Promotion of Rice Development Project

PRiDe Project

Rice in Uganda:
Viewed from Various Market Channels

A Survey Report

December 2013

Japan International Cooperation Agency

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Chapter I. Introduction

In the history of crop cultivation in Uganda few crops have hardly attracted such a sudden attention as rice has been attracting since around the turn of the century. Rice being not a traditional staple crop in Uganda for consumers as well as for farmers, the production and consumption of rice used to be negligible. At around the time of independence in 1960, rice took only 0.5% of total per-capita calorie intake of Ugandan people and 0.05% of the total area planted by Ugandan farmers to major staple food crops (plantains, cassava, sweet potatoes, millet, sorghum, maize and rice, in descending order), according to the 'official' statistics as reported to the Food and Agricultural Organization (FAOSTAT 2012). Such a minor crop has attracted abrupt attention of policy makers, researchers and farmers since the early 2000s when a massive campaign commenced to promote the cultivation of New Rice for Africa (NERICA) developed by the Africa Rice Center (then West African Rice Development Association) in many farming areas in Uganda. In 2008 the Government of Uganda prepared the Uganda National Rice Development Strategy (MAAIF 2008), which states that rice production is a key to food security and poverty reduction in Uganda, and joined in the same year the Coalition for African Rice Development (CARD), which aims at doubling rice production in sub-Saharan Africa within 10 years. In 2010 the Regional Rice Research and Training Centre was established at the National Crops Resources Research Institute (NaCRRI) in Uganda with the aim to train farmers, extension agents and researchers and conduct research on appropriate rice technologies in East Africa.

A telling testimony of this 'rice boom' is a sudden proliferation of the literature related to rice in Uganda: Basic rice statistics and innumerable reports and research papers concerning various aspects of rice have appeared since the early 2000s. In particular, the literature that has been mushrooming is on rice production.[1] Also burgeoning is the literature on the post-harvest rice marketing processes, or so-called rice value chains, including studies on rice milling which is an important nodal point that determines the quality

[1] Balasubramanian *et al.* (2007) report that rice cultivation in Uganda is practiced under three ecosystems (land types): Rrainfed wet land (roughly equivalent to rainfed lowland; 53% on the average for 1994- 2004), dry land (rainfed upland; 45%) and irrigated wetland (irrigated lowland; 2%). Of these three types, upland rice cultivation has been studied most intensively (Imanywoha *et al.* 2004; Bigirwa *et a*l. 2005; Wilfred 2006; FIT 2006; Kijima *et al*. 2006, 2008, 2011; Hyuha *et al*. 2007; Jude 2009; Fujiie *et al*. 2010, 2011a; Oonyu 2011; Miyamoto *et al*. 2012; Bergman-Lodin *et al*. 2012; Goto *et al*. 2013; Haneishi *et al*. 2013a, 2013b, 2013c). In spite of the negligibly small share among the land types, irrigated lowland has attracted increasing attention (Sserunkuuma *et al*. 2004; Hyuha *et al*. 2007; Kijima *et al*. 2010, 2012a; Watanabe 2010; Nakano and Otsuka 2011; Nakano *et al*. 2011; Fujiie *et al*. 2011b; Kijima 2012). Contrary to its dominance among the three land types, rainfed lowland rice cultivation has been studied relatively less (PMA Secretariat, 2009; Haneishi *et al*., 2013b, 2013c).

of rice in the market.[2] Compared to the production side, studies on the consumption side of rice in Uganda have been nearly totally absent, though there are some studies on food consumption in which rice is included as one of staple foods.[3]

The rapidly growing literature facilitates greatly our understanding on rice cultivation and production in Uganda. However, the past studies, by nature, tend to focus on well, but narrowly, defined subject areas of the rice economy, and on certain geographically confined parts of the country. For example, studies on rice production are usually based on data obtained from farmers in certain rice production regions of certain rice growing eco-systems.[4] Similarly, the past rice marketing studies deal with the rice markets in certain regions or with piecemeal parts of the entire marketing network extending between rice producing regions and consuming areas all over the country. Though none of the past studies is useless, all of them together are still not sufficient to configure a holistic picture of the newly emerging rice sector in Uganda.

For configuring the holistic picture, more important than theme-specific individual studies are the national statistics on rice, the provision of which primarily falls in the responsibility of the statistics-related agencies of the government. Indeed, great efforts have been made to generate statistics on rice production systematically: For the first time in the history of the census-level national statistics in Uganda, the area and production of rice were collected in the Agricultural Module of the Uganda National Household Survey 2005/ 2006 as one of the major crops (UBOS 2007), and again in the Uganda Census of Agriculture 2008/2009 (UBOS 2010a, 2010b). These basic national statistics, particularly the latter, are extremely useful in drawing a good picture of the regional as well as national rice production. Such efforts in the systematic data collection being still at a burgeoning stage, however, these statistics are not without problems (Kikuchi *et al.* 2013a). Regarding rice-market-related statistics, such as the market rice prices and rice production costs, efforts to provide the statistics have also been made by the Bank of Uganda (BOU) and the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF). However, the coverage and extent of the statistics are not at the level usable for analytical purposes.[5]

It is highly preferable, or a prerequisite, for policy making to have a holistic picture of the rice sector. The purpose of this study is to provide it based on the data obtained a

[2] Studies that touch on the rice markets are Wilfred (2006), Yoshida (2008), Emerging Market Group (2008), PMA Secretariat (2009), Fujiie (2009), Oyee (2009), Chemonics International (2010), Gitau (2011), Kijima *et al.* (2012b). Studies on rice milling include Wilfred (2006), Candia *et al*. (2008), Kijima *et al*. (2012b), SMJR Consult (2012).
[3] Werema (2007), Benson *et al.* (2008), Dary *et al.* (2012).
[4] Haneishi *et al.* (2013b, 2013c) use data collected from a nation-wide rice farmer survey, but cover only rainfed rice farmers.
[5] A systematic collection of domestic-market-related statistics is left much to be wanted even in developed countries.

series of surveys conducted in the rice marketing channels. The rice markets are the places where all rice, imported from foreign countries as well as produced in the country, goes through, from the farm-gate of rice farmers in the country, and from the country borders through which rice is imported, to consumers outside as well as in Kampala. Therefore, if the rice flows in all the market channels in the country are clutched, the configuration of the country's rice sector at large would be drawn in regard of the quantity of rice produced, consumed and traded with foreign countries and their regional distributions. Also made clear are the prices and grades of rice in the markets. The information in these respects helps configure the holistic picture of the rice sector.

Under that grand objective, we set the following specific objectives:

1. Estimate regional as well as national rice consumption by grade (quality),
2. Estimate regional as well as national rice production and its distribution among the regions including Kampala,
3. Estimate rice imports to and export from the regions in the country,
4. Estimate the price structure by grade in the rice markets outside as well as in Kampala,
5. Estimate price margins and account for costs incurred in the rice marketing process from the farm-gate all the way through to the retail market in Kampala by market stage,
6. Estimate the international competitiveness of domestic rice, and
7. Observe the rice milling process in the country.

Chapter II. Data Collection and Methodology

1. Surveys conducted

The main body of data used in this report was collected from a series of surveys conducted from March to September 2012. The major part of the series consisted of four interview surveys: (1) rice trader survey, (2) small grocery store survey, (3) supermarket survey and (4) rice mill survey.

In the rice trader survey, we interviewed rice traders who were engaged in the buying and selling of rice either paddy or milled rice at some levels of the rice marketing process from after farm-gate to before final consumers, including brokers (middlemen), wholesalers and vendors, operating in and around public markets[6] in Kampala as well as in major cities and towns in the regions outside Kampala. The small grocery store survey covered small grocery stores that sold rice, outside the public markets in Kampala. Supermarkets in Kampala and in major cities and towns in the regions outside Kampala were visited in the supermarket survey. Rice millers in the regions outside Kampala were interviewed in the rice mill survey.

