

Analysis of ICT Application to Tomato Production and Marketing in Saint-Louis Region of Senegal

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Abstract: The agricultural sector has been one major component of the Senegalese economy. The northern region, Saint-Louis, which benefits from the Senegal River has favorable environment for horticulture. However, producers are facing over surplus and marketing difficulties in the study area. In order to facilitate accessibility of decisive market information for rural farmers, a survey was conducted on tomato producers in Saint-Louis Region of Senegal. A total of 138 respondents were interviewed using structured questionnaire to assess their marketing patterns, information and communication technology (ICT) capacity and information needs. The results indicate that 78% of the respondents depended on a tomato processing factory as their regular outlet and 94% regarded rot or spoilage of products as their main marketing risk. To design a feasible ICT-based management system in the future, telephony may be used as technological tool, as mobile phone and tele-centre were widely used by 82% and 71% of the farmers respectively. Moreover, given that 70% of the producers were interested in wholesale prices, the accuracy and dissemination of the information obtained from wholesale markets will be crucial. In conclusion, the use of information communication and technology (ICT) information needs better policy and regulatory frame work by the Senegalese government to enhance the production and marketing of tomato in the country.

Key words: Horticulture % ICT % Information system % Marketing management % Senegal % Tomato production

INTRODUCTION

Senegal is one of the leading countries in West Africa with a population of 12 million people in which 58% lives in rural areas. The agricultural sector engaged 72% of the labor force and contributes 15% to GDP [1]. Despite a surface area of 196, 722 km², only 13% is under cultivation and mostly for subsistence farming among smallholder farmers. The increase of agricultural population density and poor access to farm inputs and equipment have led to inefficient agricultural productivity and intensified competition for resources and markets. In the northern part of Senegal, Saint-Louis Region, there is a favorable environment for agricultural production and farmers formed the majority of the active

population [2]. It is particularly well known for horticulture and rice production due to abundant water resources flowing from the Senegal River. Onion and tomato, two dominant garden crops of the nation, are widely cultivated in this area [3]. The horticultural sector is promising, but farmers have also encountered difficulties in marketing, for instance, price fluctuations, seasonal restrictions, marketing risks and perishability unlike the grain crops. The problems are severe especially at harvest when there is surplus of products. Meanwhile, to reduce uncertainty and to access information and inputs, the producers in Senegal generally rely on market intermediaries [4]. This close relationship, however, restrains the flexibility of marketing channels and price negotiation capacity of farmers.

In the age of knowledge-based economy, knowledge and information have been regarded as productive inputs for output increase, cost reduction, value addition and competitiveness improvement [5]. Innovative and widespread information and communication technology (ICT), which covers a extensive electronic devices and network, offers new access to and more creative use of information [6, 7]. Given that, dissemination of information and knowledge related to agricultural technologies, weather and geology, policies and market environment are important to farming households for decision-making. [8], there is a need for easily accessible information to benefit the income of farming communities, particularly in rural area.

With stable economic growth, ICT usage is expanding rapidly in Senegal. It is estimated that 76% and 26% of the household owned radio sets and TV respectively in 2004 [9]. Telecentre and cybercafé are also quite popular while the use of mobile phones and internet have both dramatically increased and reached to 249.9 and 54.5 per 1, 000 inhabitants respectively in 2006 [9-10]. However, the studies about rural areas were rarely mentioned despite there is a serious urban-rural gap [11]. Although several market information systems (MIS) have been set up for horticultural sector, they were also criticized for inaccessibility, unfitness for the needs of producers and ineffectiveness in changing the marketing chain [4].

To strengthen the existing market information systems and to further integrate ICT network into horticultural sector, it is important to investigate the provincial marketing patterns, potential ICT capacity and the information needs of the rural producers. Therefore, one objective of this study aims at revealing the inconveniences in marketing and ICT adoption to determine the reasons of holding back the success and efficiency of current information systems of tomato growers in Saint Louis Regions. Results of this study could serve as the basis for improving agricultural marketing management to provide tailored information through preferable instruments for farmers.

