, and the prevalence of interlinked transactions in trade. Thus, although rice farmers are equipped with mobile phones, the hypothesis of an improvement in their economic situation will be rejected, given that these factors limit their bargaining power and ability to engage in market arbitrage.

## Mobile Telephony and Smallholders' Incomes: Theory, Mechanisms, and Controversies

### *The Impacts of Mobile Phones on Market Functioning*

A significant body of literature, within the field of development economics, is now devoted to studying the effects of ICT diffusion in the Global South. At the macroeconomic level, studies have explored questions such as links between ICT diffusion and economic growth in these regions (Niebel, 2018; Thompson & Garbacz, 2007; Waverman et al., 2005). At the microeconomic level, research has focused in particular on the effects of ICT adoption on the functioning of markets. A seminal study in this field is that of Jensen (2007) on fish markets in the Indian state of Kerala. Using a quasi-experimental methodology, the author compares the situation of these markets before and after the expansion of mobile telephony. His study shows that the arrival of the cell phones was accompanied by a reduction in price dispersion between markets, from 70% to less than 15%, a complete disappearance of unsold fish, and above all an 8% increase in fishermen's profits, as well as a 4% decrease in fish prices.

In the context of the early 2000s, marked as much by the implementation of anti-poverty policies as by the rapid spread of mobile telephony in the Global South, the publication of this study generated a great deal of interest in the academic world, and a great deal of enthusiasm among international development agencies (Berrou & Mellet, 2020). Indeed, from a simple means of communication, Jensen elevated the mobile phone to a status of a tool promoting the well-being of market participants. The argument has been widely taken up and integrated into the discourses that institutions such as

the World Bank (2012) and FAO (2020) have produced around the potential of digital technologies in development. It is important to say that this argument has been confirmed by a number of studies carried out in other regions and contexts. Studies by Aker (2008, 2010) in Niger, also based on quasi-experimental approach, conclude that mobile phones have a positive impact on grain traders' profits. Further confirmation is provided by Courtois and Subervie (2015) in a study on Esoko, an agricultural market information system (MIS<sup>3</sup>) implemented in Ghana. The authors show a positive relationship between access to this service and the incomes of maize and peanut farmers in the north of the country. The main explanation put forward by these authors for their results is that of a reduction in the costs of accessing and searching for information—via mobile telephony—strengthens smallholders' bargaining power vis-à-vis traders and enables them to make better decisions when choosing between different sales points.

### *Contrasting Perspectives from Other Studies*

Different and contradictory findings have, however, emerged from other impact studies and quantitative methodologies. A study carried out in Uganda by Muto and Yamano (2009) reveals that the adoption of mobile phone encourages smallholders to participate more actively in markets but does not significantly improve their income. This limitation, according to the authors, stems from the persistence of informational asymmetries that favor traders. Similar conclusions were drawn by Aker and Fafchamps (2015). Their study on cereal markets in Niger shows that mobile phones reduce price dispersion for cowpea—a perishable product without storage facilities—but does not have the same effect for storable products like millet or sorghum. Furthermore, the authors note that the mobile phone has no significant impact on the prices paid to producer.

These “negative” findings are echoed in studies evaluating market information systems (MIS) or initiatives promoting mobile phone use among smallholders. For example, a randomized evaluation of a MIS in India by Fafchamps and Minten (2012) found no significant effect of this service on prices received by farmers. According to the authors, this result can be explained by the market structure in the regions studied, where crop sales are centralized in one whole sale market per district. They consider that this spatial concentration limits producers' opportunities for arbitrage. Another study by Aker and Ksoll (2016) in Niger, also based on randomized experimentation, concludes that there is no impact of mobile telephony on prices received by farmers who benefited from a development project that included a training module in the use of the mobile phone. The authors suggest that the existence of “market failures”, such as difficulties accessing credit or non-competitive practices, may explain this outcome.

Finally, some research has highlighted constraints that limit smallholders' ability to capitalize on mobile phone opportunities. Based on research carried out in Ethiopia, Tadesse and Bahiigwa (2015) reveal that producers, although equipped with mobile phones, generally lack reliable resources for accessing price information. Another study conducted in Tanzania by Nyamba and Mlozi (2012) shows that poverty levels, difficulties accessing electricity, and lack of digital skills are barriers to mobile use. In some cases, mobile phone use can even negatively impact smallholders' incomes. This is suggested by the study of Minkoua Nzie et al. (2018) in Cameroon where they indicate that communication costs constitute transaction costs when farmers pay airtime to obtain information that is not always accessible.

3 A market information system (MIS) is a technical device designed to collect and disseminate various types of information, particularly concerning prices, to market participants. These systems, which exist in various African countries, were launched in the 1980s as part of agricultural liberalization policies. MISs first relied on radio to disseminate information, then, more recently, increasingly on mobile telephony. (David-Benz et al., 2012; Galtier et al., 2014).