The number of samples interviewed in each survey is listed in Table II-1 for Kampala by division and in Table II-2 for off-Kampala by region. The samples for these surveys were drawn in two stages. For the rice trader survey, at the first stage, we selected markets in Kampala and districts in the regions outside Kampala, and at the second stage, rice traders in the sample markets for the former and those in the central market of the capital city/town of the sample districts for the latter were selected for interview.[7] The selection of the sample markets in Kampala and of the sample districts in the regions was purposive. In each sample market in Kampala and in the capital city/town of the sample districts, we counted the number of rice traders and drew sample traders randomly for interview. For the small grocery store survey conducted in Kampala, we first selected 14 blocks randomly out of 70 blocks obtained by dividing the entire Kampala City area into isometric rectangular blocks, 1 block being 1.5 km (east-west) x 2 km (north-south), and counted the number of small grocery stores that sold rice in the sample block, and then selected sample small grocery stores selling rice randomly for interview. For the

[6] Public markets here refer to 'market places' where many vendors, shops and stores are gather together, selling various commodities. Many of the markets are operated by city/ town governments, but there are some operated under private/ non-governmental ownership.

[7] As stated in the footnoted to Table II-2, in some districts where the largest market was in a town other than the capital town, samples were drawn from that market. There are some districts where samples were drawn from more than one market.

supermarket survey in Kampala, the same sampling method as for the small grocery store survey was adopted. The same sampling as for the rice trader survey was adapted to the rice mill survey in the sample districts. In addition to these four surveys, small number of agricultural input/implement suppliers, transporters and rice importers were interviewed (Table II-3). The questionnaires used in these surveys are shown in Appendix 1 to 7. Since the rice mill survey was conducted in two phases, the first phase for March-June and the second phase for July-September, there are two questionnaires.

2. Estimation of rice sold for consumption and produced in the country

Another important set of data in this study is the numbers of rice vendors/traders, small rice retailers, super markets and rice millers in the country, which are necessary for estimating the total consumption and production of rice in Uganda.

(1) Quantity of rice sold to consumers

In this report, we estimated the quantity of rice consumed in Kampala and outside Kampala separately, as the quantity of rice sold to consumers for final consumption.[8] For Kampala, the quantities of rice sold by rice traders in public markets, small retailers and supermarkets were estimated by multiplying the average quantity sold per rice trader in public markets, per retailer and per supermarket by the number of the rice traders, the retailers and the supermarkets, respectively, respectively. The number of rice traders in the public markets in Kampala was estimated by multiplying the total number of rice traders in all the markets in each division by the average percentage share of rice traders in the corresponding division obtained from the rice trader survey in Kampala. The numbers of the total rice traders in the 67 public markets in 5 divisions of Kampala were obtained from the Kampala Capital City Authority (KCCA). The total number of small grocery stores selling rice outside the public markets in Kampala was estimated, first by dividing the 70 blocks of Kampala into high-shop-density blocks and low-shop-density blocks, including the 14 sample blocks, and then by multiplying the average number of small grocery stores selling rice per sample block by the number of the blocks by density class and by division. The number of supermarkets in Kampala, classified into large, small and mini supermarkets, was estimated in the same method as for the small grocery stores, except large supermarkets for which all were enumerated.

[8] This quantity includes rice consumed in institutions, such as schools, military barracks, prisons, hotels and restaurants, as well as in ordinary households, but does not include the quantity of rice consumed by rice producing farmers as their home-consumption, which in this report is dealt with separately from the rice that goes through the 'markets'.

For outside Kampala, the total amount of rice sold for final consumption in public markets was estimated by multiplying the regional average quantity per capita of rice sold obtained from the sample market data by the regional population. The total amount of rice sold in supermarkets was estimated in two steps. First, the average number of supermarkets by region was estimated by using the number of supermarkets in the sample districts and the population density of these districts, and second for each region the estimated number of supermarkets is multiplied with the average quantity sold per supermarket obtained from the supermarket survey. The data on population and population density, as of the end of 2011, were obtained from the UBOS.

(2) Quantity of rice produced

The total quantity of rice produced in Uganda was estimated as the total rice milled by rice millers in the country,[9] the quantity of which was estimated by multiplying the average amount of paddy rice milled per rice miller per year by region, obtained from the rice mill survey, by the number of rice millers in the respective region. The estimation of the number of rice millers by region was made by using a few data sources. One of them was a phone survey conducted in mid-2012, in which we made phone interviews to the District Agriculture Officers of rice producing districts to ask the number of rice millers operating in the district as of early 2012. The data on the number of rice millers by district in 2007 from Candia *et al.* (2008) and in 2009 from a survey conducted by Kijima *et al.* (2012) were used, together with the data from our rice mill survey explained earlier, to supplement the data obtained from the phone-survey. The regional totals of the number of rice millers were multiplied with the average quantity of paddy rice milled per rice miller per year of respective regions, obtained from the rice mill survey, to reach the rice production by region.

3. Time reference

The data used in this report were collected during the period of March to September 2012. Since rice prices at various stages of the rice marketing chain vary significantly over time in a year, the price-related data used in the report are confined to those obtained during the period of March-April 2012. For the quantity-related data, such as rice production and consumption, the time reference of this report is the year for 2011-2012.

[9] There could be some discrepancy between the total rice production and the total rice milled. For example, there could be paddy rice produced last year but carried over to this year for milling or produced this year but stored for milling in the next year. There could also be paddy rice produced in other countries and imported to Uganda for milling or produced in Uganda and exported to neighboring countries in the form of paddy rice. However, the amount of such paddy rice is a tiny fraction of the total domestic production.

4. Regions

In this report, we divide Uganda into Kampala and outside Kampala, and the latter into eight regions (Table II-4 and Fig. II-1).[10] Note that our regional demarcations are slightly different from the conventional/ administrative ones in some details. We adopted ours so as to represent best the nature of the regions in terms of rice production and rice marketing. For example, all the regions, except for Central-west and Kampala, include some districts that grow rice, as reported by the Census of Agriculture 2008/2009 (UBOS 2010a). The region of Central-west is demarcated in our study so as to include non-rice-producing districts. In the course of this report, when appropriate, East-far and East-near together may be referred to as East, and so as Central for Central-east and Central-west.

5. Rice marketing channels and agents involved

It is important to recognize what channels exist in the post-harvest rice marketing chain and what functions actors involved in the chain play. Channels through which rice produced domestically and imported from foreign countries goes from farm-gates to retailers in Kampala and from importers to retailers in cities and towns outside Kampala, respectively, are drawn in Fig. II-2, together with the actors involved.

For domestic rice that flows according to the green arrows, rice mills in rice producing areas, located either in major district towns or in villages, are important nodal points where many actors involved in the rice marketing chain gather together. Paddy rice produced by farmers is brought to rice mills by farmers themselves or village collectors or agents sent by rice mills or town brokers.[11] Town rice brokers, also called suppliers or middlemen, are operating around the rice mills with varying scales. Some town wholesalers take the brokers' role.[12] Many rice millers engage in rice brokerage as well. They sell milled rice, bought from farmers or village collectors, to Kampala wholesalers/ suppliers who come to the rice mills for procuring rice and sending it to Kampala. An amount of rice goes

[10] Appendix Table I shows the districts in each region in more details.
[11] Since the rice milling by hand with a mallet is rarely practiced by farmers, virtually all the rice produced goes to rice mills, even for home consumption.
[12] Although both town rice wholesalers and town rice brokers are engaged in the brokering and wholesaling of rice, they differ in a few points: i) the wholesalers are, without exception, with their stores, whereas the brokers are usually with storages but without stores, ii) the wholesalers are engaged not only in rice brokering at rice producing areas but also in the trade of many other commodities, whereas the brokers are specialized to the trade of only rice or of a few crops including rice, and iii) the wholesalers handle not only domestic rice but also imported one, whereas the brokers handle only domestic rice.

from town brokers to vendors in local markets, but the majority goes to the Kampala wholesale markets,[13] through there to market vendors and small grocery stores in Kampala, and some further to town wholesalers in other districts.

