Improving access to market information: a driver of change in marketing strategies for small producers?

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Summary:

The circulation of information has been pointed out by the economic literature as a main factor of market performance. In developing countries, information asymmetries are frequently mentioned as limiting the effectiveness of agricultural markets. Rice market in Madagascar, characterized by a great instability and a poor spatial integration, is an illustration of such situation. Market Information Systems (MIS) aim at improving market performance, through the dissemination of information to producers and other market players. However, their effectiveness often remains limited, hampered by the lack of consideration of the market players' behavior and constraints, especially those of smallholder farmers.

Livelihoods, commercialization practices and access to market information are analyzed on a sample of 582 farm households in two main rice production areas in Madagascar. Different ways to disseminate market information and knowledge are tested on a subsample of farmers and extension staff: SMS, radio programs, and educational modules. A light survey on the recipient provides early feed-backs on their appraisal of each communication media.

To have a better access to market information is perceived as necessary by the majority of producers. Expectations in term of information are differentiated according to producers' types and their degree of remoteness. The more the actors are involved in market (more marketable surplus or paddy collection), the more they demand for precise and personalized communication means (ie. mobile phone) and the more they are willing to pay the information. Yet, the capacities of the majority of producers hamper the adoption of systems based only on mobile phone. Furthermore a large share of farmer households still doesn't have a mobile phone. Among those that do, there is rapid turn-over of phone numbers, which cannot allow maintaining sustainably recipients. To alleviate the risk of increasing inequalities while developing MIS entirely based on mobile phones, it seems critical to include them within extension or other farmer support programs, and to diversify communication means (including radio, bulletin board) along with marketing capacity building.

Key-words: market access, market information systems, smallholder farmer, price, rice

JEL : Q12, Q13

Introduction

The availability of information is seen by many economists as one of the fundamental factors of market efficiency (FAMA, 1965). In developing countries, information failures prevail in agricultural markets, leading to high transaction costs related to the search for products, to negotiation and to transport (FAFCHAMPS & GABRE-MADHIN, 2006). These high transaction costs depreciate farm prices, producers being penalized by information asymmetries, particularly in the case of remote production areas.

The MIS (Market Information Systems) are seen as market tools that can contribute to a better insertion of producers in markets (ARIAS et al., 2013). They are designed to improve market performance, reducing asymmetries by the disseminating of information to market players, and providing monitoring tools for policy makers (SHEPHERD, 2007). The rise of mobile phone brought-up a wind of modernization in rural areas and a renewal of MIS. Several case studies highlight the positive impact of mobile phones on market performances (JENSEN, 2007; AKER, 2010). MIS have increasingly integrated mobile phone as their main dissemination tool, since the beginning of the 2000's. However, MIS efficiency remain limited and controversial (FAFCHAMPS & MINTEN, 2012; GOYAL, 2010). One of the factors limiting their efficiency appears to be the inadequate consideration in their design of the practices and strategies of market actors as well as the real constraints to access to market, particularly those of smallholders' (GARUKU et al., 2009; GALTIER et al., 2014). In the context of structural changes in food markets in developing countries, due to trade liberalization and to the growing demand of expanding urban centers, the role of information in improving access of small producers to the market is questioned.

Market performance issue is particularly strategic for rice in Madagascar. Indeed, rice is not only the staple food of the population; it is also produced by 85% of farm households (MAEP, 2007). Rice has always held a paramount place in the economic policy of the country (RANDRIANARISOA, 2003). However, rice prices are suffering from high instability, which penalizes both producers and consumers. The magnitude of seasonal fluctuations is particularly important in remote areas, going up to 70%, likely due to high transaction costs and a limited credit market (STIFEL & RANDRIANARISOA, 2006). A Rice Observatory (OdR) was set-up in 2005, after a major crisis on the domestic market, which leaded to a violent surge in prices. OdR aims at both informing policy makers and ensuring a better access to information to market players. But the audience of the OdR, which mainly relies on emails to disseminate its bulletins, has so far remained largely institutional (DAVID-BENZ et al., 2014). The challenge to reach market agents, and more specifically farmers, is shared by many MIS.

The main questions addressed in this communication are the following ones. How far a better understanding of farmers' marketing strategies can contribute to adjust the design of information systems to the needs of users? Can dissemination of market information by mobile phone be adapted to smallholder farmers in remote areas? The communication is divided into 6 parts: (i) the state of the art about MIS in developing countries; (ii) the issues of the rice market in Madagascar; (iii) materials and methods; the results into two parts, (iv) farm household's characterization (structural typology, marketing strategies, practices and expectations towards information); (v) feed-backs from the dissemination and training tests; (vi) a general discussion.

1. MIS to improve market efficiency

Agriculture Market Information Systems (MIS) are designed to collect, process and disseminate information on the situation and dynamics of agricultural markets. In developing countries, a large number of them were set-up in the 80's and 90's, as part of supporting

programs to the agricultural market liberalization (SHEPHERD, 1997; EGG & GALTIER, 1998). Their objective is twofold: (1) improve the flow of information between market players to optimize their time and space arbitrage and to promote a fair distribution of value between different market players; (2) provide policy makers with information to guide agriculture and trade policy decisions and to assess the impact of their implementation, notably regarding food security (DAVID-BENZ, et al, 2012; GALTIER, et al., 2014).

But their effectiveness in providing services to market players appeared soon limited (SHEPHERD, 1997; EGG & GALTIER, 1998; ROBBINS, 2000; TOLLENS, 2002). Since their creation, MIS have been facing technical challenges (lack of reliability of data, transmission delays, different quality of products not taken into account ...), institutional ones (lack of reactivity associated with public institutions), and financial ones (lack of sustainability of funding, based mainly on projects). But they also bump into more fundamental problems related to the really functioning of markets, that was not really taken into account in their design (information circulation between agents, institution arrangements between seller and buyers…) - EGG et al., 2013. From the late 90s, the rapid penetration of mobile phone in developing countries, the strengthening of regional integration policies, the rise of farmers' organizations and their willingness to address marketing issues, have sparked a renewed interest in MIS. Technically and organizational innovations followed one another, tens of new MIS were created, older MIS changed: a new generation of MIS emerges (DAVID-BENZ, et al, 2012).