A review of these studies underscore the controversial nature of the question of the effects of mobile telephony on the incomes of smallholders in the Global South. Thus, contrary to the way it is sometimes presented in certain settings or by international development agencies, the argument establishing a direct link between access to mobile phone and improved wellbeing for smallholders need to be nuanced. While the relationship is proven in some situations, it may be non-existent or even potentially negative in others. As Aker and Ksoll point out:

While seemingly contradictory, there is little theoretical reason to believe that access to mobile phone technology would lead to changes in agricultural behavior or an increase in farm-gate prices in all countries for all crops<sup>4</sup>. (2016, p. 45)

### *The Contribution of Qualitative Methodologies*

Several studies from disciplines such as information science, sociology, and anthropology have enriched the debate through qualitative methodologies. By shedding light on usage contexts, which are often overlooked by quantitative approaches, these studies introduce new elements.

This is particularly the case with surveys carried out in Kerala, the region where Jensen (2007) conducted his study on fishermen. The idea that the latter use mobile phones to make market arbitrations has been critically evaluated. In a study on a fishing community in this region, Sreekumar (2011) argues that mobile phones are mainly used by buyers to keep prices low. However, the author explains that mobile phone adoption has fostered new forms of coordination among fishermen, particularly for sharing information about fishing areas or alerting others in case of danger. Srinivasan and Burrell (2015) explain that only traders and boat owners, minority actors in the fishing sector, use mobile phones to arbitrate prices, while the majority use them to coordinate their activities and maintain social connections. Still in Kerala, Steyn (2016) notes that the auctioning of fish by auctioneers reduces fishermen's involvement in price negotiations. Generally, these authors criticize Jensen for not considering the diversity of uses and different organizational forms that exist in the fishing sector.

In parallel to this controversy surrounding fishermen in Kerala, ethnographic surveys explore other dimensions linked to the adoption of mobile phones by smallholders. Molony (2008), in a study on the food production sector in Tanzania, highlights producers' dependence on their buyers for the credit necessary to purchase agricultural inputs. He notes that the adoption of mobile phones did not change this situation. Although it can be perceived as a constraint, Molony argues that this dependency is part of a trust-based relationship between the producers and their buyers. This analysis seems relevant as it is in line with a problematic already envisaged by Bardhan (1980) and widely documented in studies of agricultural markets in countries in the global south: that of interlinked transactions and loyalty-based transactions<sup>5</sup>. These practices have been interpreted by authors such as David-Benz et al. (2012) as factors explaining the mixed results of many MIS deployed in Africa. According to them, while these systems may have improved producers' access to information, a significant proportion continued to prefer transactions with buyers who provided financing or established mutual trust in exchanges.

To conclude this literature review, it is important to mention studies on the circulation of information in rural areas and agricultural markets in the global south. Through ethnographic studies conducted in Uganda and China, Burrell and Oreglia (2015) challenge the idea that smallholders have limited access to information. The authors emphasize that social relationships, village organizations, and traditional media such as radio play an important role in informing smallholders. A complementary contribution from Egg et al. (1996) highlights the comparative advantage that some traders have in terms of access to information. Their study of large cereal traders in Niger shows that these traders

<sup>4</sup> Translation by the authors.

<sup>5</sup> The term "interlinked transaction" refers to economic exchanges involving two or more interdependent transactions. This is the case, for example, when access to credit via a buyer is linked to the sale of production to the latter. The term "loyalty transaction" refers to repeated exchanges over time with the same partner.

rely on communication tools such as the phone, but also on their networks including agricultural collectors, transporters, market traders, and sometimes contacts in public administration, as channels to centralize information and maintain their strategic position.

This body of knowledge enriches and makes complex the analysis of the effects of mobile phones on the economic activity of smallholders. Indeed, in addition to the factors already considered by quantitative approaches – such as the structure and level of market integration, the characteristics of goods exchanged, or the conditions of access to and use of mobile phones – qualitative approaches open up new perspectives. In particular, they invite consideration of dimensions such as the organization of exchanges and the strategies of actors in the markets.

In our view, these two approaches converge toward two essential conclusions. Firstly, the reflection on the effects of mobile phones on the economic activity of smallholders requires understanding the contexts of use. Secondly, this reflection must be based on an empirical approach to markets. Indeed, in its academic formulation, the hypothesis of a causal relationship between access to mobile phones and the improvement of smallholders' well-being is based on the theoretical framework of standard economics. However, this theory conveys a vision of markets as spaces where atomized agents evolve, their relationship being limited solely to market transactions. Yet, as many of the studies mentioned here show, social relationships are intrinsically linked to the economic and market practices of smallholders. These observations are in lines with theoretical perspectives open up by disciplines such as economic sociology (Granovetter, 1985; Steiner, 2011; Zelizer, 1992), institutional and historical economics (Boyer, 2013; Chavance, 2018; North, 1994; Polanyi, 1944/1983), which view markets as organized entities founded on a set of institutions, norms, and rules—formal or informal. In other words, markets must be seen as social and historical constructs.

Building on these theoretical and empirical advancements, the rest of this article examines the effects of mobile phone adoption on the market activities of rice farmers in Côte d'Ivoire.