In every major city and town in rice producing areas, a large number of town brokers are operating around rice mills. Some of them who handle a large amount of rice keep their own storage capacity (storehouse) but usually not store (shop). It is common that some brokers of small size share a storage space or borrow storing space from rice mills. The main function of these town brokers is to buy a few sacks of rice each from farmers, in paddy at farm-gate or in milled rice at rice mills, and accumulate the sacks of milled rice to sell in bulk to buyers from Kampala. When they come, Kampala buyers visit a few rice mills in a town or a few towns in rice producing areas, meet town rice brokers at or around rice mills, buy rice from them until the target quantity, say 100 sacks (a 10-ton truck load), is acquired, and hire transporters on the spot to carry his/her rice sacks to Kampala. With few exceptions, the buying and selling transactions between farmers, town brokers and Kampala wholesalers and hiring transport trucks are all made in cash.[14]

Kampala wholesalers have a shop in or around major wholesale markets in Kampala, such as Owino, Nakawa, Bwaise, Kawempe, Kisenyi and Kasubi. They usually handle many commodities not only rice but also other food items, such as maize and cassava flour, and many other daily living necessities. Kampala brokers and suppliers play the same role as rice wholesalers, but they usually do not have any store but a storage space for rice alone or rice and other grains and flours. In this report, we use the term 'Kampala wholesalers' as including Kampala rice brokers and suppliers, unless there is a need to distinguish them. Market rice vendors in Kampala markets and small grocery stores selling rice usually go to Kampala wholesale markets to buy their rice for sale. It is also not rare for them to acquire their rice by Kampala suppliers' delivery service upon order by phone or their mobile sales that go around many retail-oriented markets in Kampala.

Aside from the marketing channels for domestic rice flowing from smallholder-farmers to Kampala retailers, there is another channel that involves rice estates who produce rice in their own farms of several hundred to a few thousand ha as well as in smallholders' farm land on a contract basis, mill the rice produced in their own large scale rice mills, and sell it under their own brands. Such rice is mainly sold in supermarkets in Kampala and in cities and towns all over outside Kampala, but a minor part of it goes to consumers through rice vendors in Kampala markets (Fig. II-2). In addition to the rice mills

[13] Relatively large rice wholesale markets, which have a similar function as those in Kampala, are found in Entebbe and Jinja.

[14] For example, if a Kampala wholesaler makes a purchase of 100 sacks, the cash payments involved could be more than Ush 30 million (US$ 12,000).

owned by the several estates, there are some rice mills of extraordinary large scale operating in the country. Every rice mill makes efforts to secure as much paddy rice as possible so as to attain a higher profit. Such a need is so high for large scale rice mills that they collect paddy rice from a very wide area, in some cases including foreign countries.

For imported rice that flows according to the red arrows in Fig. II-2, a few different channels can be discerned. The channel that contains the largest amount of imported rice runs from foreign export countries, such as Pakistan and Vietnam, through importers in Kampala or some other towns such as Busia (a border town to Kenya), to Kampala wholesalers, and further to Kampala vendors, or to town vendors through town wholesalers outside Kampala who buy the imported rice from Kampala wholesalers. In this channel, rice is transported by land from Mombasa in Kenya through Busia or Malaba to Kampala. The second largest channel is formed mainly by Kampala wholesalers and brokers who go to Tanzania, and Kenya in a smaller extent, to procure rice. Many town brokers and wholesalers in areas adjacent to Tanzania and Kenya join this channel as importers. A main route to import rice in this channel is by land from rice growing areas in Tanzania through Mutukula to Kampala and another is a water route on the Lake Victoria from Mwanza in Tanzania to Port Bell and from there to Kampala on land. The third channel for imported rice is a small one in which traders in border towns, such as Arua in North-west and Katuna in South-west, buy rice from traders in border town in neighboring countries, such as Congo (DRC) and Rwanda.

Of the actors in the rice marketing channels shown in Figure II-2, we interviewed rice mills, town brokers/ middlemen, town wholesalers, town retailers/ market vendors, Kampala wholesalers/ brokers/ suppliers, Kampala retailers/ market vendors/ small grocery stores, and supermarkets in and outside Kampala. Based on the data obtained from them, we try to grasp the quantity and the quality of rice, domestically produced as well as imported, which flows in these channels between producing areas and consumption areas and between Uganda and foreign countries, and examine how the rice markets in producing as well as in consuming areas work and are inter-linked each other.

Table II-1. Number of samples interviewed / visited in Kampala

	Division / market	Rice trader	Small retail shop	Super-market		
				Large	Small	Mini
	Central	**25**		4	2	
1	Nakasero	5				
2	Owino	5				
3	Kikubo	7				
4	New Taxi Park	5				
5	Kisenyi	3				
	Kawempe (North)	**17**	6		1	4
6	Bwaise	7				
7	Kawempe	6				
8	Kalerwe	4				
	Nakawa (East)	**9**	4	5	1	1
9	Nakawa	7				
10	Bugolobi	2				
	Makindye (South)	**12**	6			4
11	Gaba	4				
12	Kansanga	2				
13	Kabaragara	2				
14	Katwe	4				
	Rubaga (West)	**14**	7		4	3
15	Natete	3				
16	Kasubi	7				
17	Nalukolongo	2				
18	Kibuye	2				
	Total	**77**	**23**	**9**	**8**	**12**

Table II-2. Number of samples interviewed in districts [a]

	Region / District	Rice trader	Super-market	Rice mill		Region / District	Rice trader	Super-market	Rice mill
	North-west	**9**	**3**	**2**		**Central-east**	**15**	**4**	**15**
1	Arua	5	1	2	20	Mukono	4	1	5
2	Nebbi	4	2		21	Luwero	3	1	3
	North	**12**	**4**	**13**	22	Nakaseke			3
3	Amuru [b]			2	23	Wakiso [e]	5	1	3
4	Gulu	3	2	5	24	Mpigi	3	1	
5	Lira	9	2	6	25	Kiboga			1
	East-far	**29**	**8**	**23**		**Central-west**	**7**	**3**	
6	Soroti	8	3	4	26	Kalungu [f]		1	
7	Amuria			2	27	Masaka	2	1	
8	Katakwi			2	28	Rakai [g]	5	1	
9	Serere	2				**South-west**	**18**	**5**	**2**
10	Kumi	4	1	1	29	Kanungu [h]	5		2
11	Pallisa	2		2	30	Mbarara	5	1	
12	Mbale	10	3	6	31	Kabale	4	1	
14	Butaleja [c]			4	32	Rukungiri	2	1	
13	Tororo	3	1	2	33	Bushenyi [i]	2	2	
	East-near	**15**	**3**	**9**		**West**	**18**	**3**	**6**
15	Namutumba [d]	2		2	34	Hoima	8	2	4
16	Bugiri	3	1		35	Masindi	10	1	2
17	Iganga	5	1	2					
18	Mayuge			3					
19	Jinja	5	1	2		**Total**	**123**	**33**	**70**

a) Unless otherwise noted, surveys were conducted in the capital city/town of the districts listed.

b) Pabo and Atiak.

c) Doho area.

d) Busembatia.

e) Entebbe.

f) Lukaya.

g) Rakai and Kyotera.

h) Lukaya.

i) Bushenyi and Ishaka.