LITERATURE REVIEW

Horticultural Development of Tomato Industry: The agricultural sector in Senegal suffers from erratic rainfall and poor irrigation systems. The percentage of land under cultivation is low, but there is a large population engaged in the crop production. Accordingly,

the agricultural population density is tense, but the grains production remains not enough for the market needs. Senegal remains an account on food imports, particularly rice. Groundnut is the primary cash crop, accounted for a considerable proportion of cultivable land. But due to the highly variable price fluctuation in the international market, recently the government has been promoting the diversification of crops to reduce the risk and increase income.

The horticulture coastal zone of Niayes Region along Senegal River Valley is the country's leading horticultural production zone in Senegal. Moreover, Senegal's expanding horticulture production used to be mainly formed by many smallholder farmers and mostly for domestic consumption. Of recent few big producers are leading the trend, particularly for export market, tomato, watermelon, onion, mango, cabbage, orange, sweet potato and banana were the major horticultural crops that normally scores highest production volume in 2007 [12]. As far back as 1970s, tomato has been cultivated in Senegal. Tomato is grown for fresh consumption and supplied to agro-based industries for processing into tomato paste, an important component of the national diet. Onion and potato growers have been hard hit in recent years with the dumping below production costs of very cheap produced by the Dutch company. Tomatoes were sold by producers to state-owned tomato-paste factories and tomato production was the best paid activity available to rural households in the early 1990s. Due to unfair competition from the EU which is the world's second largest producer of tomato concentrate, by the 1996/97 growing season, Senegal's production fell to less than 20, 000 tonnes [13]. Prior to 1994, high tariffs and quotas were used selectively by the government to protect and promote domestic industries. In 1994, in order to comply with the conditionality of the World Bank and International Monetary Fund (IMF) under structural adjustment loan agreements, Senegal opened up its economy. It gradually reduced tariffs between 1994 and 2001 from an average of 36 per cent to 14 percent, with the highest tariffs falling from 70 per cent to 42 percent. However, European commercial tomato farmers have easy access to credit and qualified labour compared to the Senegalese counterparts and they were able to produced tomatoes more cheaply for the European processing industry. Moreover, in 1997 the EU paid out US\$300 million in export subsidies to tomato processors. This posed another problem for the farmers in Senegal that had managed to continue to grow

tomatoes. The tomato-paste factories stopped buying their tomatoes as they found it cheaper to import the triple concentrate tomato paste from Italian processors and transform it into double concentrate for the local market, than to buy local fresh tomatoes. As a result, prices received by local tomato farmers fell (from CFA50 to CFA25 a kilo during this time) and European tomato paste imports soared. [14].

Information Exchange in Agricultural Marketing:

Within the agricultural knowledge network surrounds smallholder farmers, many agricultural actors are interacting for information exchange [9]. In terms of the marketing sector, the role of intermediaries has been highlighted in the process of sharing information [15]. Market information about pricing, marketing channels, policies, logistics and access to input and credit are very useful to smallholder farmers. Accurate and fast market information exchange can also guide farmers and intermediaries to produce and sell moderate amount of their products at a right moment to meet market demands and price stability. Hence, the collection and distribution of market information is crucial to the efficiency of agricultural marketing. According to literature, intermediaries at times would hold information in order to protect their own interests [15, 16]. Price negotiations between farmers and intermediaries takes time and postponed the time for products to be sold. Nevertheless, farmers need intermediaries to collect and carry their products from the production area to the consumption area for selling. Bargaining is not completely harmful given that it facilitates information transmission among the agricultural knowledge information system. To improve information exchange in agricultural marketing, information transparency is a key to benefit the partnership between farmers and intermediaries.

In Senegal, mainly there are three different types of intermediaries dealing with vegetable crops and they are called “Bana-banas”, Assembler producers and Coxers (or negotiators) respectively [4]. Bana-banas carry products from the production areas to urban markets for selling while Coxers mostly stay in the markets to help sellers look for buyers and charge for a fixed commission per unit they sell. As for Assembler producers, they are actually big producers who also buy from small farmers. These intermediaries are informal but primary sources of market information to the producers. Moreover, [4] stressed that the other services, e.g. social links, grants of inputs or credits and transport means, make producers

and intermediaries tightly bound. To encourage a more dynamic and free mechanism of information exchange, other actors within the agricultural knowledge and information network ought to be involve in collective action and inflow of information with one another effectively and efficiently [8]. For this reason versatile and tractable ICT will continue to play a useful role in agricultural production.