## Mobile Phone Adoption by Rice Farmers in Côte d'Ivoire

### *A Research Hypothesis*

The reflection we propose to undertake regarding the effects of mobile phones on the economic activity of rice farmers in Côte d'Ivoire is situated within a specific context: that of Sub-Saharan African countries where rice plays a central role in food systems. Indeed, particularly adapted to urban lifestyles, rice is one of the most consumed cereals in these regions (Rutsaert et al., 2013). In West Africa, for example, annual per capita consumption of rice has increased from 13 kg in the 1960s to 30 kg in the early 2000s (Lançon, 2011), reaching recently 45 kg (Chalmain & Jégourel, 2021).

This rapid growth in consumption has nevertheless been accompanied by increasing dependence on the global market. Despite the formulation of successive public policies at the national and regional levels aimed at food self-sufficiency, most countries in the region continue to rely heavily on imports to meet their consumption needs. The case of Côte d'Ivoire, as shown in Figure 1, illustrates this historical situation of dependence.

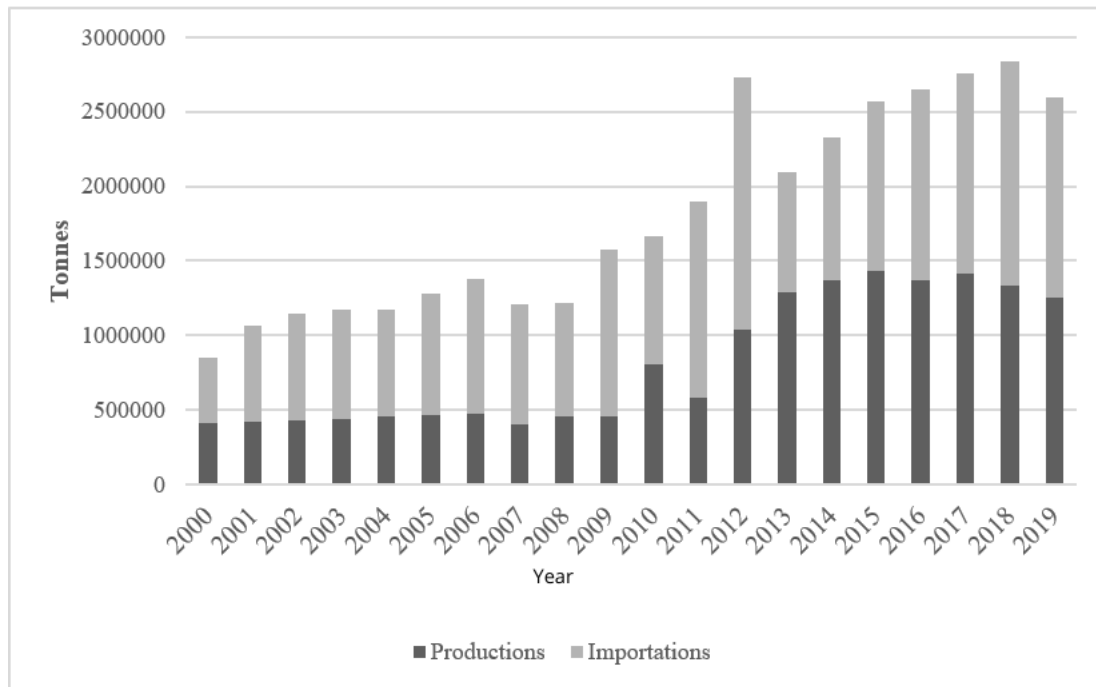


Figure 1: Shares of domestic production and imports in total rice consumption in Côte d'Ivoire, 2000–2019.

Source: developed from FAO6 data.

In light of the argument assuming a positive relationship between mobile phone access and the market incomes of smallholders, an exploratory hypothesis in this specific case would be to consider the adoption of mobile telephony as an incentive factor leading producers to increase their rice production, thereby helping to reduce dependency on imports. This hypothesis—already formulated by Huet (2021)—appears questionable at first glance, given that the growth of mobile phone in Côte d'Ivoire since the early 2000s (Fig. 2) has followed a different trajectory from that of rice production and imports (Fig. 1).