Table II-3. Number of agricultural input/ implement suppliers, transporters and rice importers interviewed in Kampala and off-Kampala

	Ag. input supplier	Trans-porter	Rice importer	Total
Kampla	4	1	1	6
Outside Kampala	11	10		21
Total	15	11	1	27

Table II-4. Regions adopted in this study and total area planted to rice

Region	Total area planted to rice in 2008-09 (ha /year) [a]	District [b]
North-west	2,056	**Maracha (Nyadri), Yumbe, Koboko, Arua, Nebbi, Moyo**
North	23,857	**Amuru, Lira, Pader, Gulu, Oyam, Kitgum, Dokolo, Adjumani, Apac**, Abim, Amolatar, Kaabong, Kotido, Moroto, Nakapiripirit
East-far	17,525	**Pallisa, Soroti, Tororo, Butaleja, Busia, Mbale, Budaka, Amuria. Kumi, Bukedea, Sironko, Kaberamaido, Katakwi,** Budua, Bukwo, Kapchorwa, Manafwa
East-near	18,818	**Bugiri, Iganga, Mayuge, Kaliro, Kamuli, Namutumba, Jinja**
Central-east	2,638	**Mukono, Kayunga, Wakiso, Luwero, Mpigi, Kiboga, Nakaseke**, Kalangala, Mityana, Nakasongola
Central-west	0	Masaka, Mubende, Lyantonde, Rakai
South-west	1,397	**Rukungiri, Kanungu**, Bushenyi, Isingiro, Kabale, Kisoro, Mbarara, Ntungamo
West	9,106	**Hoima, Kibaale, Masindi, Kamwenge, Bundibugyo, Kasese, Kabarole, Ibanda,** Bullisa, Kiruhura, Kyenjojo
Kampala	0	Kampala

a) Area planted to rice in the 2008/09 Csnsus, with the figure for the 2008 2nd season of Amuria adjusted (Kikuchu et al. 2013).

b) Old districts prior to the administrative reorganization in 2010. Districts in bold face letters are rice producing didtricts in the 2008/09 Census, in the order of total area planted to rice in the Census. Districts in small, non-bold face letters are those where no rice planted area is reported in the Census.

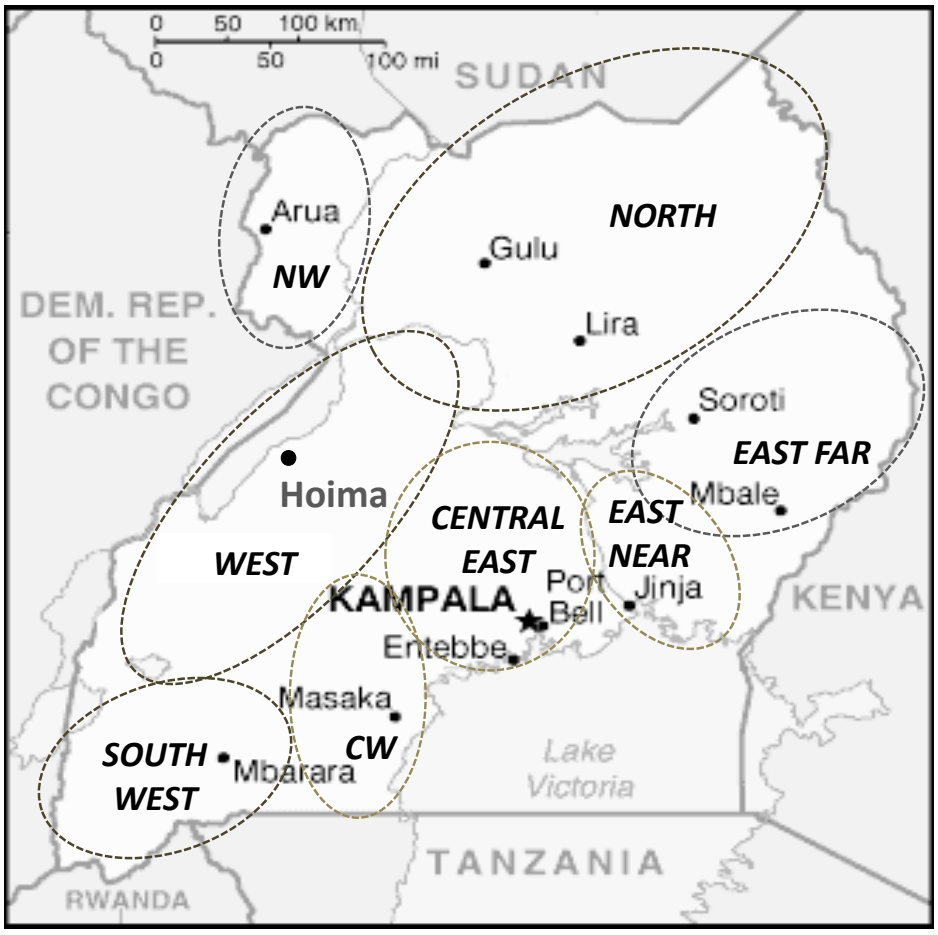

Fig. II-1. Map of Uganda and her regions as used in this report

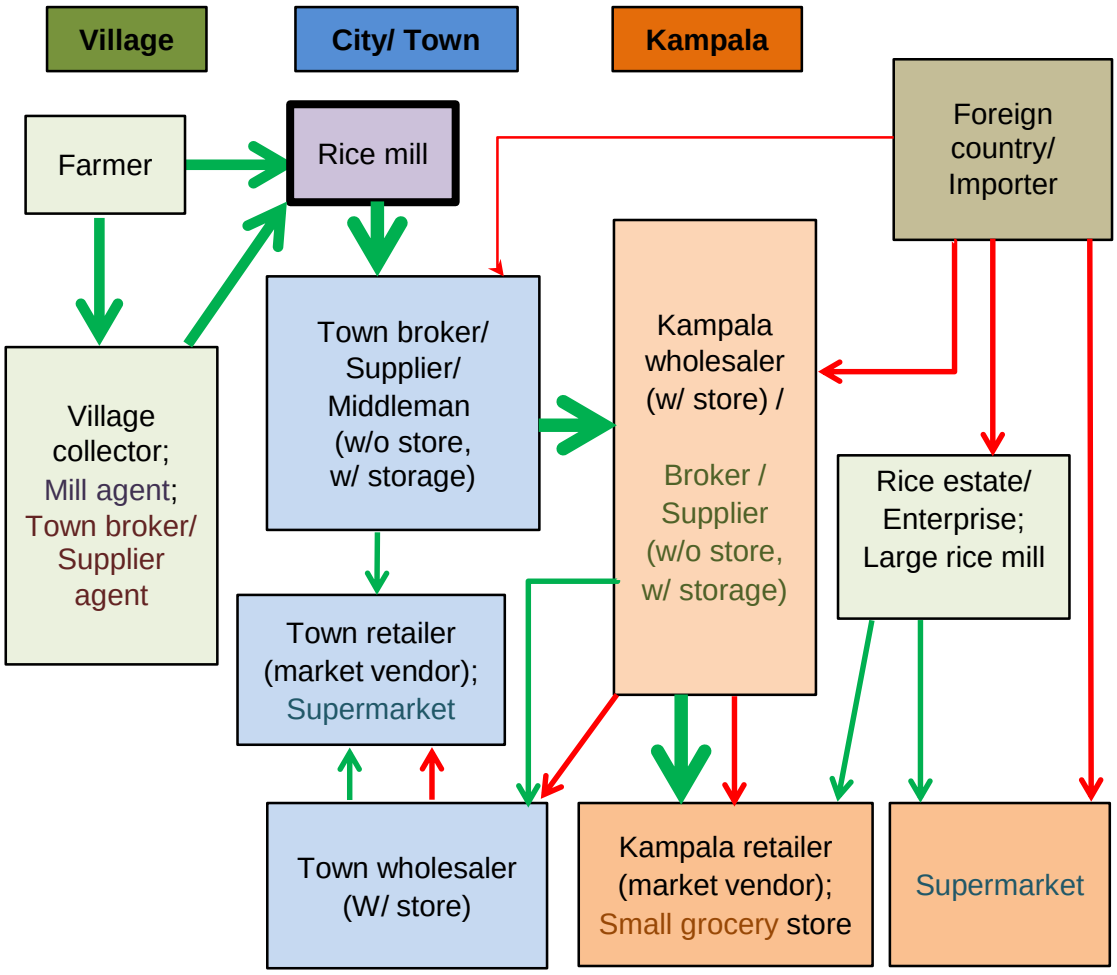

Fig. II-2 Flows of rice through market channels and actors involved

Adopted from Fujiie (2009).

Chapter III. Structure of Rice Consumption

Compared to the production side, the consumption side of rice in Uganda has been far less studied.[15] We know that rice is sold popularly in Kampala as well as in major cities and towns outside Kampala, in public markets where rice vendors in small stalls call out for customers from behind a few rice sacks, the top of which are opened and heaped with white rice for display. We also know that every supermarket in and outside Kampala has sales stands where rice is sold in packages under numerous brands. Do we know, however, how much of rice reaches consumers through the public markets and how much through supermarkets? How are these rice channels different, in terms of kind and quality of rice involved, totally independent of each other or overlapping to some extent? We know, from the food-balance sheet (FAOSTAT 2013), that the per-capita rice consumption in Uganda was on average 4.6 kg/year in 2009. How this rate differs between Kampala and outside Kampala?