The innovations developed on the basis of mobile phones have brought real improvements from a technical point of view. They have broadened the range of products and markets covered, as well as the categories of information available. The traceability of the information that is actually requested opened the way to possible detailed monitoring. These improvements strengthen the potential of MIS to better meet the needs of market players. However, the use of mobile has several limits: first of all it increases the gap of access for the poorest (sparse coverage in rural areas, difficulty to use SMS for illiterates, cost). MIS based solely on mobile phone might reinforce inequalities, rather than improving market access for the poor (GALTIER et al., 2014). Dissemination by radio makes it possible to reach a wider audience, but its success is strongly linked to the involvement of local communities in the definition of program content (SULAIMAN et al., 2011). Furthermore, GAKURU et al. (2009) highlight that agricultural producers cannot be considered as mere consumers of information; learning communities are needed both to define information needs and to promote learning based on dialogue and exchange. In addition, the more communication media are sophisticated, the more users need a support to understand the information and the way it can be used. Such dimension is currently inadequately taken into account by MIS (DAVID-BENZ, et al., 2012).

Several recent works on MIS have attempt to measure their impact on market participants, particularly on farmers. Several authors found a significant impact on the producers' selling prices and quantity sold (SVENSSON & YANAGIZAWA, 2009; GOYAL, 2010; KIZITO, et al, 2012; NAKASONE, 2013; COURTOIS & SUBERVIE, 2014); in other cases, the impact is much less noticeable or not significant (FAFCHAMPS & MINTEN, 2012; MITRA et al, 2013.). The econometrics methods that are used (propensity score matching, randomized control trial) bump on methodological challenges when applied to MIS (STAATZ et al., 2014). Moreover, they focus mainly on measuring impact on income (selling price, quantity sold) but they don't bring much understanding of the determinants of adoption vs. non-adoption (where as one of the main issue is often that the actual users of MIS are few). More qualitative assessment by users and light monitoring, less heavy to implement, could be useful to guide and adjust the dissemination of information, but they are seldom mobilized.

2. Rice market and Rice Observatory in Madagascar

Rice is the staple food in most regions in Madagascar, with an average of 97 kg / pers. / year (INSTAT / DSM, 2011). It remains the main source of agricultural income, with 48% of the total farm income generated (INSTAT / DSM, 2011). About 85% of farms grow rice (WORLD BANK, 2011, according to the 2004-05 Agricultural census data), but production is primarily for self-consumption[1]. Market access remains highly constrained by road infrastructures and low efficiency of marketing network. MOSER et al. (2009) found that the rice market is relatively well integrated at local level, but the degree of integration is lower at regional level and becomes very low nationally (based on data from 2000-2001, ILO program census, Cornell Univ., FOFIFA). The authors point at insecurity, transportation costs and poor competition among traders as the major constraints to market integration. A decade later, the issue of improving market integration remains crucial in terms of food security: some surplus areas are insufficiently developed because of their weak connection to market. These areas suffer from low prices and very high level of price volatility; they cannot manage to cover the needs of relatively close deficit areas, shedding the light on marketing dysfunction (ANDRIAMBELONA, 2012). This instability is detrimental to both producers (either net sellers or net buyers) and consumers.

Since late 2005, the Rice Observatory (OdR) ensures a monitoring of rice prices. A bulletin is broadcast weekly; more analytical report is issued every two months. In case of agricultural or food shocks, the OdR elaborates targeted briefs for policy makers. The shape of dissemination (in French, sent by email) reaches mainly institutional targets (public institutions, donors, projects, researchers…) and very few direct market players or producers. However, the deficit in information is identified as one of the factors that limit farmers' access to market and the performance of rice market in Madagascar and (MINTEN &DOROSH, 2006). The challenge is thus to develop dissemination tools for users with low-level of education and low income, to accompany them with learning sessions to better understanding the global functioning of rice market, and to assess the effectiveness of these tools.

3. Materials and methods

Data and results derive from InfoRiz, a research project funded by the French Ministry of Foreign Affairs[2]. The project was based on an iterative approach, in several steps : (1) analyze the farmers and traders' marketing behaviors and needs of information, in order to identifying the potential of the different profiles of farmers and traders to use MIS ; (2) improve technically the collection and dissemination means of the MIS to give the possibility to receive and send data through SMS, (3) develop different dissemination tools taking into account the results of the first diagnostic, (4) then test these tools and adjust them according to the feed-backs from the recipients (see Figure 1) .

Only results on farmers are analyzed in this communication.