6 <https://www.fao.org/faostat/>

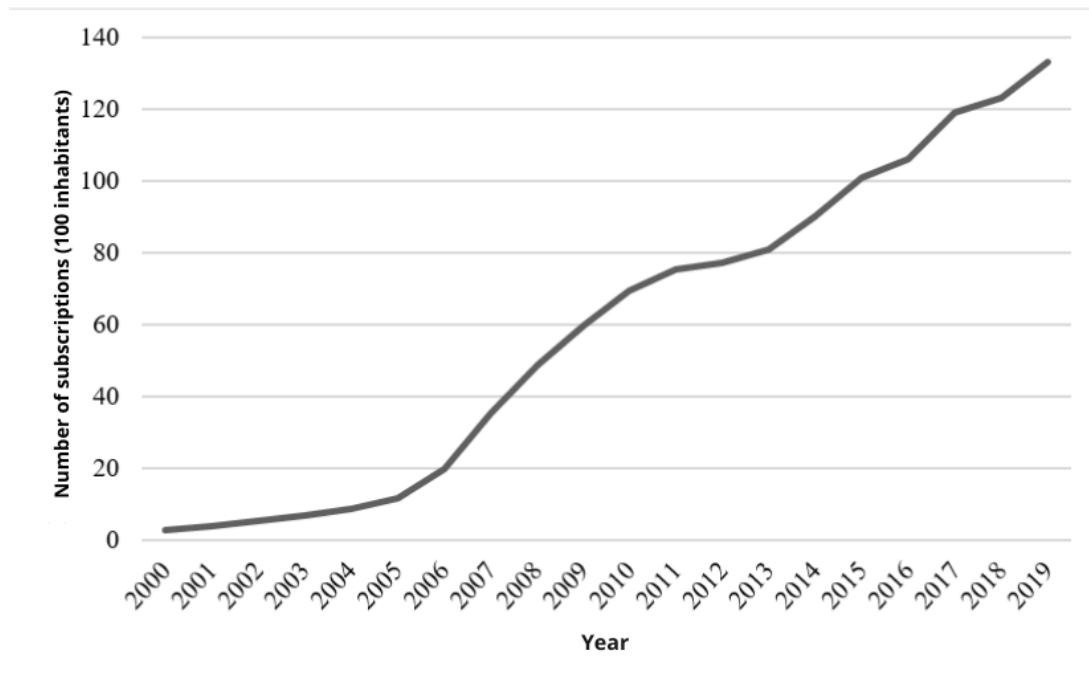


Figure 2: Mobile phone subscriptions per 100 inhabitants, Côte d'Ivoire, 2000–2019.

Source: Based on data from the International Telecommunication Union (ITU)<sup>7</sup>.

The hypothesis will be examined in detail in the following sections through two main axes. The first analyzes the structure of the rice market in Côte d'Ivoire, while the second proposes a microeconomic and sociological study of the organization of production and trade in two survey areas.

### *Structure of the Rice Market in Côte d'Ivoire*

According to the Ivorian agency responsible for the development of the rice sector (Aderiz), three production systems coexist in Côte d'Ivoire<sup>8</sup>: rain-fed rice cultivation, floodplain rice cultivation, and irrigated rice cultivation. Rain-fed rice cultivation, the most widespread system, represents 85% of the sown areas and about 80% of national production. On a smaller scale, irrigated rice and floodplain rice occupy 15% and 2% of cultivated areas, respectively, contributing 13% and 5% of total production. These three systems differ in terms of their average yields, which are generally higher in irrigated rice cultivation due to water management, the use of fertilizers, and plant protection products. However, they share common characteristics such as low mechanization and relatively small farm sizes, ranging from 0.2 to 2 hectares.

This coexistence of production systems is complemented by another: the types of rice cultivated and found on the markets. Although other classifications have been proposed by various authors (Chohin-Kuper et al., 1999; Lançon et al., 2004), Aderiz and a recent survey by the Japan International Cooperation Agency (JICA, 2021) propose a typology in three categories (Table 1).

Category	Variety or name
Luxury	CY 2 ; JT 11 ; M18 ; C10
Semi-luxury	Danané rice ; Bété rice ; Man rice ; Akodi rice
Ordinary or « common use »	Gbagbo rice ; WITA 9 ; Bouaké 189

Table 1: Classification of Locally Produced Rice in Côte d'Ivoire

Source: based on data by Aderiz (2019b) and Jica (2021).

<sup>7</sup> <https://datahub.itu.int/>

<sup>8</sup> <https://www.aderiz.ci/fr>



This classification is inspired by the standards applied to imported rice, particularly the broken rice rate, and surveys on local consumer preferences. The average prices of different categories of rice reflect this classification. According to Aderiz, in the third quarter of 2022, in the city of Abidjan, the main market in the country, prices ranged from 425 CFA francs/kg (0.68 USD) for ordinary rice to 1,000 CFA francs/kg (1.60 USD) for luxury rice<sup>9</sup>. Jica (2021) also specifies that ordinary rice is generally sold in bulk in rural markets, while luxury and semi-luxury rice is packaged in 1 to 50 kg bags under local brands.

Local rice is generally marketed via a so-called “traditional” food trade circuit. This circuit, which has been described as “dioula networks” (Chauveau, 1985), relies on two main actors: wholesalers located in urban center markets, who mobilize collectors operating in the production areas across the country, and merchants, who obtain supplies by touring rural or peri-urban markets. These practices have been documented by several studies (Becker & N’Guessan, 2004; Kra Djato et al., 2006; Nassa, 2010). Some authors have highlighted the historical dynamism of this local commercialization system, particularly its ability to supply consumption centers. Chauveau (1985) had already emphasized the ability of dioula networks to bypass rice distribution control measures imposed by the colonial administration. Chaléard (2002) showed how the interactions of wholesalers, merchants, transporters, and collectors, operating in both rural and urban areas, contributed to the integration of food product markets.

From this brief description of the rice production and market systems in Côte d’Ivoire, it is clear that there can be no question of market corresponding to the criteria of standard economic theory. Rice is a heterogeneous commodity, and various authors have pointed out that one of the reasons for the sustained coexistence of local rice production and imports lies in the mismatch between supply and demand (Chohin-Kuper et al., 1999; Lançon, 2011). In this regard, available studies on consumption habits highlight a differentiation, which vary according to social classes (Chohin-Kuper et al., 1999). These studies also reveal a certain rigidity in these habits (Lançon et al., 2004). They show, in this sense, that several criteria influence consumer choices, including price, but also the intrinsic or perceived qualities of the rice, as well as its associated attributes (Chalmain & Jégourel, 2021; Lançon et al., 2004).