The purpose of this chapter is to grasp the structure of rice consumption in Uganda, in Kampala as well as outside Kampala, by estimating the quantity of rice sold to consumers for final consumption. Our major concerns in this estimation are the relative importance of the marketing channels through which rice reaches consumers, how these channels are separated or overlapping in terms of the type and the quality of rice channeled, how the per capita rice consumption differs between Kampala and outside Kampala, and what directions the rice markets in Uganda are heading to. The basic data used for the estimation were collected by our rice trader survey. The basic strategy to estimate the quantity of rice consumed as the quantity of rice sold to consumers for final consumption is the same for Kampala and outside Kampala, but slightly different methods of estimation were adopted for them. In what follows, first, we look at rice sold in Kampala, second, outside Kampala and then in the country as a whole. This chapter will be closed with future prospects of rice consumption markets in Uganda.

1. Rice consumption in Kampala

In Kampala, rice is sold to consumers mainly through three market channels: public markets, small grocery stores and supermarkets. We made the estimation separately for these

[15] There are some studies on food consumption in which rice is included as one of staple foods (Werema, 2007; Benson *et al.*, 2008; Dary *et al*., 2012), but these studies give few information about the structure of rice consumption in the country.

three channels.

(1) Public markets

There are 67 public markets in Kampala (Table III-1).[16] Many large markets are administered by the Kampala Capital City Authority (KCCA) (e.g., St. Balikudembe or Owino, Nakasero, Nakawa), but some are under private ownership (e.g., Kasubi, Bwaise, Entebbe Road View) and some others under the Buganda Government (e.g., Katwe, Namirembe). Of the five divisions in Kampala, many markets are found in Kawempe and Rubaga. As many as 100,000 vendors and traders are operating in these markets, on average about 1,400 vendors/ traders per market. Large markets are bunched up together in the Central Division.

Compared to the total vendor/ trader population, the vendors/ traders who sell rice in these markets are a small minority, taking only 1%, or a little less than 1,000 in number, for the Kampala public markets as a whole. This share is relatively high in Nakawa and low in Central. However, reflecting the fact that there are a few large markets, such as Owino, Kikuubo and New Taxi Park, where many large-scale rice wholesalers are concentrated, the number of rice vendors/ traders per market is largest in Central. In contrast, Makindye is characterized as a division where not only the total number of markets is small but also the number of rice vendors/ traders is fewest. Fig. III-1 shows the rough locations of the five divisions and major markets in Kampala. It should be noted that some major markets are located at some entrance zones where the main roads, along which rice is transported from the major rice producing areas, enter into Kampala. Such major markets are Nakawa Market along Jinja Road bringing rice from East-far and East-near, Bwaise and Kawempe Markets along Bombo Road from North, and Kasubi Market along Hoima Road from West.

The some profiles of the rice vendor/ traders in these public markets in Kampala are shown in Table III-2 for the sample rice traders. The rice traders we interviewed in Kampala include wholesalers, brokers, suppliers and vendors. The function of the first three types of traders is wholesaling, i.e., buying rice in producing areas and selling it to retailers and other bulk buyers such as hotels and hospitals,[17] while that of vendors is retailing rice to final consumers. There are rice traders who are apparently wholesalers on one side and those who are apparently rice retailers on the other. However, the distinction between them is often vague at the margin. Some wholesalers entertain final consumers as customers, while it is also fairly common among retailers (market vendors) to wholesale

[16] The data on the public markets were obtained through the courtesy of the KCCA.

[17] Wholesalers are with stores and storage spaces, and engaged in trading many commodities, rice being one of them. Brokers and suppliers are with storage spaces and specialized to the trading of rice or a few cereals including rice.

rice to customers who make a bulk purchase. In this study, rice traders whose scale of rice sale is less than 10 tons per month are regarded as rice retailers and those of 10 tons per month or more as rice wholesalers. The demarcation scale of 10 tons per month was determined by checking the sources and destinations of their rice.

An average retailer in Kampala markets sells rice about 3 tons per month and an average wholesaler about 50 tons per month. Since the most popular weight of a sack of rice is 100 kg, daily rice sales of retailers and wholesalers are on average about 1 sack and 17 sacks, respectively. The scale of rice sales per wholesaler is larger in Central, Kawempe and Rubaga Divisions where many large scale wholesalers are operating. On average, both rice retailers and rice wholesalers started their operation about 10 years ago, i.e., in around 2002. This is the year when the Government started the promotion of NERICA cultivation in the districts of West and North regions. It is interesting to observe that, among the five divisions, rice traders in Nakawa, located at the entry point along the main road coming from the oldest rice growing areas in East-far and East-near regions, have on average the longest history of 15 years.[18] In contrast, the average number of years of operation of rice traders in Rubaga, located at the entry points along the main roads coming from the newest rice growing areas in West region, is shorter than that in Nakawa by about 7 years, and that in Kawempe, receiving rice from new as well as old rice growing areas in North region, just in-between. Another characteristic of rice traders in Kampala markets, not shown in the table, is the heavy presence of female traders. Their female-male ratio is 44:56 for rice retailers and 23:77 for rice wholesalers.

The estimates of the quantity of rice sold for final consumption in Kampala markets are presented in Table III-3 by division, by variety for domestic rice, and by country of origin for imported rice.[19] The estimates were obtained by multiplying the average quantity sold for final consumption per rice trader in each division and the number of rice traders in each division. As explained above, some rice wholesalers sell rice to ordinary household consumers. Their customers also include non-household institutions[20] that make bulk purchases for final consumption. In this study, the average quantity sold for final consumption per rice trader is estimated by assuming the rice retailing ratio, that is, the percentage of rice sold for the purpose of final consumption to the total amount of rice sold by a trader, which varies according to the quantity of rice sold per month as follows: 100% for retailers with monthly sales of less than 10 tons, 50% for wholesalers with monthly sales

[18] In the Nakawa Market, there are rice traders who have been handling rice since their parents' generation.

[19] In the tables throughout this report, a blank cell means none, and 0, 0.0 and 0.00 stand for a positive figure less than 0.5, 0.05, and 0.005, respectively.

[20] Rice consuming non-household institutions include schools, dormitories, hotels, restaurants, hospitals, military barracks, prisons, etc.

of 10-20 tons, 25% for 20-40 tons, 10% for 40-70 tons, and 5% for 70 tons or more.

There are three salient features that characterize the retail markets of rice in Uganda, in Kampala and outside Kampala alike.[21] First, of the rice sold for final consumption, an overwhelmingly large percentage is sold in public markets. Second, the number of variety groups or brands of rice sold in the markets is remarkably small. Third, rice is sold in loose, not pre-packed, displayed in sacks put perpendicularly the top of which is open. The first feature shall be shown towards the end of this chapter.

Table III-3 shows that 64% of rice sold for final consumption in public markets in Kampala is produced within Uganda and 36% imported from foreign countries. For domestic rice, only five varieties or brands, Supa, Kaiso, Upland, other lowland and branded (pre-packed), are distinguished. The first four refer to 'variety groups'. Supa[22] is a lowland rice variety group, the most popular variety for its aromatic quality, produced mostly in East-far, North and East-near. Kaiso, another lowland variety group, is produced mostly in East-far and East-near. 'Upland', including various upland varieties, is produced mostly in West and North.[23] It should be clear that although each of these 'varieties' is a variety group that includes many rice varieties,[24] rice sold in the Kampala markets is under the name of one of the three 'variety groups', the detailed variety names being all wiped off.[25] As such, these 'varieties' are nothing but 'brands'. The quantity of other lowland varieties, also produced in Eastern regions, is negligibly small and usually sold as Kaiso.