ICT Application in Agricultural Marketing:

The reasons of using ICT to support farmers can be simply identified as ease of adoption and its great potential benefits [16]. Firstly, the technology base of ICT is universal rather than specialized for farm production. The process of ICT diffusion is not as arduous as the adoption of agricultural innovations. Secondly, ICT adoption provides more than merely faster access to vast information and lower communication cost, but new market opportunities as well. Internally, the growth of ICT coverage in rural Senegal also paved a broad way for the development of ICT-based information services in agriculture. It has been reported that 73% of the rural households possess radio sets [9] and there has been an increasing numbers of fixed telephones and mobile subscribers in rural villages [17-19]. Furthermore, with a successful project of the wireless technology, now all the rural communities in Senegal can have access to satellite internet services [20].

Since the late 1990's, several agricultural information systems have been initiated in some regions of Senegal. Through different equipments and services of ICT, farmers, fishermen and pastoralists have received more accessible and timely information regarding market prices, location of pasture and water, or weather alarms [4, 21]. As to the horticultural sector, the market information systems have been set up for delivering wholesale price information for some specific garden crops from urban markets [4, 5] The most remarkable one is an innovative commercial information service called “Xammarsé” (means “know your market” in a Senegalese local language) founded by a private company, Manobi, in 2001 [22]. It supplies daily price information of different garden crops in the principal wholesale and retail markets through SMS, voice, WAP and web according to the farmers' needs. It also follows up the trends of price fluctuation and provides assistance to supply chain management and trade transactions. It is estimated that the farmers have increased more than 15% of their revenue due to [22] information service. Despite this exhilarating news, the usage of Xammarsé system among farmers remains restricted.

In order to promote better usage of information systems, it is important for researchers to understand the factors that affect users' perceptions of ICT to design feasible and workable systems. According to a theoretical model for ICT adoption, information quality (completeness, accuracy, format, currency) and system quality (reliability, flexibility, integration and accessibility) may indirectly affect the usefulness of the information system and attitudes of users [23]. Therefore, it is necessary to examine farmers' capacity of ICT usage to find out what are the obstacles to the employment of information systems among farmers.

METHODOLOGY

Fieldwork was designed to clarify the marketing risks and information needs of tomato growers in Saint-Louis Region of Senegal and to reveal the potential of ICT applications to the region's tomato marketing management. According to the model of information needs [24], African users need information which is pertinent to their daily activities and can be accessed and used within the current constraints. Therefore, data collection methods included literature reviews of related publications and a survey with questionnaires concerning the marketing patterns and capabilities of tomato growers for using ICTs.

Field research team was employed in Dakar, the capital of Senegal and trained for the administration of the questionnaires. The survey covered a total of 150 randomly selected tomato growers in Saint-Louis Region and was conducted under the supervision of the local collaborator from Centre de Formation Professionnelle Horticole (CFPH) de Camberene (Professional Horticultural Training Center of Camberene) in July 2006. Of the 150 questionnaires distributed, 138 were returned, a rate of 92%. Some respondents who were not able to read and write answered the questions through the help of interviewers who translated the questions in official or local languages. Data were analyzed using descriptive statistical procedures with SPSS and Excel.

RESULTS AND DISCUSSION

For a social research it is vital to study the socio-economic profile of the respondents. One of the most important aspects is the gender. The result shows that male accounted for 83.9% of the respondents. This may suggest men were the main forces of tomato

production in Saint-Louis Region. Meanwhile, the age distribution of the population indicates the productive age potentials for agricultural production. As a result this research deems it necessary to examine the age distribution of the respondents. The average age of the total respondents were 43 years old and the respondents chiefly ranges from 40 to 49 years old (27%) and from 30-39 years old (25%), as the two most productive age groups. In other words, majority were formed by prime-aged adults against the extremely young population at the regional level (Figure 1).