Although the local rice market may seem relatively integrated due to the dynamism of the commercialization systems, its segmentation, both on the supply and demand sides, calls for a theoretical reconsideration of the potential effects of mobile telephony on the income of rice farmers. It can no longer be approached solely through the lenses of access to price information and connection with buyers. It is also about whether the offered product meets the quality criteria of the demand. Market segmentation, by reducing the effective size of demand, appears to be a limiting factor in the commercial opportunities for rice farmers. The situation seems even more restrictive when we examine the organization of production and exchanges at a micro-social scale.

9 <https://www.aderiz.ci/fr/statistiques-sur-la-commercialisation>, consulted on November 24, 2024.

**Box 1: Research Methodology**

The empirical approach of this study is based on socio-anthropological field surveys (Olivier de Sardan, 2008) conducted during the months of July and August in 2019 and 2024 (four months). In addition to the previously mentioned debates, the reflection that led to this research were informed by a previous investigation on the failure of a rice seed information system in Côte d'Ivoire (Dembélé, 2023). As part of this investigation, contacts had been established with agents from the Rice Development Agency (Aderiz), the National Agency for Rural Development Support (Anader) in Abidjan, as well as with rice seed producers in the city of Agboville, located in the southeast of Côte d'Ivoire. The survey started based on these contacts. The first interviews were conducted with these informants with the aim to gain an overview of the general conditions of production and commercialization. Additionally, in July 2019, we followed an informational and training mission for Aderiz agents in the Yamoussoukro region in the northwest of the country. New contacts were made with rice farmers on-site. Based on these contacts, we were able to visit production areas in the localities of Nanan and Logbakro, located 7 km and 17 km from Yamoussoukro, respectively.

It was mainly in and around these two localities, where irrigated rice cultivation is practiced, that the first phase of the two-month survey took place. The selection of participants was done randomly using the "snowball" technique (Blanchet & Gotman, 2017; Noy, 2008). This approach proved to be particularly suitable because the plots, which are modest in sizes, are generally grouped in developed rice fields. Moreover, the continuous nature of irrigated rice cultivation, spanning two or three annual cycles depending on the varieties cultivated, facilitated data collection.

The interviews, conducted with rice farmers and village group leaders, focused on the socio-economic trajectories of the farmers, as well as the organizational models of production and commercialization. Most of the actors met had mobile phones. Thus, part of the interviews were focused on describing the use of the mobile phone and its associated importance.

In Yamoussoukro, additional interviews were conducted with the managers of two mills, who play a key role in the sector as actors in processing. Finally, in addition to direct observations made on the farms, formal and informal interviews were conducted with women traders, who are the main trading partners of the rice farmers interviewed.

The second phase of the survey, carried out in 2024 in the Gagnoa region in the center-west of the country, began with initial contact made with a mill manager in the city. The connection with rice farmers was made through this informant. The survey focused on the peri-urban areas of the city where irrigated rice cultivation is practiced and the localities of Dimi-Dougou and Dahiépa, located 15 km and 21 km away, respectively. The observations and interviews conducted during this second phase followed a similar structure to that of the first phase.

In total, the empirical corpus of this work comprises, in addition to observation notes, 52 formal and informal interviews. After transcription, these data were analyzed into categories in order to answer the research question: how do rice farmers use their mobile phones as part of their productive activity, and what are the potential effects on their market income? In this regard, the selected survey areas are particularly relevant because most rice production is intended for commercialization.

## *The Diversity of the Socio-Economic Conditions of Rice Farmers*

The biographical analysis of the rice farmers encountered reveals a diversity of socio-economic profiles. At the time of the surveys, the age range was between 22 and 54 years, and the experience in rice farming ranged from five to twenty-five years. This diversity is particularly reflected in their trajectories. Kouakou<sup>10</sup>, 25 years old, encountered in the village of Nanan, explains that he became a rice farmer following a school failure and previous experiences in agriculture:

Like any child, I went to school. In the 10<sup>th</sup> grade, when I failed the BEPC (First Cycle Studies Certificate) due to a lack of resources, my parents did not give me a second chance. I turned to agriculture. I started with cotton, then maize, and later I got into rice farming<sup>11</sup>.

He explains that he got into rice farming after participating in a development project aimed at promoting it among the youth of the region. His plot neighbor, N'Guessan, in his thirties, has a similar experience. After leaving high school, he says he tutored students at home, then took on small jobs, before joining a program run by an NGO to train young people in rice farming<sup>12</sup>. In the village of Logbakro, 45-years old Isidore had a different path. Not schooled, he explains that “field work<sup>13</sup>” has always been his main activity since his adolescence. First on the family plantation, then, for over twenty years, as an independent farmer. In addition to rice, Isidore cultivates maize and cassava too. Also in Logbakro, 29 year-old Kouassi is continuing the rice farming activities of his parents.