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[1] Estimates of the share of self-consumption range from 72% in quantity (CARIMENTRAND et al., 2011), to 57% in value (INSTAT / DSM, 2011).
[2] InfoRiz involved research institutions and universities (CIRAD, FOFIFA, ESSA), development institutions and projects (Chamber of Agriculture, Prosperer/FIDA, OSDRM/Aga Khan Foundation), and a mobile phone company (Orange).
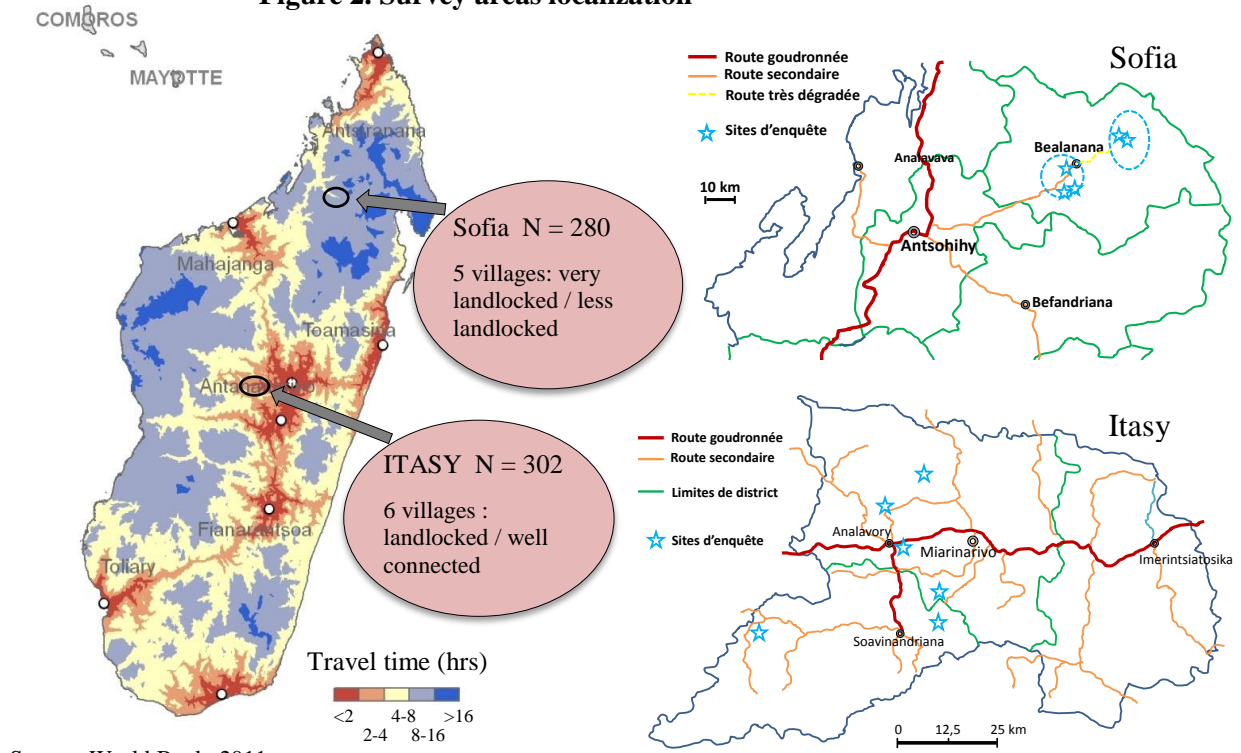
Figure 1. The iterative approach of InfoRiz
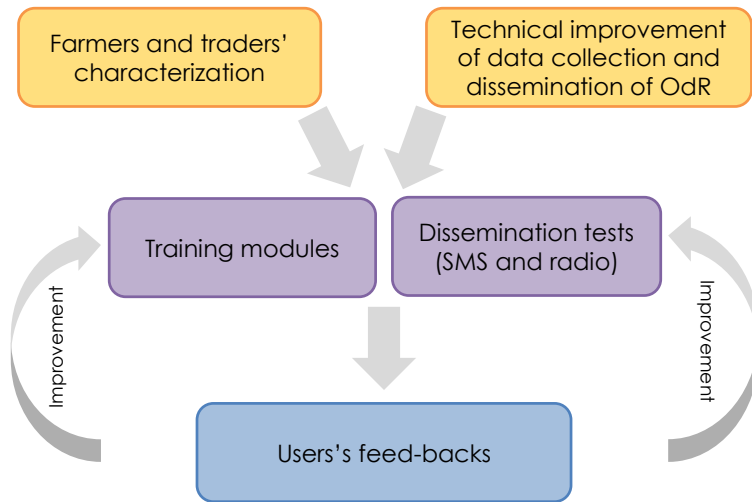
3.1. Surveyed areas

Two among the most important rice growing areas of Madagascar where chosen (see. Figure 2). The choice was based on the contrast of situation in term of accessibility, which leads to a contrasted level of price instability.

Figure 2. Survey areas localization

Source: World Bank, 2011.

• the neighboring districts of Soavinandriana and Miarinarivo in the Itasy Region (accounting for 8% of the rice produced nationwide), which have an easy access to capital city of Antananarivo[3], and a relatively limited rice price seasonal fluctuations (average of 53% between harvested price and learn price – 2011-2013);

• the district of Bealanana in Sofia Region (accounting for 7% of the rice produced nationwide), hampered by a very high degree of isolation[4] and high seasonal price fluctuations (average of 90% between harvested price and learn price – 2011-2013).

3.2. Farm household survey

To analyze the structural features of farm households and understand their marketing practices, an approach based on the Sustainable Livelihoods (DFID, 1999; SCOONES, 1999) was mobilized.

In each of the two production areas, a two-stage purposive sampling was carried out (based on the choice of the villages and that of the households), in collaboration with local partners of the project.

All the investigation sites (villages) have a high rice production level but they show differences in the degree of isolation and a more or less marked presence of a support institution regarding agricultural production.

Only farmers producing more than their family consumption needs were targeted (ie. farms with at least 0.5 ha of rice fields). Indeed, very smaller farmers very have too little marketable surpluses and under the pressure of many structural constraints; they have almost not flexibility in their selling decisions, making the potential usefulness of MIS very low.

In the district of Bealanana, 280 farms were surveyed over 5 villages and in Itasy 302 farms were surveyed over 7 villages; thus, a total of 582 producers. The survey focused on the structural characteristics, the marketing strategies and constraints, the access to information, and farmers' perceptions and expectations towards MIS (ANDRIANDRALAMABO, 2014; SOANJARA, 2014). A total of 127 traders and rice millers where interviewed as well, but the results for these down-stream actors are not included in this communication.

3.3. Trials of market information dissemination by means of SMS and the radio

For each of the two surveyed areas, relevant markets and types of rice were selected, based on the first results of the diagnostic and on the previous studies (PERRY et RANDRIAMBOLOLONA, 2010 ; ARIMOTO et al., 2013). SMS on a selection of 12 prices were sent weekly to a sub-sample of 70 farmers and 30 extension staff by area. After the first two months of dissemination, a rapid survey on the users provided preliminary feed-backs about the shape and the understanding of the messages (CHIMIRRI, 2014). The SMS were then simplified and made more explicit. Flyers presenting briefly the OdR and explaining the abbreviations used have been distributed to all recipients.