In addition, two ethnic groups were dominant respondents Fula (71%) and Wolof (29%). Education levels, a basic indicator for high quality of human resources, were low among these tomato growers. The results show that, 77% of the respondents did not receive any formal education. To offset the vulnerability of peasants, small farmers' associations have been promoted in the villages by international development organizations. Production resources and technical assistance are greatly distributed to the farmers through these associations and as a result many farmers have been attracted to join membership. It is found that 91% of the respondents reported themselves as a member of local producers' groups. Furthermore, in the results and discussion, it is equally important to shed light on the production situation of the study area. The smallholder farmers in Saint-Louis Region are not only engaged in tomato production but produce in tandem with other predominant crops. The result in Figure 2 shows that 86% of the respondents cultivate rice while 83% and 56% cultivate onion and okra respectively. Tropical fruits, leafy greens and solanaceous fruit vegetables, e.g. banana, cabbage, melon, green pepper, lettuce and eggplant, were also cultivated by some respondents. These crops usually have the characteristics of short growing periods, easy cultivation similarity to tomato production. Farmers can plant few types of crops in their fragmental lands at the same time to increase income and spread risks without much more effort needed. The diversification of crop production helps mitigate risks, uncertainty of climate change and increase income thereby reducing poverty at household level.

In addition, the reasons of crop diversification might also relate to the fact that the tomato production in Saint-Louis is usually seasonal. Only 20% of the respondents produced tomato all year round, while 78% simply produced tomato in specific months, mostly during the cold and dry season, when the weather is more favorable for tomato production.

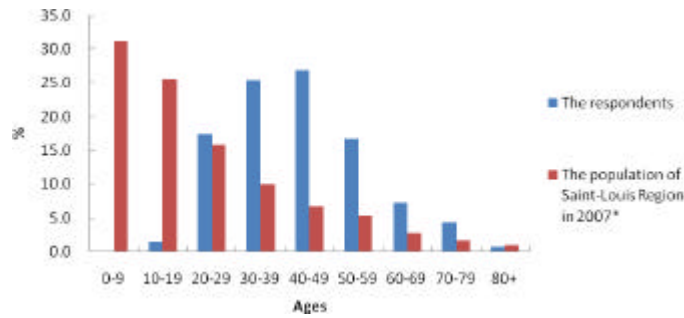


Fig. 1: Age distribution of the respondents
* Source from SRSD Saint-Louis (2008)

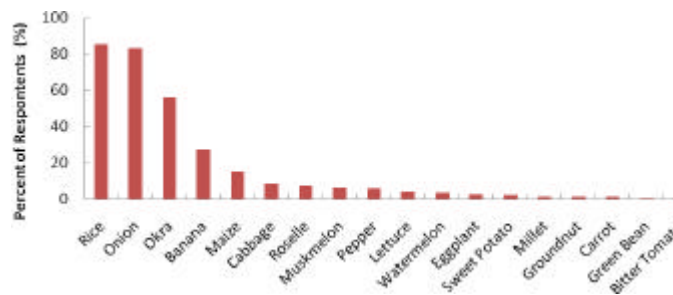


Fig. 2: Diversification of crop production pattern

Table 1: Tomato annual production volume of the respondents

	Volume in Tons	Frequency	Percent	Valid Percent	Cumulative Percent
Quantifiable	<5	44	31.9	56.4	56.4
	5 to <10	20	14.5	25.6	82.1
	10 to <15	7	5.1	9.0	91.0
	15 to <20	3	2.2	3.8	94.9
	20+	4	2.9	5.1	100.0
	Total	78	56.5	100.0	
Unquantifiable		60	43.5		
Total		138	100.0		

