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WOMEN ENTREPRENEURS
FINANCE INITIATIVE

INTEGRATING GENDER INTO THE MARKET INFORMATION SYSTEM IN CÔTE D'IVOIRE

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About We-Fi

Founded in 2017, the Women Entrepreneurs Finance Initiative (We-Fi) is a multilateral partnership supporting women entrepreneurs in developing countries with access to finance, markets, technology, mentoring, and other services, while working with governments and the private sector to improve the laws and policies inhibiting women's businesses in developing countries. It has allocated $353 Million since 2018, which will support over 200,000 WSMEs in 60+ countries and will mobilize $3.55 billion in additional private and public sector funds.

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1. Introduction

Agricultural Markets, particularly in low- and middle-income countries, can often be characterized as suffering from imperfect and asymmetric information (Allen, 2014). Individuals, households, and firms use a variety of tools—such as personal travel, radio, television, and more recently mobile phones—to help mitigate information constraints on input and output prices, potential buyers and sellers, new technologies, natural disasters, etc. Prior to the widespread adoption of mobile phone technology, Aker (2008) highlights that personal travel, rather than listening to weekly radio programs, is a preferred tool for gathering information on market dynamics. Since personal travel requires significant time and money, relative to other tools, this represents an important barrier to market integration for individuals who must travel long distances to gather market information. In addition, if women have tighter constraints on their time relative to men—due to gendered social norms and responsibilities taking care of children or other at-home activities—then the opportunity cost associated with gathering market information will be higher for women than for men. Therefore, innovations in market information systems that reduce the transaction and opportunity costs associated with gathering information have the potential to reduce gender gaps in agricultural outcomes and, in turn, may promote women's economic empowerment.

This policy note first reviews the role of sustainable agricultural market information systems in promoting functional agricultural markets in low- and middle-income countries. Although much of this literature only reports on the average effect of market information systems on agricultural outcomes, this review pays special attention to any gender specific effects reported in existing studies. This policy note also discusses why we may—or may not—expect to see differential gender-specific results when studying the effect of market information systems on agricultural outcomes. Next this policy note briefly discusses the context of Côte d'Ivoire. In doing so this policy note introduces the Office for the Commercialization of Fruits and Vegetables, an institution that may be uniquely positioned to implement and manage a market information system innovation in Côte d'Ivoire. Finally, this policy note concludes with a list of recommendations to be considered prior to the implementation of a market information system intervention, particularly if a primary goal of such an intervention is to reduce existing gender gaps in agricultural production.

Summary

- Evidence on the effect of market information systems on agricultural market outcomes is mixed.
- Given its mission, the Office for the Commercialization of Fruits and Vegetables may be well suited to providing market information and services.
- To be beneficial, market information systems need to provide relevant information for participants.
- Market information systems alone may not improve market outcomes; effectiveness also depends on the market structure, bargaining power, and other market failures that persist (e.g. access to credit or insurance).
- Market information systems have the potential to reduce gender gaps in agricultural outcomes if women have tighter constraints on their time relative to men and the reduction in transaction and opportunity costs associated with gathering market information is more valuable to women then men.
- Access to and ownership of technology—and particularly mobile phones—can skew toward men in some contexts. Therefore in order for market information systems to reduce gender gaps in agricultural production, critical attention must consider the potential barriers to access and use of technology for women possibly due to gendered social norms.
- Market information systems are not a panacea, but an important ingredient to the functioning of local agricultural markets.

2. The Role of Market Information Systems and Gender

In this section this policy note reviews the literature on the role of market information systems with a special emphasis on documented gender differences in the estimated effects. Several other reviews on market information systems include more general discussions on mobile phones and information and communication technologies (ICTs). For example, focusing broadly on the role of mobile phone technology in driving economic development in sub-Saharan Africa, Aker and Mbiti (2010) discuss how mobile phones may reduce the cost of information and facilitate welfare gains. Additionally, Heeks (2010), Jenson (2010), Aker (2011), and Nakasone, Torero and Minten (2014) review the role of ICT services in reducing information constraints on agricultural development.