Weekly radio programs of about five minutes each have been developed for each area on the same selection of markets and types of rice. These programs present the prices of the week, the trend compared to previous weeks, and some explanations or contextualization.

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[3] The region is crossed by a good national road (RN1). The main rural market (Analavory) is 100 km away from Antananarivo.

[4] 100 km of an almost unpaved road between the capital city of the district (Bealanana) and a national road (RN4). Followed by 415 km of national road to Antsiranana (main urban center of the North of Madagascar) or 690 km to Antananarivo.

3.4. Educational support

Four educational modules about rice market and marketing have been designed. Extension staff of the local partners was trained in each area. They in turn had to train 50% of the farmers that received SMS.

3.5. Users' feedback

Two waves of rapid surveys provided an early appraisal of the information dissemination (via SMS and radio) and the educational modules. A first qualitative survey carried out 8 to 10 weeks following the sending of the first SMS and the beginning of the training, targeted 25 producers and 15 technicians. A second short survey based on multiple-choice questions was carried out 7 or 8 months after the first broadcast, and targeted 70 producers and 35 technicians. Such users' assessment was part of an iterative process to gradually improve dissemination and teaching modules.

4. Farm household's characterization

In the first section, a structural typology of farms is elaborated to explain their marketing performance. Then, their marketing strategies are analyzed and their attitude towards information, that could drive on their ability to use market information systems.

4.1. A typology of marketing periods based on farmers' assets

The typology is based on the marketing period (dominant period of rice sales), which is considered as a commercial performance indicator. Indeed, rice prices increase from harvest time to lean period. When producers sell straight after harvesting, at low prices, it is usually urged by cash needs (for current expenses, to repay credit, to carry out market gardening over the dry season season). The supply is then plentiful and producers' negotiation power is low; one can expect the information from a MIS to be of not much use for them. The producers that can expect until prices rise before selling are a priori less constrained and have more choice in their marketing decisions; it can be expected that they take into account market conditions and may be interested in the information disseminated by a MIS.

Itasy

The 302 farmers from Itasy can be classified into four types. A first differentiation was made between standard producers and collector-producers. The latter buy paddy to the nearby farmers and most often sell on gathering markets, either directly or after storing. They clearly distinct themselves from mere producers by their stronger market orientation. The other three types are split according to the main selling period: early (majority of the quantity sold between May and September), late (majority of sales from October to December) and spread out (no dominant selling period). These four groups are differentiated quite clearly by their structural features (see Table 1and Figure 3).

Table 1. Types of farm households in Itasy – Structural variables

	VARIABLES	Early (27%)	Spread (20%)	Late (37%)	Collector - producers (16%)	Total
Human capital	Household head level of education[1]	5,4	6,4	6,3	6,9	6,2
	Age of the household head	48	42	49	42	46
	Permanent labor in farm[2]	12%	34%	26%	55%	29%

Social capital	Member of farmers' organization	16%	44%	28%	33%	29%
	Supported by an extension service	34%	54%	55%	55%	49%
Natural capital	Rice cultivated area (ha)	1,28	2,39	1,77	3,14	1,99
	Rice yield (t paddy/ha)	2,7	3,0	2,9	3,1	2,9
	Production (t paddy)	3,5	6,5	4,8	8,9	5,4
	Quantity sold (t paddy)	1,6	4,5	2,9	56	11,5
	Agricultural diversification[3]	27%	23%	22%	21%	24%
Physical capital	Herd size (TLU)[4]	2,8	1,9	3,1	4,1	2,9
	Motorcycle or car	1%	5%	2%	16%	5%
	Mobile phone	59%	59%	65%	69%	63%
Financial capital	Access to production credit	13%	28%	25%	47%	26%
	Participation to GCV[5] (%)	9%	20%	31%	43%	25%

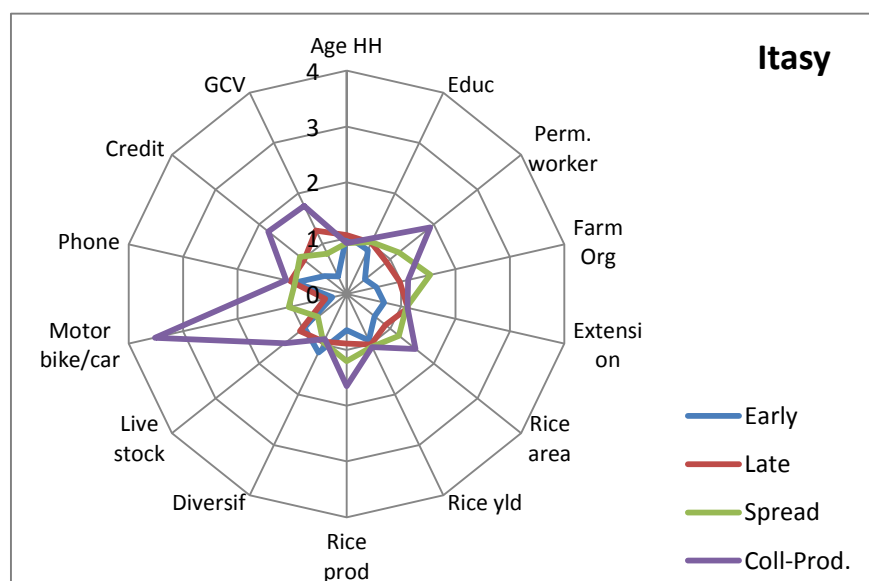[1] Number of years of education
[2] Percentage for farms with at least 1 permanent hired worker
[3] Value of other agriculture production than rice / total value of agriculture production
[4] TLU: Tropical Livestock Unit.
[5] Grenier commun villageois (collective storage credit)