My parents were already in the field, and I already had a notion of the activity. My father had a large plot of land, but he did not have the means to fully develop it, so when I stopped school in the 8<sup>th</sup> grade, I approached him to get a plot<sup>14</sup>.

A diversity of trajectories is also observed in the Gagnoa region. On the outskirts of the city, Bakary, 37, took on various “small jobs” as a factory worker and taxi driver after obtaining his high school diploma. He recounts joining his brothers, who were already involved in rice farming, to “get by with them<sup>15</sup>”. In the village of Dimi-Dougou, located 15 km from Gagnoa, Adama traces his journey, which is linked to that of his parents, originally from Burkina Faso, who came to work in the region's cocoa plantations. Uneducated, he attended a Koranic school before taking over the family's rice farming business to support his family. Finally, there is the case of Clément, 47, who became a rice farmer after “trying his luck” in Abidjan, the metropolis, where he obtained a higher technician's diploma (BTS). Having returned more than ten years ago to his native village, Clément practices now rice farming on “lands belonging to his family<sup>16</sup>”.

The underlying theme of this diversity of trajectories and social conditions lies in a shared view of rice farming as an essential source of monetary income. The examination of access to land—the main production factor—in the two survey areas reveals three main procedures. The first, particularly common in the Yamoussoukro area, is based on inheritance through succession or land allocation through customary rights. The second, more widespread in the Gagnoa area, where a significant portion of rice farmers are immigrants from Burkina Faso and Mali, is based on land leasing. This practice, also known as “condition”, involves payments in kind based on the level of the harvest. This is the case for Kader<sup>17</sup>, a rice farmer from the village of Dahiépa, who pays a rent of 3 bags of 100 kg of paddy<sup>18</sup> on a harvest estimated at 3 tons per cycle. Finally, the last method, less common but observed in the peri-urban areas of Gagnoa, involves the acquisition of plots through the transfer of property rights

10 This name is a pseudonym as well as those used in the rest of the text.

11 Extract from an interview conducted on July 20, 2019.

12 Interview conducted on July 20, 2019.

13 Interview conducted on July 26, 2019.

14 Interview conducted on July 27, 2019.

15 Interview conducted on July 24, 2024.

16 Interview conducted on August 4, 2024.

17 Interview conducted on July 27, 2024.

18 Paddy is rice as it is harvested. It undergoes a transformation process to become white rice, which is generally consumed.

## *The role of mobile phones in productive activity*

In terms of production, rice farmers generally obtain seeds and fertilizers from cooperatives or village groups. Fertilizers and plant protection products, which are commonly used, are supplied by resellers who travel through the production areas.

In addition to inputs, irrigated rice cultivation relies on a series of key steps: plowing, transplanting nurseries, harvesting, and threshing. In conditions where the majority of rice farmers only have a hoe as their main work tool, these steps are difficult to accomplish individually. Various strategies are adopted to overcome these constraints. The first approach is through workgroups. Composed of about ten people, these groups, also called “societies”, are based on mutual assistance, with members taking turns to work on their different plots. The dynamism of these groups, observed in both survey areas, is facilitated by the fact that several plots are grouped together in the same rice field. The steps of plowing and harvesting are generally carried out by these workgroups. Another strategy is to use the service of the daily workers. In the Yamoussoukro area, in particular, women living in the villages surrounding the rice fields offer their services to rice farmers for transplanting seedlings. Finally, another practice involves renting power tillers for plowing and combine harvesters during harvest time from operators.

In both survey areas, these three strategies coexist without excluding each other, as illustrated in Figure 3. The choice of one or another depends on the situation and individual resources. While workgroups are based on the trust relationships that may exist between rice farmers, hiring workers and using machines depends on the ability to generate cash. At this level, other strategies are also implemented. In Logbakro, Isidore explains that he finances work on his plot with a part of the profits from his cassava and maize production. On the outskirts of Gagnoa, Bakary relies on his savings. Another rice farmer, Yao, who lives in the village of Nanan, says he regularly receives financing from certain women’s traders.

Trust has developed between them [the traders] and us. They pre-finance us, and at harvest time, they come to collect our rice. They pay part of the price, and the other part is the repayment of the loan. It often takes time before they pay us, but they always end up doing it<sup>19</sup>.

The existence of this practice, confirmed by the interviews conducted with agents from Aderiz, is also confirmed by Rama, a wholesale trader met in Gagnoa:

I work in partnership with the producers. We assist them, we provide pre-financing for the harvest, meaning that the rice is already ready, already cultivated, and the producer wants to harvest it. This is where we usually come in, and I recover my investment during the processing, based on the current market price<sup>20</sup>.

<sup>19</sup> Interview conducted on August 30, 2019.

<sup>20</sup> Interview conducted on July 23, 2024.



Figure 3: A group of rice farmers working collectively to thresh a harvest.

Source: Author, August 2019.