The work of Jensen (2007) and Aker (2010) represent the seminal studies on the role of market information systems. Both studies use similar empirical strategies and estimate the effect of the staggered roll-out of mobile phone coverage on agricultural markets. Jensen (2007) investigates aquaculture markets in Kerala, India and finds that the introduction of mobile phone coverage within the state reduces price dispersion for fish and also reduces wasted products. This increased efficiency leads to an eight percent increase in fishermen's profits and a four percent reduction in consumer prices. Therefore, the welfare of both producers and consumers increased as a result of the introduction of mobile phone coverage and the associated reduction in the cost of market information. Jensen (2007) does not differentiate the results by gender, nor does a complementary study by Abraham (2006) who also studies the role of mobile phones on the fishing industry in Kerala, India. Aker (2010) investigates grain markets in Niger and finds that the introduction of mobile phones reduces the dispersion of grain prices. This effect seems to be partially explained by mobile phones providing actionable market information for grain sellers who usually incur relatively high transportation costs. Aker (2010) also finds that the price dispersion effect grows in magnitude over time, which suggests that the strengthening of mobile networks over time increases the effectiveness of mobile phones on agricultural market outcomes. Similar to Jensen (2007), Aker (2010) also finds that the introduction of mobile phones is associated with increases in both producer and consumer welfare.

Aker and Mbiti (2010) compare the findings of Jensen (2007) and Aker (2010) and note that although the estimated effect magnitude of Aker (2010) is smaller than the estimated effect magnitude of Jensen (2007), the finding is more surprising because grain is easier to store and preserve over a long period of time than fish. A primary mechanism explaining these effects is that grain traders with access to mobile phone technology compare market conditions over a larger set of markets, sell in more markets, and have more market contexts compared to grain traders without access to mobile phone technology. Additionally, Aker (2010) does not differentiate results based on gender.

Previous work on the topic of market information services includes Svensson and Yanagizawa (2009) who study the effect of radio shows broadcasting market prices for different agricultural commodities in Uganda. The authors find that farmers who received this price information received farm-gate prices that were 15 percent higher and sold more maize as compared to farmers without access to this information. This implies that farmers with access to price information enjoyed a 55 percent increase in crop revenues (Svensson and Yanagizawa, 2009).

Other studies build on the work of Jensen (2007) and Aker (2010) and add additional insight. In general, evidence on the effect of market information systems on agricultural market outcomes is mixed. Aker and Ksoll (2016) point out that mixed evidence is expected, noting that there is little reason to believe that access to market information systems would lead to changes in agricultural outcomes in all countries for all crops. If markets are well integrated, then increased access to information should have very little effect on agricultural outcomes. On the other hand, if markets are not well-integrated—due to, for example, relatively high transaction costs—then easier access to quality information could give farmers more ability to compare market conditions across a variety of locations, consider alternative production approaches, or switch to produce an alternative set of crops. Despite all of this, if other market failures persist—such as lack of access to credit or insurance—then increased access to information may not lead to improved economic outcomes. In the remainder of this section this policy note summarizes the literature that builds on the work of Jensen (2007) and Aker (2010). Specifically, this policy note discusses the role of perishable crops, the effect on investment choices, and how market information systems can enhance farmer bargaining power.

Perishable Crops—Using a similar empirical approach to both Jensen (2007) and Aker (2010) but highlighting the effect on market participation rather than market efficiency, Muto and Yamano (2009) estimate the effect of mobile phones on agricultural markets in Uganda. Focusing on market participation, rather than market efficiency, allows for a more detailed investigation of different effects among sub-groups in the data. Muto and Yamano (2009) find that mobile phone coverage is associated with a ten percent increase in the probability of market participation for bananas, but no effect on the probability of market participation for maize. Muto and Yamano (2009) argue that maize is much easier to store and preserve than quickly perishable bananas and this detail likely explains their differential effects.

Similarly, Aker and Fafchamps (2014) study the effect of mobile phone coverage on producer price dispersion for cowpea, millet, and sorghum in Niger. Aker and Fafchamps (2014) find that mobile phone coverage reduces price dispersion for cowpea but not for either millet or sorghum and point out that cowpea is more perishable than millet or sorghum, which may explain these differential results. Both of these studies highlight that market information systems may be more important to farmers of perishable crops due to the inability to store and preserve these crops for a favorable time to sell. Neither Muto and Yamano (2009) or Aker and Fafchamps (2014) explicitly explore gender-differentiated effects.