Table 2: Tomato annual revenue accumulation of the respondents

	Revenue in Euro	Frequency	Percent	Valid Percent	Cumulative Percent
Quantifiable	<250	33	23.9	42.3	42.3
	250 to <500	15	10.9	19.2	61.5
	500 to <750	18	13.0	23.1	84.6
	750 to <1000	4	2.9	5.1	89.7
	1000+	8	5.8	10.3	100.0
	Total	78	56.5	100.0	
Unquantifiable		60	43.5		
Total		138	100.0		

After harvest, tomatoes were put into crates to the necessary delivery point for consumers. Usually each crate was loaded with 25 to 28 kilograms of tomatoes and worth around 1200 CFA (about 1.8 Euro). In terms of per kilogram, the range of tomato price was pegged between 41 to 54 CFA with an average of 46 CFA (about 0.07 Euro). However, 43% of the respondents were not able to quantify the amount of their production. The reasons might relate to the

poor record of farm production and low level of education. As for the rest of producers 57%, of them were not big producers of tomato. They mainly produced less than 5 tons of tomatoes (Table 1) and earned less than 250 Euro a year (which means less than 0.7 Euro or 1 USD per day on average) from their tomato production (Table 2). The revenue of tomato production was basically insignificant, not to mention the net profit.

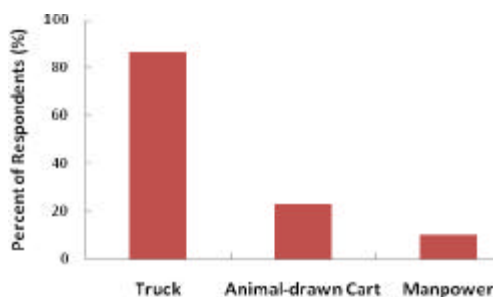


Fig. 3: Transportation means use by respondents

For this research work or any business setup, the issue of market is very important to elaborate on as marketing determine the prospects of production activity. The smaller holder farmers need to know pricing mechanism, access to update market information and risk management for better decision making and strong bargaining power. Currently tomato farmers have limited market outlets for farmers to sell their produce. The results from research work show that 78% of the respondents signed a contract with a tomato-processing firm; Société de conserves alimentaires au Sénégal (SOCAS) to buy their products. The guaranteed price and income provided by this regular customer makes the bank willingness to give loans to these contract farmers [15]. The relationship seems mutually beneficial, but some respondents even wished to have another company to compete with SOCAS to enhance reasonable prices for tomato producers in the Saint-Louis Region of Senegal [25].

Meanwhile, this reliable key account did not remove the intermediaries from the marketing chain. Although SOCAS takes much tomato production from the farmers, there is oversupply of products at the market. Given that, most tomato farmers produce not only tomatoes, they also need to find markets for their other crops. As a result, many contract farmers and individual farmers still do transactions with local intermediaries]. “Bana-banas” are one of the intermediaries that farmers often approach where 40% of the respondents mentioned “bana-banas” delivered their products to markets.

Transportation is one of the crucial issues refer to farmer’s choice of marketing channels. Farmers need to be more concerned as how to move their products from the production site to the markets on time to receive a good price and reduce the loss in the distribution process. The survey results show that several methods of transportation, including trucks (86%), animal-drawn carts (23%) and human labor (10%), were used by the

respondents to send their products to the markets (Figure 3). Generally, SOCAS send trucks to the villages to collect tomatoes from the farmers at harvest season. This strategy helps to cut down the costs and the risk that the farmers bear. It is also more effective than using animal-drawn carts or human labor which usually takes time before the products reach the market and the degree of uncertainty. Moreover, improvement in SOCAS’s truck scheduling and mobility remains needed. Some farmers mentioned their products got rotten before arriving at the factory because of poor road condition and untimely arrival of trucks to collect the products

In most of the developing countries, transportation cost is relatively high for poor farmers. Distance between the farm and the market, containers, production volume, season, wastage rate and product properties all affect transportation cost. Given that vegetables and fruits are usually large in size but low in price, horticulture farmers must consider how much they can afford to transport their products to the markets. In Saint-Louis Region, SOCAS’s participation in transportation contributes to relieve the burden for tomato producers. From the results 31% of the respondents did not incur any cost for transportation while 69% indicated payment (Table 3). In terms of monetary value, 34% of the respondents paid some less than 10 Euro for tomato transportation in a year. The share of transportation costs in tomato revenue of the respondents was 2.2% on average, according to the available data from those respondents who quantified their tomato revenue and the transportation costs in a year. On the other hand 33% of the respondents were liable to pay less than 5% of their revenue for transportation while another 14% of the respondents spent from 5 to less than 10% (Table 4).