In this production system, the mobile phone plays an important role. Kablan, a rice farmer from Nanan, considers it an indispensable tool:

We need it to work. I received calls this morning. Even in the mud when we are working, we keep our phones with us. Often, we get calls and the phone falls into the mud and gets damaged. We are obliged to repair it or buy a new one, since we cannot do without a phone<sup>21</sup>

The analysis of mobile phone usage (fig. 4) described by rice farmers highlights two main functions: coordination and information. The first is expressed through phrases like “it makes work easier”, “it helps avoid unnecessary travel”, and “it saves time”, which were regularly mentioned during interviews. For example, Germain explains that his phone allows him to “call the other members of the society [when he has] tasks in his field<sup>22</sup>”. In Logbakro, Aboulaye uses it when he needs help to work on his plot:

It is during the harvest period that I get help from other people. I have their number, so when the time comes, I call them. As I said, I call the people I work with and I receive information from the cooperative<sup>23</sup>.



Figure 4: A mobile phone placed next to a daba, the main tool used by rice farmers.

Source: Author, August 2019.

<sup>21</sup> Interview conducted on July 10, 2019.

<sup>22</sup> Interview conducted on August 8, 2024.

<sup>23</sup> Interview conducted on July 17, 2019.

The second function of the mobile phone in the context of production concerns access to information:

I use my phone in my activities. I can call the president of the cooperative when I have problems in the field or call other farmers to get information<sup>24</sup>.

The phone allows us to easily access information. For example, if a farmer wants to know about treatment products, he can call the suppliers to find out<sup>25</sup>.

Often, we do not know the prices in the market. Instead of traveling, we can call other farmers to share information<sup>26</sup>.

### *The economic situation of rice farmers*

The argument presenting the mobile phone as a tool likely capable of improving the economic situation of smallholders is based on the idea that better access to information enhances their negotiating power and ability to make trade-offs. As we have just seen, the mobile phone is widely adopted and used by the rice farmers met. It remains to be seen whether this usage translates into better market prices. This question is addressed in the final section through a descriptive analysis of the organization of trade in the two areas studied.

After the threshing activities, the harvest goes through several steps before it is marketed. The paddy rice must be dried to reduce its moisture content, then winnowed to remove impurities and other external elements. It then undergoes a transformation process that removes its outer shell to produce the polished rice sold on the markets. In the areas surveyed, except for drying, which is often done on the edges of the rice fields, these activities are carried out at mills (Fig. 5) where farmers bring their harvests through transporters.



Figure 5: Drying of paddy rice in the courtyard of a mill in Gagnoa.

Source: author, July 2024.

The mills or rice mills thus play a central role in the rice production chain. As processing facilities equipped with husking machines (fig. 6), the mills also serve as aggregation points where supply and demand meet.

<sup>24</sup> Interview conducted on July 25, 2024.

<sup>25</sup> Interview conducted on July 22, 2019.

<sup>26</sup> Interview conducted on August 2, 2024.



Figure 6: A husker in a mill in the city of Gagnoa

Source: author, July 2024.

However, exchanges take place under a number of conditions that should be presented.

A first condition is logistical. To minimize transportation costs, rice farmers transport their harvest typically to the mill closest to their farm. In this regard, it is worth noting that mill operators often grant advances in cash or in kind—inputs in particular—to rice farmers. This practice, previously highlighted by Becker and N'Guessan (2004) in a study on the rice sector in Côte d'Ivoire, was confirmed by Philippe<sup>27</sup>, a mill operator in the Yamoussoukro area. He sees it as a strategy to secure production and maintain his business. For the rice farmers benefiting from these advances, the sale at the mill coincides with the repayment of their debt.

Another exchange condition, directly linked to the first, concerns the resources available to rice farmers. Table 2 provides an overview of the different average costs associated with irrigated rice growing. These costs, especially high for smallholders, represent a first constraint. A second constraint lies in the lack of storage and packaging infrastructure in the study areas to preserve the quality of harvested rice. The combination of these two constraints creates a situation where rice farmers, short on liquidity during harvest time, often find themselves in a hurry to sell their production.

Another condition of the exchange relates to the formation of sale prices. Although rice prices are generally the result of a bargaining process between the exchange partners, two parameters are generally taken into account. On one hand, there is what the actors refer to as the “current price” for a given variety or type of rice. Both the rice farmers and the traders encountered have an understanding of the national market as an integrated market, with prices that, in a way, “impose” themselves on them. During the survey carried out in 2019 in the Yamoussoukro area, “WITA 9” rice, the most cultivated variety, was sold between 175 and 200 CFA francs per kilogram. In the Gagnoa area, the rice farmers we met mainly cultivated “JT 11”, “C 26”, and “C 10” varieties whose price range was respectively between 400 and 550 CFA francs, 450 and 500 CFA francs, and 550 and 600 CFA francs per kilogram. The other parameter mentioned in the evaluation of rice prices is its perceived quality. This is generally determined by the whiteness and uniformity of the rice grains. Rice deemed to be of poor quality, for example, yellowish rice or rice with grains of varying sizes or shapes, is less valued by traders, which can result in a significant drop in price or even the cancellation of the transaction.