Investment Choices—One way farmers can use market information is by investing in alternative production processes, adopting a new technology, or changing the variety of crops they grow. Aker, Ksoll and Lybbert (2012) implement a randomized control trial evaluating an adult education program in Niger where some students received training on how to use a simple mobile phone. Aker and Ksoll (2016) report on the agricultural outcomes of this randomized control trial and find that treated households were more likely to plant a more diversified set of crops. In particular, households were more likely to grow okra, a cash crop that is predominantly grown by women in Niger. Aker and Ksoll (2016) also find that the estimated effects were stronger among households that did not previously own a mobile phone, lived in villages without a market, and where a female was the primary beneficiary of the training program. The findings of Aker and Ksoll (2016) represent the clearest insight in the literature highlighting any gender-specific effects of market information systems.

This result, however, does not persist in all countries. Fafchamps and Minten (2012) find no evidence that information on market conditions and weather influences agricultural outcomes. The authors conduct a randomized control trial in Maharashtra, India where treated farmers are provided information on market conditions and weather fore- casts. Fafchamps and Minten (2012) find no statistically significant effects on a number of outcomes including the likelihood of changing crop varieties and cultivation practices. The primary reason for the lack of any effect is the lack of take-up of the information treatment of study participants over the study period. As this policy note will discuss in Section 4, this highlights the need to ensure that the market information system provides relevant information for participants. Finally, Fafchamps and Minten (2012) do not discuss gender-specific results.

Bargaining Power—In many low- and middle-income countries farmers have a choice between selling their products to traders and transporting their products to the nearest market themselves. Due to relatively high transportation costs, farmers in relatively re- mote villages often have little alternative than to sell their products to traders. Further- more, traders can collude with each other to ensure that they themselves capture as much of the profits as possible, leaving little profit for the farmer.

Goyal (2010) studies a unique innovation on behalf of a large buyer of soybeans in Madhya Pradesh, India. Prior to the innovation, soybean farmers sold their crop to traders in agricultural markets who, in turn, sold the soybeans to processing companies. These traders often colluded with each other to avoid bidding up the price of soybeans too much and therefore extracted a larger share of the profits for themselves and left little for the soybean farmers. In 2000 a large buyer of soybeans decided to eliminate the intermediaries entirely. They installed internet kiosks in villages, which enabled farmers to easily observe wholesale prices of soybeans. Goyal (2010) finds that in villages with an internet kiosk soybean prices increased by between 1 and 3 percent. This increased price seems to also have incentivized more cultivation of soybeans in villages with access to an internet kiosk. Finally, Goyal (2010) does not differentiate effects based on gender.

Similar findings do not necessarily hold in all other contexts. Courtoic and Subervie (2015) survey farmers in Northern Ghana and find that farmers with access to a mobile phone based market information system received about 13 percent higher prices for maize and ten percent higher prices for groundnuts. Nakasone (2014) report on results from a randomized control trial in Peru which provided farmers with detailed price information on a mix of relevant crops and find that farmers who received this information received 14 percent higher prices for their crops than farmers who did not receive this information. Finally, Zanello, Srinivasan and Shankar (2014) document that although the use of market information systems in Northern Ghana did not encourage farmers to sell their crop at different markets, the farmers used this information and increase their bargaining power at a closer market. In contrast, Mitra et al. (2018) implement a randomized control trial with potato farmers in West Bengal. In the experiment the authors provided potato price information via public boards and personal phone calls. Although the price information increased farmers' knowledge of price information, it did not have an effect on their prices received. Mitra et al. (2018) suggest that this result is due to the market structure in the area. It turns out wholesalers were not willing to buy directly from smallholders and negotiated only with middlemen. Therefore, even with the price information, farmers were unable to translate this improved knowledge into increased bargaining power. Finally, none of these studies report on gender-specific effects.

The lack of specific information on gender-specific effects of market information systems begs the question: Why would we expect different effects between men and women? The literature raises at least two reasons why we would expect to find different effects of market information systems between men and women on agricultural outcomes.

First, dating back to Udry (1996), we have seen evidence of gender disparities in agricultural outcomes driven in part by disparities in resource allocations within agricultural households. If access to information provides insight on the profitability of alternative crops—which perhaps are predominantly farmed by women, as with okra in Niger (Aker and Ksoll, 2016)—then we may expect to find different gender-specific effects. If, however, access to the market information system does not influence the specific constraints limiting equitable and efficient resource allocations within agricultural households, then we may not expect to find different gender-specific effects.