Figure 3 : Livelihoods by type of farm households - Itasy

Early sellers are generally less endowed than others, while the collector-producers are the most favored ones. Late sellers and spread sellers are in an intermediate situation; depending on the category of capitals, one or the other is in a better position. The characteristics of the household head are quite similar for the 4 types. But in term of human capital, the presence of permanent workers clearly differentiates them. This additional labor force is related to the rice acreage and production: the "spread" are better off on both aspects than the "late". Late sellers appear as farmers with a relatively limited acreage, seeking to maximize their income by selling their crops at the best price (as late as possible). They benefit form a larger herd than the "spread" and more frequent access to storage credit that can help them to cover their cash

requiriments pending sale of rice. The spread sellers have a comfortable rice area and large production, which allows them to sell in several times, when needed. The "early", who have the smaller rice acreage, seek additional income through agricultural diversification and livestock. They have seldom access to storing credit and sell their rice quickly after harvest to finance the dry season gardening or pig farming. Storing credit (GCV) is frequent mainly practiced by collector-producers and to a lesser extent by the "late".

Bealanana

The farms of the district of Bealanana were classified in three types, as collector-producers are few in this area (one case in our sample, similar spread sellers and included in this type). The differentiation between these three types appears less clear than in Itasy (see Table 2 and Figure 4). The spread sellers are, as in Itasy, those who benefit from larger rice acreage and production. Their rice surplus gives them the flexibility to split their sells period: meeting their cash needs in the months following the harvest and selling a part of their production later at the best price. The "spread" and "late" are also more likely to hire permanent workers than "early" sellers. Some vegetable are grown on dry season (especially garlic in the West zone), but the diversification rate is globally lower than in the Itasy. Breeding is however more important than in Itasy, especially for the "spread" and "late". The financial capital distinguishes the 3 types: the "spread" are those who have more access to cropping credit and the "early" those who are least likely to participate in a GCV. It must be notices that GCV is more marginal in Sofia than in Itasy (respectively 10% and 25% of the sample).

A typology based on the marketing calendar appears less relevant in Sofia than in the Itasy. Indeed, the district of Bealanana has geographic features that impact on the structural characteristics of farms, but event on their marketing options. The whole district is hindered by the distance from major consumption centers and remoteness (see above). But within the district, western part is much relatively less landlocked (the district capital is 100 km away from the first asphalt road) than the eastern part (a great alluvial basin surrounded by mountains, connected to district capital and to the rest of the country by 30 km of an extremely bad road, impassable by trucks after the first rains, and then by the same 100 km of bad road before the asphalt). Land pressure is lower in the eastern part than in the West (which is likely to be related to the heavy constraints of access), but the topography and the agro-climatic conditions are more favorable for rice production. Acreage and yields are higher, and therefore quantity sold are much higher (more than double; see Figure 5). The mobilization of permanent workers, the use of credit and GCV are going in the same way. Agricultural diversification is more pronounced in the western part (garlic and onion), to compensate for lower rice area. Being strongly integration into the market, and may be also because they are younger and slightly more educated, the large majority of farmers in the East have a mobile phone (as in Itasy), while less than a third of them in the West.

Table 2. Typology of farm households in Bealanana – Structural variables

		Early (50%)	Spread (25%)	Late (25%)	Est (38%)	West (63%)	Total
Human capital	Household head education[1]	43	48	43	41	46	44
	Age of household head	6,1	4,9	5,5	6,1	5,4	5,6
	Permanent labor in farm[2]	24%	34%	32%	49%	17%	29%
Social	Member of farmers'	56%	64%	59%	57%	60%	59%

capital	organization						
	Supported by an extension service	64%	69%	63%	67%	64%	0,65
Natural capital	Rice cultivated area (ha)	196	220	194	241	177	201
	Rice yield (t paddy/ha)	2,5	2,7	2,8	3,2	2,3	2,7
	Production (t paddy)	4 662	5 905	5 071	7 232	3 784	5 077
	Quantity sold (t paddy)	2 482	3 532	2 580	4 070	1 974	2 769
	Agricultural diversification[3]	7%	6%	15%	2%	13%	9%
Physical capital	Herd size (TLU)[4]	4,4	6,5	7,3	4,6	6,2	5,6
	Bicycle or motorcycle	37%	37%	49%	40%	40%	40%
	Mobile phone	47%	40%	52%	61%	38%	46%
Financial capital	Access to production credit	24%	34%	20%	30%	23%	25%
	Participation to GCV[5]	6%	14%	13%	17%	5%	10%

[1] Number of years of education
[2] Percentage for farms with at least 1 permanent hired worker
[3] Value of other agriculture production than rice / total value of agriculture production
[4] TLU: Tropical Livestock Unit.
[5] Grenier commun villageois (collective storage credit)

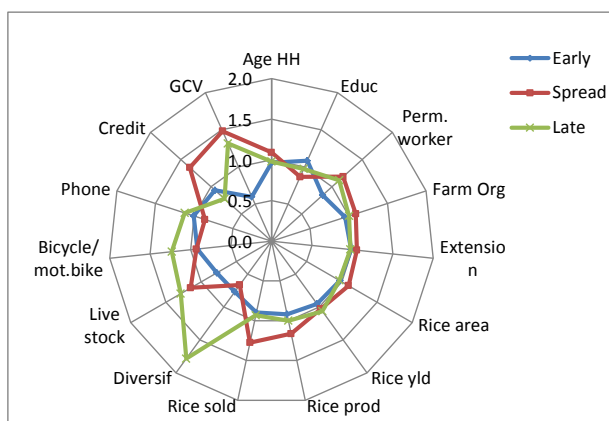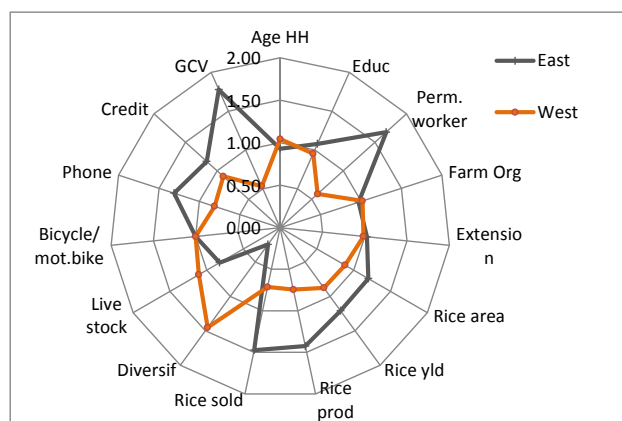**Figure 4. Livelihoods by type - Bealanana**