Finally, a last condition of exchange concerns the relationships that may exist between rice farmers and their buyers, primarily women traders in the areas studied. Interlinked and loyalty transactions are common practices. The former can be seen in the advances on harvests granted by some traders

<sup>27</sup> Interview conducted on July 24, 2019.

to rice farmers, as mentioned above. Thus, the exchange is not only seen as a meeting of supply and demand but also as the moment when relationships of trust are honored, with the buyers also acting as creditors. Loyalty transactions, for their part, are reflected in some statements from rice farmers:

Everyone has their own clients, but it is a market, so it happens that your client collaborates with another producer, and that is not a problem. The most important thing is that among all these clients, each one has their partner with whom they collaborate for financing and other things. When harvest time comes, it is that partner who gets served first before the others are given their supply<sup>28</sup>.

After having presented these various descriptive elements, it is now necessary to address the question that has run through the entire reflection: Does mobile phone enable the rice farmers we met to obtain better market prices?

This research, mainly qualitative, does not allow for a definitive answer to this question. It does, however, provide some elements for an initial response. It has been pointed out that, despite relative integration, the local rice market is characterized by its segmentation. Theoretically, this macroeconomic structure of the market limits the effective size of consumer demand, and consequently that which traders address to the rice farmers. Despite this constraint, however, it is still possible to assume the existence of informational problems that could be resolved by adopting mobile phones, enabling rice farmers to obtain better prices. In order to examine this hypothesis, we need to assess the opportunities for arbitration and the bargaining power of the rice farmers. However, the elements that have just been presented—such as the geographical concentration of exchanges at mills, the lack of storage infrastructure, and the limited resources of the rice farmers—indicate that their ability to make spatial or temporal arbitrage decisions is constrained. The existence of prices that impose themselves on the actors, as well as the phenomena of tied and loyal transactions, also lead us to believe that the rice farmers have limited bargaining power. Ultimately, if the ability to make arbitrage decisions and bargaining power are considered as means to obtain better market prices, it seems evident that the rice farmers surveyed do not possess these means, even though they are equipped with mobile phones.

1-Input				
NPK	kg	150	445	66 750
UREA (46%)	kg	100	270	27 000
Herbicide (Garil)	liter	4	8 000	32 000
Insecticide (Furadan)	kg	20	3 500	70 000
Seeds	kg	40	600	24 000
<b>Total 1- Inputs</b>				<b>219 750</b>
2 - Service Provisions				
Cleaning	ha	1	35 000	35 000
Plowing	ha	1	85 000	85 000
Transplanting	ha	1	50 000	50 000
Security	ha	1	25 000	25 000
Harvest	ha	1	25 000	25 000
Paddy Collection	ha	1	20 000	20 000
Threshing	day	1	20 000	20 000
Winnowing	100kg bag	50	200	10 000
Drying	day	3	1 500	4 500
Paddy Transportation	ha	1	7 000	7 000
Membership Fee	F/cycle	1	15 000	15 000
Sacherie	Number of Bags	50	600	30 000
<b>Total 2- Services Provision</b>				<b>326 500</b>
<b>TOTAL EXPENSES</b>				<b>546 250</b>

Table 2: Typical operating costs for an irrigated rice cycle on a one-hectare area

Source: Aderiz documentation (2019a).

**Note:** The expenses borne by a rice farmer on a one-hectare plot represent more than seven times the minimum wage in Côte d'Ivoire, set at 75,000 CFA francs.

28 Interview conducted on July 17, 2024.



## Conclusion

The aim of this article was to take a critical look, both theoretically and empirically, at the argument that mobile phone is a tool likely to improve the economic situation of smallholders in the global south.

The first part of the article revisited the academic debate surrounding the effects of mobile phones on smallholders' market income. A review of various studies conducted in this context highlighted that no direct causal relationship can be systematically established between access to mobile phones and smallholders' income. Indeed, while some impact studies have found positive relationships, others have shown no effect or even potentially negative outcomes. The discussion of quantitative and qualitative research in this first section highlighted the need to consider the structure and organization of markets when analyzing the effects of mobile technology.

Building on these theoretical considerations, the second part of the article addressed the question of the effects of mobile phones on the income of rice farmers in Côte d'Ivoire through a combined macro-economic, micro-economic, and sociological approach. The macro-economic analysis revealed the relatively integrated but segmented structure of the rice market in Côte d'Ivoire, a parameter limiting the effective size of the demand directed towards rice farmers. This analysis was further deepened with data from a field survey conducted in localities in two regions in the country. Micro-economic and sociological perspectives highlighted several constraints: limited resources, geographic concentration of trade, lack of storage infrastructure, and the prevalence of interlinked and loyalty transactions. These constraints limit both the bargaining power of rice farmers and their ability to make trade-offs. Therefore, the idea that mobile phone adoption could improve their remuneration appears unlikely.

This article highlights the fact that issues as crucial as the livelihood of smallholders, a key component of the economies in the global south, cannot be reduced to problems of access to information, mobile phones, or digital platforms. Above all, these issues require in-depth, multidimensional analysis that takes into account economic structures and social dynamics. In a context marked by the proliferation of initiatives aimed at promoting digital tools in various sectors of the global south, often accompanied by discourses presenting them as "solutions", it is essential to remind that many contemporary challenges are less about technology than about political choices and transformations.

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