Second, in many contexts around the world local social norms demand that women spend more time on tasks within the household—such as taking care of children, cooking, or other home activities. This being the case, women may have a higher opportunity cost associated with gathering market information in the absence of some innovative market information system. As the literature documents, increased access to market information reduces the necessary time required to gather critical market information. If the value of this cost reduction is greater for women than it is for men, then we may expect to find different gender-specific effects. If, however, men and women value this cost reduction similarly, then we may not expect to find different gender-specific effects.

Despite these reasons why we may expect women to benefit more from market information systems, we may still fail to find meaningful differences in gender-specific effects in some cases. In some contexts around the world mobile phone ownership in particular tends to skew in favor of men over women (Burrell, 2010). Additionally, even if women have access to a mobile phone, they may have limited privacy or independence to use the phone as they wish due to gendered social norms (Dodson, Sterling and Bennett, 2013). These constraints to access and usage can reduce women's potential access to and use of market information systems, and their ability and capacity to translate the information into economic benefits (Aker, Ghosh and Burrell, 2016).

This brief review suggests that future research on the effect of market information systems on agricultural outcomes could do well to estimate gender-specific effects. Although it seems entirely plausible that women may benefit from market information systems more than men, there is no evidence that clearly documents this type of differentiated effect.

3. Côte d’Ivoire Context

In this section, this policy note summarizes the Côte d’Ivoire context with a special emphasis on the potential effectiveness for an innovative market information system to promote widespread access to functioning agricultural markets and women’s economic empowerment. Agriculture remains a critical sector in the Ivorian economy. According to the International Fund for Agricultural Development (IFAD) the agricultural sector employs over 70 percent of the Côte d’Ivoire’s labor force. It is also the world’s largest producer of cocoa, the world’s third largest producer of yams and cashew nuts, and is the world’s eighth largest producer of plantains. At the same time, according to the World Bank in 2020, 41.5 percent of the population lives in poverty (down from 55 percent in 2011 and 44.4 percent in 2015, but up from 39.4 percent in 2019). The recent increase in poverty can be attributed to the coronavirus pandemic. Again according to the World Bank, in April 2020, 43 percent of the household-heads in Abidjan reported being either unemployed or inactive, compared to 15 percent in 2018. Moreover, according to IFAD about 15 percent of rural households experience food insecurity, with rural women and children being the most vulnerable.

This context includes four factors that may enable an intervention of an innovative market information system to provide benefits for both agricultural markets in general and for women’s economic empowerment more specifically. First, despite high levels of production of specific agricultural commodities, the agricultural sector in Côte d’Ivoire is often characterized with low productivity. Second, the purchasing price of many agricultural products in Côte d’Ivoire is often relatively low. Third, the cost of agricultural inputs is relatively high. Therefore, an innovation that can boost agricultural productivity, increase the bargaining power of smallholder farmers, and reduce the price of inputs relative to crop revenue may spur agricultural development. Finally, Côte d’Ivoire has an administrative agency that seems capable to organize and facilitate such a market information system innovation.

Founded in 1984, the Office for the Commercialization of Fruits and Vegetables (OCPV) aims to provide assistance to improve the marketing of food products in Côte d’Ivoire. The OCPV was founded in response to a reorganization of the food sector in Côte d’Ivoire where the central government formally withdrew from the production and distribution of agricultural commodities. Therefore, given the mission of the OCPV, its role is primarily to provide information and services that aid the marketing of agricultural commodities. The actual distribution of these commodities is reserved for private actors.

The OCPV is responsible for the following activities:

- Study constraints related to the collection and distribution of food products and re- port on strategies capable of ensuring better marketing of these products.
- Contribute to the organization of markets for food products—particularly wholesale and retail markets, and report on strategies capable of improving the performance of these markets.
- Participate in the development and application of any policy aiming to improve the supply and distribution of food products.
- Provide assistance to private actors in the food system and generally promote the expansion of trade of these products.

To date, the OCPV has conducted three core initiatives: (i) Provide valid and actionable market information in the form of food crop chronicles, bulletins, price collections, and trade flows; (ii) Promote commercial infrastructure supporting wholesale markets and food product collection centers; and, (iii) Provide assistance and supervision to private actors in the distribution and marketing of food products.