In the marketing activities of agricultural products, needs management to deal with risks and uncertain circumstances. Farmers face many types of risks, in terms of adverse weather, poor road and long distance of transportation, price fluctuations, glut during the peak season, spoilage, low storage capacity, import competition, crafty intermediaries and accidents. Risk management greatly impacts farmers’ income and persistence in the next farming season. Tomato farmers in Saint-Louis Region are also facing teething problem of risks and most salient one is perishability of products. From the results, 94% of the respondents indicated rot of products as their major threats while 50% indicated competition. In addition, 25% of the respondents were also troubled by the poor condition of roads and transportation infrastructure.

Table 3: Whole year round transportation costs

		Transportation Cost in Euro	Frequency	Percent	Valid Percent	Cumulative Percent
Charged per unit	Quantifiable	above 0 to <10	47	34.1	66.2	66.2
		10 to <20	6	4.3	8.5	74.6
		20 to <30	9	6.5	12.7	87.3
		30 +	9	6.5	12.7	100.0
		Total	71	51.4	100.0	
	Unquantifiable		24	17.4		
	Total		95	68.8		
Free		0	43	31.2		
Total			138	100.0		

Table 4: The share of transportation costs in tomato revenue of the respondents

		Share of Transportation Costs in Percent (%)	Frequency	Percent	Valid Percent	Cumulative Percent
Charged per unit	Calculable	above 0 to <5	46	33.3	68.7	68.7
		5 to <10	20	14.5	29.9	98.5
		10+	1	0.7	1.5	100.0
		Total	67	48.6	100.0	
	Incalculable		28	20.3		
	Total		95	68.8		
Free		0	43	31.2		
Total		138	100.0			

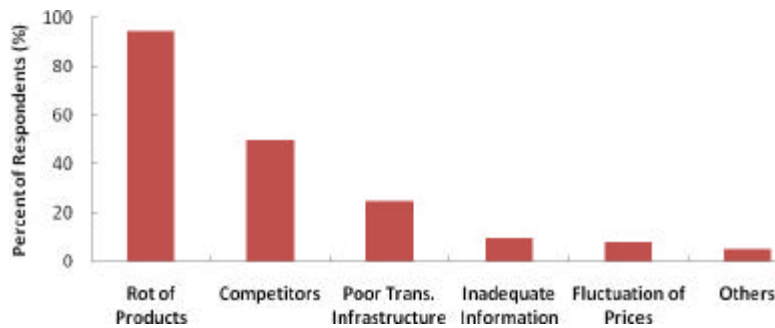


Fig. 4: Marketing risks encountered by respondents

Agricultural market information is essential for smallholder farmers to make decisions on production and marketing. ICT can facilitate information exchange among agricultural knowledge network and may open more opportunities for agricultural development leading to economic growth.

However, the accessibility and applicability of ICT to farmers in rural areas of the developing countries has been a major concern. In Sub-Saharan Africa, Senegal has relatively advanced telecommunication and wireless technology which covered nationwide areas, including urban and rural dwellers. This advantage implies the great potential of Senegalese farmers for ICT application to improve their agricultural marketing management. The results of this research

indicate that the majority of tomato farmers in Saint-Louis Region were familiar specifically with phones (Figure 5). Mobile phone shows (82%) and telecaster (71%) were widely used by the respondents. Some respondents also mentioned radio (24%) and television (15%) were commonly used in their daily life respectively. Only 4% of the respondents claimed that they had no conventional access to any ICT.