The fifth variety/ brand, 'Branded (packed)', is entirely different from the brands explained thus far. This is a group of rice produced, including contract growing, by some large rice estates or food companies, and packed in their factories into plastic bags with the label of brand name on it, in various weights, such as 1 kg, 2 kg, 5 kg, etc. As will be seen later in this chapter, a large number of pre-packed branded rice is destined mostly for the sales in supermarkets. Table III-3 shows that such kinds of rice are found in public markets as well, though still negligibly small in quantity.[26]

Among the three brands of local rice, Supa commands higher prices than Kaiso and Upland. The fact that the prices of the last two brands, Kaiso and Upland, are hardly different indicates that they are treated as the same class of rice. 'Kaiso (upland)' in Table

[21] Actually, these three features are universal in public markets selling rice not only in Uganda but also in other developing countries, including those in Asia.
[22] Also called Super.
[23] NERICA is the most popular variety group among upland varieties, but the name of NERICA is rarely made explicit in the public markets.
[24] For rice varieties planted by farmers in Uganda, see Kikuchi *et al.* (2013b).
[25] Each rice sack put for sale with its top part open is with a small plate stuck on the top, price and name on it, and the name on it is always one of these three variety groups, with sheer exceptions for 'other lowland' varieties.
[26] Although some market retailers complain "the movement of such rice is very slow."

III-3 is upland rice produced in upland rice producing areas but sold under the name of Kaiso. All these mean that there are actually only two local rice brands, Supa and non-Supa, in the Kampala public markets.

By division, the markets in the Rubaga Division sold the largest amount of rice for final consumption and the Makindye Division the smallest amount. The quantity sold in the markets in the Central Division is not so large, since the overwhelming majority of rice traders there are wholesalers. It is interesting to observe that a large percentage of rice sold in the Nakawa Division first receiving rice from East-far and East-near is Supa, followed by Kaiso (East), with a negligible quantity of Upland. In contrast, the Kawempe Division first receiving rice from North and the Rubaga Division first receiving rice from West see large quantities of Upland sold in their markets.[27]

For imported rice, seven groups of rice imported from five foreign countries are found being sold for final consumption. The most popular among them is rice imported from Pakistan. There are many classes of rice imported from Pakistan, but the most popular class of Pakistan rice is the cheapest class sold at prices comparable to those of locally produced Supa. Let us call this class of Pakistan rice 'ordinary Pakistan.'[28] An advantage of imported rice from Asia is the cleanliness of rice without any stone. In the case of local Supa, retailers have to do rice cleaning, removing stones and other odd materials by hand before selling it to consumers, whereas such rice cleaning is not necessary for imported rice such as this 'Pakistan', since it is clean when imported in sacks, which weigh either 50 kg or 25 kg per sack. Another popular imported rice is Supa Tanzania (called Supa TZ), which is sold in Kampala markets as a substitute for local Supa with a similar price level. While 'Pakistan' is imported by importers through Mombasa, Supa TZ is imported either on land or on the Lake Victoria directly by wholesalers, brokers and suppliers who go to rice growing areas in Tanzania. 'Vietnam' is rice imported from Vietnam, the position of which in Kampala markets is comparable to or slightly lower than, the ordinary 'Pakistan'.[29] Kaiso Kenya is to local Kaiso, what Supa TZ is to local Supa. Kaiso Kenya is also imported by wholesalers, brokers and suppliers who go to rice producing areas in Kenya. 'Pakistan (high quality)', 'India (high quality)' and 'Kenya (packed)' are similar to 'Branded (packed)' for domestic rice: They are mainly sold in supermarkets, but found in public markets in a small quantity.

Among the five divisions in Kampala, the largest amount of imported rice is sold in the Central Division. This is because large wholesalers in the Division who purchase a

[27] Such tendencies are pointed out by Fujiie (2009).
[28] SWT-1 TANNERS and Mabu IRRI-6 are examples of the actual brands of 'ordinary Pakistan'.
[29] Many rice traders in markets in and outside Kampala complain that the speed of sales of 'Vietnam' is far slower than 'Pakistan.'

large quantity of imported rice from importers sell it in bulk to institutional buyers, in addition to ordinary household consumers. The typical rice retailers in the markets are selling at their stores a few sacks of rice, which include Supa, always, and Kaiso, Upland or ordinary 'Pakistan', depending on where markets are situated in Kampala.

(2) Small grocery stores selling rice

The second channel through which rice is sold for final consumption is small grocery stores, which retail rice, situated outside the public markets. The quantity of rice sold in this channel is estimated by multiplying the average quantity of rice sold per store and the number of the store by division. The most popular staple food sold in these small grocery stores in Kampala is maze flour, followed by cassava flour. Rice is the third staple food in these stores, sold in sacks side by side with sacks of maize and cassava flour, and there are many small grocery stores that do not sell rice. What we counted was the number of small grocery stores that sell rice. The quantity sold per store is obtained from the small grocery store survey. The number of stores selling rice is estimated by drawing 14 blocks, 1 block from Central Division, 3 blocks each from Kawempe, Makindye and Rubaga Divisions, and 4 blocks from Nakawa Division, out of 70 blocks in Kampala, and counting the number of small grocery stores selling rice.

The estimated number of small grocery stores selling rice is shown by division in Table III-1. It is estimated that Kampala has as many as 1800 small grocery stores that sell rice. Small grocery stores in Kampala are found generally not along major roads but along smaller roads connecting, or stemming from, major ones. The density of small grocery stores is obviously correlated positively with the density of household residences, in particular, of lower income classes. There are many such city sections in the Kawempe Division.[30] The opposite cases are the Central and the Nakawa Divisions where high-grade office, commercial and industrial city sections dominate among luxurious parks and green spaces.[31]

Table III-4 shows the estimated quantity of rice sold for final consumption by small grocery stores in Kampala by division. Similar to the rice retailers in the public markets, the two thirds of rice sold are domestic production and the one third is imported. The 'brands' of rice sold are also quite similar to those of the market rice retailers, or the simplified version of theirs; Supa, Kaiso and ordinary 'Pakistan', each about one-third. A difference between small grocery stores and market rice retailers is the quantity of rice they sell. The

[30] A typical small-grocery-store-dense area in Kampala is found in the northern and southern sides of the Northern Bypass in Kyebando-Kamwokya area of Kamwenpe.
[31] No small grocery store was found in the sample block of the Central Division, so no store is assumed to be in the Division.

quantity of rice an average small grocery store sells is less than 10 kg per day, which is about one tenth of the average market retailers' rice sale per day.

(3) Supermarkets

The third channel through which rice is sold to consumers is supermarkets. Foreign shoppers who visit any large supermarkets in Kampala would be impressed by these stores' rice section, which is spacious and full of colorful rice bags of various brands and of various sizes, all of them, with only a few exceptions, packed by rice estates and food companies in Uganda as well as rice exporters in foreign countries. Customers of these large supermarkets may be biased to affluent people. However, there are many small and mini supermarkets all over in Kampala and they all sell rice without exception. A sharp difference in rice sold in supermarkets from that sold in public markets and small grocery stores is that it is sold in the form of bag pre-packed with certain weight of rice, such as 1 kg, 2 kg or 5 kg, and never sold in loose at all.

The quantity of rice sold in Kampala supermarkets is estimated by multiplying the average quantity of rice sold per supermarket and the number of supermarkets. The data on the average quantity of rice sold is obtained from our supermarket survey. The number of supermarkets, estimated in the same manner as for estimating the number of small grocery stores, by division and by size, are shown in Table III-1. It is estimated that there are more than 200 supermarkets in Kampala, more than 50% of which are mini supermarkets that are a modernized version of traditional grocery stores.

The estimated quantity sold is presented in Table III-5. Of the total quantity sold in supermarkets, the percentage share that domestic rice takes is smaller than that for public markets and small grocery stores, but the share is still more than 50%. For imported rice, Pakistan is the most popular country of origin, supplying various kinds of rice from ordinary quality rice to high quality one, while India is more or less specialized to high quality rice and Kenya to ordinary quality one. The share of large supermarkets in the total quantity of rice sold is large, and the share of the Nakawa Division is as high as 50% because many large supermarkets are in the Division.