Figure 5. Livelihoods by zone - Bealanana

4.2. Marketing strategies

Itasy

Most farmers in Itasy sell paddy rice (85% of the transactions for the whole sample) and especially the collector-producers (94% of their transactions) - cf. Table 3. Marketing strategies - Itasy. Only the spread sellers sell more frequently rice. This preeminence of paddy sales may be related to the fact that large processing units are fare away from the survey area (mostly in Imerintsiatosika, a town located on the road to Antananarivo, mid-way). Even Analavory, the largest rural market place of the area, there are few rice mills and their processing capacity is limited. A part of the added-value is transferred out of the production area.

90% of the sales are made at farm gate; the transaction in major markets outside the area mainly concern producers collectors (see Table 3). The main buyers are collectors and especially residents (who are often collector-producers). Only collectors-producers sell to wholesalers and / or millers (38% of them). Loyalty relationships between producers and buyers are dominant (about 60% of the sample). It more frequent in the case of spread sellers. Conversely, early sellers are less prone to loyalty relations with buyers.

The vast majority of farmers contact buyers before the sale, especially collector-producers and the spread sellers. But although most producers are equipped with mobile phones, their use remains very marginal for these business contacts. Only about 1/3 of collector-producers use

Table 3. Marketing strategies - Itasy

	Early (27%)	Spread (20%)	Late (37%)	Collector-producers (16%)	Total
Selling place	Farm gate (88%), local market (10%)	Farm gate (90%)	Farm gate (93%)	Farm gate (86%), main wholesale market (14%)	Farm gate (90%)
Type of buyers	Village collector (62%) or other collector (25%)	Village collector (56%) or other collector (25%)	Village collector (62%) or other collector (19%)	Large wholeseller /miller (38%), other collector (34%)	Village collector (49%) other collector (26%) large wholeseller /miller (10%) village wholeseller/miller (7%)
Loyalty relation with buyers	54%	72%	58%	61%	60%
Use mobile phone to find a buyer	4%	2%	1%	33%	8%
Use mobile phone to know market price	7%	6%	4%	31%	11%

The marketing constraints mentioned by producers are mainly their ability to meet market demand in quantity and quality (98% of the sample), followed by resource constraints: production factors, financial availability, transport costs (88% of producers). Physical constraints (isolation, road conditions, and weather accidents) are mentioned by 59% of producers. The lack of information appears less pregnant: it is mentioned by 24% of respondents.

The types appear closely connected to selling strategies: at one end, producers relatively weakly inserted in the market, selling early - possibly before the harvest, often on local markets. At the other end, producers that collect and are therefore strongly inserted in the marketing networks, with links with large major buyers of assembly market and large millers. But even for the producers of Itasy who sell at farm-gate, large rural markets are relatively

close-by and they are easily connected to the capital by a good road (Imerintsiatosika, the most dynamic milling locality of the country is about 1 hour away, and the entrance of Antananarivo about 2 hours).

Bealanana

Producers in the Sofia region sell either paddy rice or white rice. In the east area, sales are carried out almost exclusively in rice; in the western area paddy sales are largely dominant.

The marketing strategies, as well as the constraints perceived, differ rather according to production area than by type of producers. Also, only are the results by region are presented here (see Table 4). In the East, almost all sales take place before the end of November, before the road connecting to the district capital becomes impractical. A third of the farmers sell at the communal market, and the others on the farm. To compensate for their constraints of isolation, their marketing strategies and appear more offensive than in the West zone: they mill before selling, go more frequently to meet the buyers in the largest market in the region, are more likely to use cellphone in their business.

In the western area, producers have the possibility to sell later (until December). However, it is the privilege of those who that cultivate the largest area (> 4 ha), while the smallest (<1 ha) are forced to sell quickly. As access is easy for collectors, farmers sell almost exclusively on the farm. Almost none of them use cellphone for business activities.

Table 4. Marketing strategies - Bealanana

	Est (38%)	West (63%)	Total
Selling place	Farm gate (2/3) or local market (1/3)	Almost only farm gate	
Type of buyers	Collectors from outside (50%) or local (1/3)	Collectors from outside (60%) ou local (1/3)	
Loyalty relation with buyers	12%	8%	10%
Use mobile phone to find a buyer	22%	3%	11%
Use mobile phone to know market price	25%	4%	13%

Farmers from the eastern area feel accessibility issues as a major constraint, because of the extreme degradation of the road (see Table 5). Large sellers, but forced to sell before the arrival of heavy rains, they are particularly concerned about the state of the market: about 4 / 5th of them mentioned the lack of information as a constraint. This constraint is also mentioned by more than two-thirds of the producers of the West zone. But the first constraint of the latter (which sell mainly in paddy rice) is the use of non-standard units of measurement by collectors, which plays against them.

Table 5 Marketing constraints as mentioned by farmers in Bealanana district

Eastern zone : Physical constraints, including remoteness (85%) Lack of information (79%)	Western zone : Non-standardization of measurement units (73%) Lack of information (65%)

4.3. Access to communication technologies and needs of information

The mobile phone is still not generalized among rural households, mostly in Bealanana where mobile network coverage is very poor. In the Itasy, 60% of the sample has a mobile phone; in Bealanana, 62% has in the eastern part, but only 35% in the western part (see Table 6 and Table 7). In addition, its use is rather vocal and SMS use is limited, especially in Bealanana (70% in the Itasy and 48% in Bealanana Itasy).