Although the result shows that, high penetration rate of ICT among the tomato farmers in Saint-Louis Region of Senegal. It is important to look into the reasons of using ICT by tomato producers in St. Louis Region of Senegal. The respondents claimed that the reasons of using these instruments were chiefly for receiving news and information showing (91%). As in Figure 6 shows,

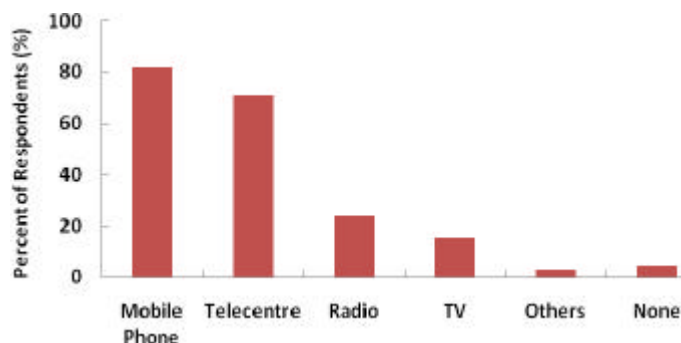


Fig. 5: Information communication and technology tools use by the respondents

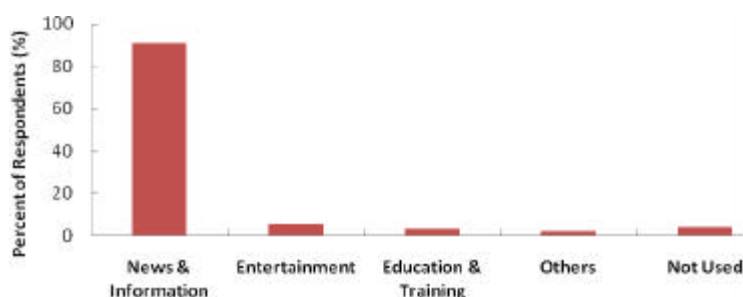


Fig. 6: Purposes of information communication technology by respondents

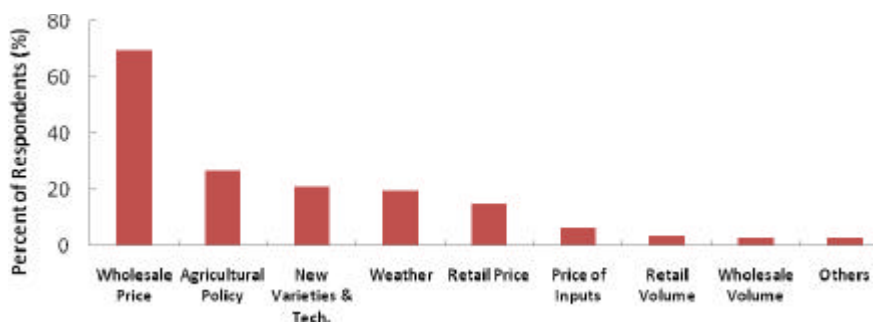


Fig. 7: Information need by respondents.

they rarely used ICT for entertainment (6%), education and training (4%), or other purposes (2%). This phenomenon might relate to their personal habits, the cost of ICT usage, or the limited functions of the instrument itself. Meanwhile, the power resources are crucial to ICT operation and the sustainability of market information system. However, in Saint-Louis Region, unreliable power supply is quite prevalent problem. The results show that 89% of the respondents stated power intermittent supply of power (at least twice a week or even everyday) in their local communities. The instability of power can be an obstacle to timely information dissemination to the smallholder farmers through ICT if there is no other alternative of power source.

Moreover, developing a market information system may not merely be the issue of equipment and infrastructure, but the need of the users must be emphasized for development purpose. The relevance of information, the design of user interface and the illiteracy of farmers may have impact on the effectiveness of the market information system. Therefore, this research probed into the information needs and language capability of farmers. From the result in Figure 7 shows that, the respondents were mainly seeking for information source regarding wholesale price (70%), agricultural policy (27%), new varieties and technologies (21%), weather (20%) and retail price (15%). Meanwhile, a total of 77% of the respondents mentioned that they had difficulties in reading French, the official language of

Senegal. Even in terms of speaking, only 13% of the respondents considered themselves capable to speak French fluently. In Contrast, 99% of the respondents stated that they spoke their own local languages.