It should be noted that, although more than 90% of rice sold in supermarkets is handsomely-packed branded rice, regardless of domestic or imported, a small amount of unbranded rice, packed in transparent cheap plastic bags without brand name, is also sold, usually found in a small corner of the rice section.[32] The most popular unbranded rice is

[32] Rice in cheap plastic bags is mostly sold in 1 kg, but some supermarkets sell unbranded rice in a 0.5 kg bag, which is rarely found for branded rice.

Supa, but Kaiso and Upland are also sold in some supermarkets.[33] The quality of unbranded rice is the same as the one sold in public markets, but for domestic rice de-stoning before packing is a prerequisite. Some small and mini supermarkets buy rice in public markets and do cleaning and packing by themselves.

2. Rice consumption outside Kampala

Outside Kampala, there are two major channels in which rice is sold to consumers for final consumption: Public markets and supermarkets. We made the estimation separately for these two channels.

(1) Public markets

Except some small, sparsely populated districts, the capital city or town of every district outside Kampala has at least a public market usually in its central part. In large cities and towns, the scale of such markets is as large as of those in Kampala, and in some district capitals there are more than one regular market in addition to several weekly markets. Rice vendors and wholesalers are found in these regular markets and their surrounding areas. In capital cities and towns in rice producing regions, many rice brokers are around in areas where many rice mills are located. The estimated numbers of rice vendors, wholesalers and brokers in the capital cities/ towns of our sample districts are shown in Table III-6.

The profile of these rice traders are shown in Table III-7. In terms of the rate of rice sales per month, the size of retailers in public markets outside Kampala tends to be smaller than those in Kampala, but wholesalers in rice growing regions are comparable to their Kampala counterparts (Table III-2). For the history of their operation, the rice traders outside Kampala have on average the years of operation less than 10 years, a shorter history than those in Kampala. Even in Eastern regions that have a longer history of rice cultivation, the history of rice traders is not so long. This seems to indicate that new entry to the business has been active. In particular, the entry for rice brokers who, unlike wholesalers, do not need any store, is relatively easier, and in fact there are many young rice brokers not only in newly emerging rice growing areas in West but also in East-far and East-near.[34] As in Kampala, female traders take important shares in rice marketing outside Kampala. The share of females is 50% for rice retailers and 20% for rice wholesalers and brokers.

[33] There are a few cases in which 'ordinary Pakistan' is sold in the unbranded form.
[34] As for the differences between rice wholesalers and rice brokers in rice producing areas, see footnotes #12 in Chapter II.

The quantity of rice sold in the markets in outside Kampala for final consumption was estimated by multiplying the quantity per capita of rice sold for final consumption in each region by the population of respective region. We obtained first for the sample districts the average quantity of rice sold for final consumption per rice trader and then multiplied it to the number of traders to obtain the total quantity. The quantity per capita of rice sold for final consumption in each region was estimated by dividing the total quantity of the sample districts by the total population of these districts as of the end of 2011.[35] The retailers and the wholesalers are demarcated in the same manner as for Kampala. The estimated quantity per capita of rice sold for final consumption is shown in Table III-8 and the estimated total quantity in Table III-9.

For the outside Kampala as a whole, the percentage share of domestic rice, 74%, is slightly higher and that of imported rice, 26%, lower than for the Kampala markets (Tables III-3 and III-9). However, the consumption structure of rice in terms of varieties, brands and countries of origin are essentially the same. A slight difference found for domestic rice is that, in addition to the varieties/ brands popular in the Kampala markets, markets in some regions have region specific varieties or brands. Examples are some lowland varieties in East-near and some upland varieties in North and South-west. Another difference found for imported rice is the presence of unbranded rice bought by local rice traders through the border with the adjacent countries, Kenya for East-near, Congo for North-west, and Rwanda for South-west. Supa Tanzania, unbranded imported rice popular in the Kampala markets, is also popular in the markets in all the regions outside Kampala, except in Eastern regions and West. A large amount of Supa TZ is imported by rice traders in Central-west that is adjacent to Tanzania.

(2) Supermarkets

Supermarkets are found all over in Uganda in cities and towns of a certain population size. With rare exceptions, rice is an important sales item in these supermarkets outside Kampala. We estimated the quantity of rice sold in these supermarkets outside Kampala by multiplying the quantity of rice sold per supermarket and the number of supermarkets by region. The number of supermarkets in the sample districts was obtained from our supermarket survey, as shown in Table III-6. For the non-sample districts, the number of supermarkets was estimated as follows: first, by using the data for the sample districts, estimate a regression equation to explain the supermarket density, defined as the number of supermarkets per population of 100,000, by the population density, defined as the population per km^2, and then predict the supermarket density for non-sample districts by inserting the population

[35] The data on population is obtained through the courtesy of the UBOS.

density of respective districts in the estimated equation.[36] Since the size of supermarkets outside Kampala is generally of small or mini supermarkets in Kampala, we do not distinguish them by size. The estimated number of supermarkets is shown in Table III-8, together with the density.

The estimated quantity of rice sold in supermarkets outside Kampala is presented in Table III-10. The types of rice sold there are essentially the same as those sold in supermarkets in Kampala. Among the regions, Central-east and South-west show relatively large amounts sold, due mainly to the high supermarket density for the former and to the larger quantity of rice sold per supermarket for the latter.

3. Structure of rice consumption and rice markets in Uganda

The quantity of rice sold for final consumption in and outside Kampala is summarized in Table III-11.

(1) Quantity of rice sold for final consumption

First for the country as a whole, the total rice consumed in the year 2011-12 is estimated to be about 0.17 million tons, of which 70% was supplied by domestic production and 30% by imported rice. Dividing the total consumption by the Uganda population at the end of 2011, obtained is an estimate of per-capita rice consumption of 6.0 kg /year, which is 30% more than the FAOSTAT estimate for 2009. It should be remarked that the per-capita rice consumption differs very much between Kampala and outside Kampala; it was 34.1 kg /year in Kampala and 4.5 kg /year outside Kampala.[37] As we have observed in the previous section, however, rice is consumed all the regions outside Kampala. In terms of the total amount of rice consumed, the consumers in Kampala took 35% of total rice consumed in Uganda and those outside Kampala about 65%.

Second, for rice produced in the country, the total amount that was brought to consumers through the public market channels was 0.12 million tons. Since about a quarter of rice produced by rice farmers in Uganda is consumed by the farmers themselves (UBOS 2010, Haneishi *et al.* 2013a), the total production of rice in the country is estimated

[36] The regression equation used is as follows:

$$Y = 0.550 + 0.00420\ X, \qquad R^2 = 0.453,$$

where Y is the supermarket density (number of supermarkets per population of 100,000) and X is population density (population per km^2). The regression is highly significant with p=0.00114.

[37] As explained earlier, large rice wholesalers in Kampala sell rice to institutional customers, such as hotels and restaurants, for final consumption. Some of these institutional buyers may be located outside Kampala. Since we did not make any adjustment for such cases in the estimation of rice sold in Kampala, our estimate for rice consumed in Kampala may be slightly overestimated.

to be about 0.24 million tons in terms of paddy rice.[38] Of the marketing channels, more than 90% of marketed domestic rice went through public markets, and only 3% through supermarkets. In Kampala, there are many small grocery stores selling rice, but these retailers procure their rice from wholesalers in public markets. Therefore, as much as 97% of rice sold in Kampala goes to consumers through the public market channel.

Of the total amount of rice produced in the country, only 4% is sold as 'branded' rice in handsome plastic bags with brand names, produced and packed by large rice estates and food companies. The rest of domestic rice is produced by ordinary rice farmers and brought into the public market channel by farmers and rice traders at various levels. For rice in this channel, the markets distinguishes only three variety groups or 'brands': Supa, Kaiso and Upland. Since there is no price difference between Kaiso and Upland while Supa commands a significantly higher price than Kaiso and Upland,[39] practically there are only two 'brands' of rice in the market: Supa and non-Supa. As we observed in Table III-3 for the Kampala public markets that a significant amount of upland produced in West and North is sold under the name of Kaiso, it is indeed a very popular practice for rice traders to disguise other kinds of rice as, or to mix up other kind of rice with, Supa. The comparison of our data on rice production (quantity milled) and rice consumption (quantity sold) gives the following figures [40]:

	Consumption (A)	Production (B)	A - B
Supa	45%	27%	17%
Kaiso	29%	34%	-4%
Upland	26%	39%	-13%
Total	100%	100%	0%

A bulk of non-Supa varieties, particularly Upland, domestically produced seems to have been disguised as, or mixed up with, Supa.