Table 6. Access to information and expectations regarding MIS - Itasy

	Early (27%)	Spread (20%)	Late (37%)	Collector-producers (16%)	Total
Have a mobile phone	59%	59%	65%	69%	63%
Use SMS[1]	67%	66%	71%	76%	70%
Type of information requested	Prices in urban markets (33%) Contacts of buyers (28%) Consumers' preferences (22%)			Prices in urban markets (20%) Prices in production areas (19%) Contacts of buyers (17%)	-
Mean of communication requested	Radio SMS *push*	Radio Phone call/SMS on request	SMS *push* Radio	Phone call/SMS on request Radio	–
Frequency of communication requested	Weekly (month, seasonnaly)	Weekly (on request, monthly)	Weekly (on request, seasonnaly)	Weekly (on request)	-
Willingness to pays for MIS	80%	97%	80%	90%	85%
Expenses for MIS [2] (Ar/an)	31 888	26 263	39 114	93 718	43 656

[1] At least 1 member of the family can read and write SMS
[2] Average amount that of farmers are willing to pay to receive information from a MIS (10 000 Ar = 3.3 Eur)

The type of information requested by the producers reflects their needs to better understand the demand (prices on consumer markets and consumer preferences), but also to develop direct links with buyers. Collector-producers (because they are buyers) are also interested in prices in the production areas.

Radio is more requested in the Itasy than in Bealanana, which can be explained by better geographic coverage of local radio and national radio. In the Itasy there is a gradient of "complexity" of the mean of dissemination, between the producers less connected to market (who are also the least equipped in various capitals) and the collector-producers. In Bealanana, producers of the East area, large sellers, are similarly seeking more personalized

means of dissemination (pull SMS) than those of the western area, who prefer oral communication and at lower frequency.

Table 7. Access to information and expectations regarding MIS – Bealanana

	East (38%)	West (63%)	Total
Have a mobile phone	61%	38%	46%
Use SMS[1]	58%	42%	48%
Type of information requested	Contacts of buyers Prices in production areas Price in urban markets, Prices in production areas Availability in consumption areas	Contacts of buyers Prices in production areas Availability in production areas Consumers' preferences	-
Means of communication requested	SMS on request Local radios	Information meetings Local radios	-
Frequency of communication requested	Monthly On request	Monthly Seasonally	-
Willingness to pays for MIS	81%	49%	61%
Expenses for MIS [2] (Ar/an)	72 000	52 000	64 800

[1] At least 1 member of the family can read and write SMS

[2] Average amount that of farmers are willing to pay to receive information from a MIS (10 000 Ar = 3.3 Eur)

Factor analysis of the sample of Bealanana has also highlighted age and level of education as discriminating for possession of mobile phones and the requested mean of communication to get informed about the market situation. In the medium term, we can expect, with the renewal of generations, a larger penetration of mobile phone and a greater relevance of this tool for MIS.

5. Feedbacks from information dissemination tests

5.1. Prices sent by SMS

The main lesson of the SMS experience is the instability of phone numbers in rural areas. Either farmers lose their phone, or their SIM card is deactivated because they don't put credit for long time, or they change of network provider after a commercial promotion, or they give their phone or SIM card to a relative, or they never check their SMS.... Within less than one year, almost half of the 70 recipient farmers surveyed said that they had not received the SMS (38% Itasy, 53% Bealanana). The number of those who were able to respond to the questionnaire (38 over 70) is unfortunately inadequate to identify differences between types of farmers. The survey provides however global learnings.

The first messages, sent without prior preparation of the recipients, have been the subject of many misunderstandings. Very few producers have immediately understood the meaning of the abbreviations (12 prices had been introduced into the first SMS, with abbreviations of rice types in 2-3 letters and markets names in 4-6 letters). Having no idea of the source of messages, many were suspicious and destroyed them without seeking to learn more. In a village, rumors of satanic messages have even spread! Following the first feed-backs, flyers explaining the purpose of the messages, the source of data and the abbreviations have given

recipients and message content has been simplified (limited to 8 prices, with the name of the rice types and the markets almost fully spelled out and indicating the source as *Observatoire du Riz*). The rate of understanding of the messages significantly improved (from 40% to 75% Itasy and 0% to 39% Bealanana). In Itasy, where these flyers were quickly distributed to all farmers, the level of reception and understanding of messages was higher than in Bealanana, where the distribution was scattered and delayed. The initial familiarity with SMS plays an important role: in Itasy, where globally 70% farmers are familiar with SMS, 40% of recipients understood the first messages at first sight; in Sofia, where only 48% are familiar with SMS, nobody understood them.

Listing the phone number of the persons that are willing to receive information by SMS appears therefore far from enough. A local intermediary is paramount to explain the system to recipients, and to transmit any change in phone numbers.

As the broadcasts lasted only few months, any significant change in marketing behavior or performance was not expected. However, almost all of those who received SMS found it useful. Their major interest is getting better general information on the market (50 to 56% respectively for Itasy and Sofia). Then, nearly a third of them (35% in Itasy and 22% in Sofia) believe that this information can be useful to manage storage and respectively 25 and 17 % to negotiate in better conditions. Only 10% considered that it is useless.

Despite the hazards of reception, farmers have overwhelmingly approved the use of SMS for the dissemination of market information (100% in the Itasy and 95% in Sofia) and wish to continue to be informed ; either those that have received or not the SMS.

5.2. Radio programs

In the survey areas, radio is not as common as it could be expected. It is regularly listened only by a little more than half of the surveyed producers (55%). In Itasy, InfoRiz program was broadcasted by the leading rural radio of the area; 53% of the producers have heard that program. In Bealanana, in many villages, local radios are very difficult or impossible to catch. It is the national radio that has the best geographical coverage; the local radios are marginal and scattered in rural areas of the district. Two of them were selected to broadcast InfoRiz programs but none of them have a large audience. Thus, only 18% producers of Bealanana heard the programs.