SUMMARY AND CONCLUSIONS

In this paper, the following components such as marketing patterns, ICT usage and information needs of tomato producers in the region of Saint-Louis was the bases of judgments. The survey results reveal that, producers usually diversify their cropping pattern; therefore farmers need to have easy access to agricultural information technologies. It has been proven that most of the producers in this region rely on the tomato-processing factory, SOCAS, to abort their harvest. The farming contract signed with SOCAS also provides the producers with easy access to inputs and credits from the bank. To some extent, the contract signed by the farmers gives them the assurance of increasing income and reducing the risks of tomato production.

However, SOCAS as the only tomato processing plant does not purchase all the tomatoes produced by farmers in Saint-Louis Region. Some farmers negotiate with the intermediaries to sell their tomatoes and other products. Furthermore, the fixed price SOCAS pays to the producers is far below than the market price in other regions due to the cost of inputs and transportation that SOCAS covers for the producers. In addition, the results of this study showed that many products perished before they reached to the market. This is because of late delivery resulting to lack of transportation and long process of dealing with intermediaries.

Therefore, to improve tomato production and marketing management in Saint-Louis Region, a formal market information system should be applied for clearing market prices. In this manner, farmers can save time from negotiation, sell their products at more reasonable prices and reduce the loss from the rot. Moreover, it is advisable for farmers to adhere to marketing management system and production adjustment plan to stagger their time of planting, use of different tomatoes varieties for farmers in rural communities. This will mitigate the problem of competitors, nullify market overload and to facilitate collective transportation of regional products.

Given that mobile phone and telecaster were the most prevalent tools with good quality for the producers to retrieve news and information, telephone should be used as the underlying technology of the marketing management system. It is also worthy to note that the equipment (e.g. the charger) supported by solar power

should be available in order to overcome the poor electricity in the rural villages of Saint-Louis Region. More importantly, most producers would like to receive the information of wholesale prices. Therefore, the information obtained from wholesale markets should be collected from reliable resources and quickly made accessible or disseminated to the farmers. The factor of illiteracy needs more consideration since a large number of tomato producers mentioned that they had difficulties in reading or speaking French. The marketing management system should take by Manobi, as a reference and include vocal or graphic approach [22] to provide more information, e.g. policies, new technology and weather, in a user-friendly form for farmers who only understand their own local languages. Now that many producers have participated in local producers' groups, the marketing management system may also take these groups as their focal point for information dissemination. Given that Senegal has one of most developed ICT infrastructures in Africa the marketing management system may eventually become more than a tool with basic functions for rural farmers to access information, lower transaction cost and explores more business opportunities. It is promising that an advanced system may develop more elaborate functions which enable farmers to manage their finance, respond to market needs, enhance crisis awareness and adaptability, foster entrepreneurship and accelerate the cooperation of rural communities in the future. Furthermore, this study showed not only the characteristics of tomato production and marketing, but also what types of the information contents, formats and media should be applied to the marketing management systems to meet the needs of the rural producers in Senegal. Some strategies for improving the current disadvantages are also presented in this paper. Mobile phone and telecentre have both been widely used by producers and therefore, telephony should be used as the basic technological tool in a feasible ICT-based management system. Moreover, most of the producers were interested in wholesale prices, the accuracy and dissemination of the information obtained from wholesale markets will be crucial.

Basing on results from this research findings we conclude that conclude that spoilage of products has been the main marketing risk of tomato farmers in Saint-Louis Region of Senegal. Therefore a better national policy and regulatory framework for the application of ICT to agricultural production and marketing in the country should be worked by the Senegalese government through the help of private sector and nongovernmental organizations for future economic development and growth.

ACKNOWLEDGEMENT

The author would like to acknowledge the valuable contributions of Dr. Aliou Diongue, Moussa Diarra (CFPH de Camberene, Dakar) Tiho Tagouelbe, Seydou Traore and all those who helped to complete this study. She also acknowledges her father (Wan-Yi Chang) and mother (Pi-Hua Huang Chang) for their generous support and the rest of her family members.

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