4. Information for Women's Empowerment: Recommendations

Research on the role of market information systems suggests that effect of market information initiatives on agricultural outcomes—such as access to information, technology adoption, marketing, yields, or profits—is mixed (Aker, 2011). The mixed results can be explained, in part, by the differing degree of information asymmetry across contexts and even across crops within a given context. This research highlights that market information initiatives are most successful when they address a key information need. For example, when information asymmetries are high, or when related markets (e.g., credit and infrastructure) performing relatively well (Aker, Ghosh and Burrell, 2016).

Is Information Missing?—A core assumption of any market information system innovation is that the intervention addresses a key market failure, namely the lack of market information. In order for a market information system to lead to any positive change in agricultural outcomes information must be a constraint in a given market context—both in general and for the specific information provided (i.e., weather, prices, technology) and for the target population (Aker, Ghosh and Burrell, 2016). Critical consideration must cover what information is missing and who is missing this information. In addition, for the purposes of increasing women's economic empowerment, critical consideration must address if gendered constraints limit women's access to this information.

Information Source and Trust—Even if information on specific market activities for a specific population is really missing, a market information system may still ultimately fail to lead to widespread benefits if it does not provide accurate or useful information. Aker, Ghosh and Burrell (2016) note a relatively extreme example, if an information system pro- vides consumer prices for crops in markets that are irrelevant for local farmers, then the benefits of that system will be limited at best. Providing irrelevant information seems to explain the weak effect of market information systems on farm prices in rural Ethiopia (Tadesse and Bahiigwa, 2015) and India (Fafchamps and Minten, 2012). Furthermore, the market information system needs to both provide information from a trusted source and the market information system needs to be managed by a trusted institution. Market information systems often replace time-consuming face-to-face interactions between trusted individuals (Oreglia, Liu and Zhao, 2011). These face-to-face interactions often come at a considerable cost, but if farmers do not trust the source or management of the market information system the benefits of that system will again be limited.

User Interface and Access—Even if information is really missing and the provided in- formation is accurate and useful, a market information system may still ultimately fail if the user interface, or access to the technology, limits the system's use. Revisiting the context of Kerala, India, Anoop, Ajjan and Ashok (2015) study the determinants of adoption of ICT-based market information systems. They find that factors such as education attainment, family size, and previous contact with an extension agent are all positively associated with the adoption of ICT-based market information systems. In addition, factors such as technical operation and language barriers are negatively associated with the adoption of ICT-based market information systems. The provision of information via any form of technology must sufficiently test the technology's user interface. Finally, as previously discussed, access to and ownership of technology—and particularly mobile phones—can skew toward men in some contexts around the world (Burrell, 2010). Therefore, in order for market information systems to reduce gender gaps in agricultural production, critical attention must consider the potential barriers to access and use of the technology for women possibly due to gendered social norms (Dodson, Sterling and Bennett, 2013). In the context of Côte d'Ivoire, however, mobile phone use is widespread. According to the World Bank in 2019 Côte d'Ivoire has a relatively high mobile phone penetration rate (the number of SIM cards divided by the population is 128 percent) and is high relative to other low- or middle-income countries. This suggests that mobile phones may be an appropriate technology for a market information system. With that said, the quality of mobile phone coverage is not universal or evenly distributed. Again according to the World Bank in 2019, 94 percent of the population has access to 2G mobile networks, about three-quarters of the population has access to 3G, and about half of the population has access to 4G. This represents a potential challenge for the expansion of mobile-based information services.

Perishability, Storage, and Institutions—Finally, even if information is really missing, the provided information is accurate and useful, and the user interface of the technology is accessible and usable by the primary beneficiaries, a market information system may still ultimately fail if the users are not able to effectively act on this information. A key in the success of market information systems in improving agricultural production and market efficiency is the ability of farmers to exploit efficiency gains by taking advantage of arbitrage opportunities (Jenson, 2010). Studying coffee farmers in rural Ethiopia, Andersson, Bezabih and Mannberg (2017) show that when two markets have access to operating ware- house space, the price spread between these markets is lower than market pairs without access to warehouse space. This evidence highlights a potential complementarity between market information systems and storage facilities. In addition, the institutional environment is also important. For example, Mitra et al. (2018) document the unwillingness of wholesalers in the potato value chain in West Bengal to buy directly from smallholder farmers. This limited the effectiveness of a market information system intervention in that context. Finally, Aker and Ksoll (2016) argue that the effect of market information systems on agricultural outcomes will be limited if market failures persist in other markets—for example, for credit and insurance. This final point highlights that market information systems are not a panacea, but rather an important ingredient to the functioning of local agricultural markets.

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