Actually, in rural areas of Madagascar, radios (especially local ones) have mainly a recreational function; they broadcast a lot of music and very few educational programs. However, among the producers who regularly listen to the selected radio stations, the rate of listening of InfoRiz program is high (100% for Itasy and 66% for Bealanana). For the producers that have heard the program, the level of immediate understanding is very good (92%), and higher than the SMS (69%). The information provided was seen as very reliable and for almost all the listeners (88%) its content was enough satisfactory and enough comprehensive.

Similarly to SMS, the first usefulness perceived is to be aware of the market situation (for more than two thirds of the producers); to a lesser extent, the producers mentioned that these programs can help storage management and improve negotiation capacity. A few mentioned a use to collect paddy. Only 4% of the producers felt that it was of no use.

However, SMS reception or listening to radio programs did not alter the main sources of information for producers: in Itasy, it is always through the collectors that most members are awarded about rice prices, while in Bealanana it is going weekly to the market.

5.3. Educational modules

The marketing training modules were followed by thirty of the surveyed producers. They were held by half days, under an incompletely forms yet. More illustrations and more time for practical exercises had been requested, but the interest of producers was evident. Participants found them useful first of all to improve their storage strategies. The interest about the module on production cost calculation was also highlighted, to enable forecasting and controlling expenditure and to avoid selling at any price. The module on the value chain has been appreciated for a better understanding of the role of each market participant and of price formation.

6. Conclusion

An important differentiation of the farmers' marketing strategies arises from the typology. It is based on quantity sold (related to land endowment and technical level) and individual characteristics of the household's head (education, age). In Itasy, the best endowed producers also collect, store and sell rice throughout the marketing season to wholesalers, millers or large collectors. At the other end, those who are the less endowed sell after harvest, at low price, to local collectors. The degree in market orientation goes along with the interest in getting more detailed market information, through more personal media and higher willingness to pay for it. Whereas the less endowed, that sell after harvest, are more in favor of radio, collector-producers and the farmers that have the capacity to store, are rather willing to receive information by SMS.

In the case of Bealanana district, characterized by an extreme degradation of the road and a long distance from main consumption areas, isolation becomes a major determinant of marketing strategies. The farmers of the most land-locked area are forced to sell before the first rains, whatever their individual livelihoods. But an antagonistic effect between individual factors (endowments) and environmental ones (remoteness) is observed in Bealanana district: the farmers which market access is the most constrained have the largest cultivated areas and the best yields. Having significant quantities of rice to sell, they adopt more offensive strategies toward the market (processing before selling, looking for buyers, selling to the main local market). Thereby, they expectation in term of MIS goes toward SMS, whereas in the western zone, farmers are rather in favor of monthly or seasonal information meetings. In terms of local development, the paradoxical situation of the major rice growing area of Bealanana sheds light on a major economic issue: opening up of the area (free the bottle-neck of the road, but also improve electrification, cellphone network, and radio coverage). Beyond the well-being of the local population, the main issue is the supply of the north of the country that suffers from the highest and most unstable prices of rice.

The lack of information is mentioned by a significant number of producers, even though it does not appear in the forefront of marketing constraints. However, it is perceived as a real bottle-neck in the isolated area of eastern Bealanana, where farmers have large surpluses to sell. The test of SMS couldn't provide clear results by type of farmers (the number of valid responses being too small). But all types together, it indicates that almost all the farmers of the sample are interested in receiving information about rice markets (as well as other preeminent agriculture products), and where ready to pay for it. But although they very largely approved the use of mobile phone to disseminate market information, relying only on SMS doesn't appear realistic in a context like rural Malagasy areas. Cellphone is not so widespread. In 2010, only 17% of rural household had a cellphone (INSTAT/DSM, 2011). Despite a fast increase, only 55% of the households of our sample own a cellphone and the share for the whole rural households must be much lower (our sample was focused on farms growing more than 0.5 ha of rice, which represent the top 50% of the farms in both areas). In

remote areas, the phone network coverage is really limited. And most of all, the loose of recipients during the dissemination test demonstrates the very fast turn-over of mobile phones and phone numbers. This instability of ownership makes mobile phone users' identification and conservation a main challenge. A close field follow-up of the recipients is required to avoid losing most of them in few months.

Apart from technical problems, learning issues need to be closely considered. SMS with market information are just a succession of more or less coded elementary information. They needs to be first decoded, the meaning has to be understood, confidence in the quality of content must be gained, and ultimately the appropriate knowledge is required to be able to turn the information into decision and action. Notably, farmers from the test found the SMS and radio programs useful first of all for their own knowledge. It doesn't mean that it can be immediately translated into profitability. SMS alone cannot be enough. They need to be backed with more comprehensive explanation of the content of the messages and of the way to interpret and use them. Local radios can be very complementary, when they have a good rural coverage, in the way that they can reach a larger audience (less endowed farmers, little or not familiar with cellphone and barely littered) and broadcast explanatory and educational programs. Collective training on different marketing issues can improve marketing capacity of small farmer and provide the opportunity to share knowledge on different options to use the information provided by MIS. Storage management is the first practical implementation of market information foreseen by farmers. But knowing when would be the best period to sell is not enough without a proper storage facility and cash availability to avoid selling at harvest time. To reach smallholder farmers, MIS cannot be isolated from programs supporting market access, including a close presence of extension staff that can play the role of intermediary between the MIS and the ultimate targets.

But the information is nowhere the main constraint. The foremost constraints are isolation and measurement units for Bealanana district; in Itasy, low prices at harvest, production capacity, isolation, and climate hazards come first. It reinforces the idea that better access to information does not allow by itself to lift the array of constraints faced by farmers (GALTIER et al., 2014). Improving access of small farmers to market needs to be addressed comprehensively (ARIAS et al., 2013).

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