Third, for imported rice, the largest amount was imported from Pakistan, followed by Tanzania, India, Kenya and Vietnam. Other countries include South Africa, Thailand, UAE, Italy, Rwanda and Congo, all small quantities. The Uganda Revenue Authority (URA) recorded the quantity of rice import for the year 2011 of 58,600 tons, of which 53%

[38] This estimate of total rice production based on our rice trader survey matches well the estimate of total rice production based on our rice mill survey, which is 0.23 million tons.
[39] The prices of different variety groups or brands will be shown in Table III-12 and further analyzed in details in Chapter V.
[40] Consumption excludes pre-packed branded rice of rice estates and food companies, production excludes the production by the rice estates, and Kaiso includes 'other lowland varieties'.

was imported through the Kenyan border and 46% through the Tanzanian border.[41] These figures are compared with our estimates for the year 2011-12, which are 52,000 tons, 74%, and 23%, respectively.

Of the total imported rice, 8% (2% in Kampala and 6% outside Kampala) sold in supermarkets is 'branded' rice. The rest of imported rice, most of 'Pakistan' and all of 'Vietnam' and Supa TZ, goes through the public market channel and sold in loose, except for about 2% of the total imported rice, which is sold in public markets as 'branded' rice (Table III-3). The prices of 'unbranded' imported rice, ordinary 'Pakistan', 'Vietnam' and Supa TZ, are just at the same level as Supa local.[42] All this means that 90% of imported rice aims at 'ordinary' rice consumers who take locally produced rice, while the rest 10% is high quality rice, such as Basmati, aiming at consumers of high-income classes.

(2) Structure of rice markets in Uganda

The structure of consumption markets of rice in Uganda shown in Table III-12 is depicted schematically in Fig. III-2. The entire rice market of Uganda consists of two different segments: supermarkets throughout the country form the upper segment where high-quality rice, packed and branded, is circulated, and public markets and small grocery stores form the lower segment where 'ordinary' quality rice, sold in loose, is circulated. The upper segment is small relative to the lower segment, taking only 5% of the total amount of rice that comes into the market, or 10% in terms of the value of the total amount of rice marketed.

These two segments are nearly completely independent each other. The type of store, the channel of rice wholesaling, the quality of rice transacted, the mode of sales and the type of packing are all sharply different between the segments; in short, the one is 'modern' and the other is 'traditional.' However, it is important to notice that, though at a very limited extent, the two segments are overlapping, in the sense that the same qualities of rice are found in both segments in common. Some Supa, and Kaiso and Upland at lesser amount, in the ordinary 'traditional' marketing channel are diverged and appear in 'modern' supermarkets, though well-cleaned and pre-packed in simple plastic bags. Similarly, some high-quality branded rice, domestic as well as imported, is sold in public markets.

This fact is confirmed by looking at the rice prices in the two market segments (Table III-12). The prices of Supa and unpacked 'Pakistan' in the public markets and unbranded Supa and unbranded 'Pakistan' in supermarkets are all at similar levels, without

[41] These data, which shall be presented in Table IV-6 in the next chapter, are obtained through the courtesy of the URA.
[42] See footnote #39.

any statistically significant difference. Likewise, the price of the lowest-quality branded rice sold in supermarkets[43] seems to be set at a level competitive to the prices of Kaiso and Upland in public markets. Such close affinities in prices of the goods of the same quality are nothing but the evidence that the two segments belong to the same market for these types of rice.

Table III-12 presents other features of the rice market. The price range between the minimum and the maximum prices is narrowest for domestic rice in the public markets and widest for imported rice in the supermarkets. In particular, the maximum price of imported rice in Kampala supermarkets is Ush 32,000 /kg, more than 10 times higher than the minimum price of domestic rice in the public markets. This indicates that the range of rice quality in the market is so large that the prospect to improve the quality is wide open. If the quality differences are revealed by the differences in the price, the weighted average price over all grades of rice, using the quantity sold as weights, tells that the quality difference between the public markets and the supermarkets is less than twice.

As have been explained repeatedly, there are only a few 'brands' for rice sold loose in public markets, Supa, Kaiso and Upland, or Supa and non-Supa, for domestic rice and unpacked 'Pakistan' and 'Vietnam' for imported rice, for all of which prices vary very little[44] (Table III-12). In these markets, rice, the prices of which are at the higher end of the price range, is pre-packed branded one, either of domestic or of imported, which is found more popularly in supermarkets. Table III-13 shows the number of companies that make such branded rice and the number of brands sold in the sample supermarkets. There are at least 9 domestic companies or rice estates making 17 brands for domestic rice, and as many as 65 foreign companies and Uganda importers making as many as 123 brands for rice consumers in Uganda. On average, there are 13 rice items are for sale in the rice sales section of a supermarket. This number is as many as 31 for a large supermarket in Kampala. An enormous diversity exists towards the upper end of the rice market with a small quantity, while at the lower end exists a contrasting simplicity with nearly no quality control for an enormously large quantity of rice.

A definite prospect for the rice market in future is that the extent of overlapping between the two segments increases over time, in which the quality of rice at the lower end with a massive quantity is getting improved. It is assured that virtually all of rice will be sold in pre-packed bags with brand names, not in loose, after a certain length of time, as is the

[43] This is packed broken rice with a brand name.
[44] For Supa and non-Supa, quality, and therefore price, differences are found in some cases, not so often, depending, aside from aromaticity, on 1) purity (not containing stones and other foreign materials), 2) color (whiteness) and 3) brokenness.

case in developed countries with no exception.[45] How fast this change proceeds depends on how fast the economy develops.

[45] In developed countries, such as Japan, only very special quality of rice, with a very limited quantity, is sold by measure, not in pre-packed bags, mostly available in the internet markets.

Table III-1 Number of markets, market rice traders, rice retailers and supermarkets in Kampala by division, 2012

Division	Markets [a]				Small grocery stores selling rice [e]	Supermarkets [f]			
	No. of markets [b]	No. of traders [b]	% of rice traders [c]	No. of rice traders [d]		Large [g]	Small	Mini	Total
Central	6	38,200	0.51%	195	-	9	-	-	9
Kawempe (North)	21	14,000	1.33%	187	898	-	18	53	71
Nakawa (East)	11	10,100	1.78%	180	95	13	12	12	37
Makindye (South)	9	7,400	0.63%	47	388	3	9	30	43
Rubaga (West)	20	25,800	1.43%	368	374	1	21	33	55
Total	67	95,500	1.02%	977	1755	26	61	128	215

a) Major markets in each division are shown below:

Central: St. Balikudembe (include Owino, Kikuubo, NewTaxi Park), Kisenyi, Nakasero
Kawempe: Bwaise, Kawempe, Kalerwe, Wandegeya
Nakawa: Nakawa, Bugoloobi, Ntinda
Makindye: Gaba, Katwe, Kabaragala
Rubaga: Kasubi, Natete, Kibuye, Entebbe Road View, Namirembe

b) Original data from KCCA.

c) Data from our rice trader survey.

d) Obtained by multiplying the two preceding columns.

e) Small grocery stores selling rice outside the public markets. Estimated as follows: First, divide Kampala into 70 rectangular blocks, 1 block being 1.5 km (east-west) x 2 km (north-south), second, draw 14 sample blocks from five divisions, 1 from Central; 3 each from Kawempe, Makindye and Rubaga, and 4 from Nakawa, third, count the number of small grocery stores selling rice, fourth, obtain the average number of the stores per block for high-store-density blocks and low-store-density blocks, separately, and fifth, sum up the numbers of stores over the blocks by density class and by division, assigning the average number of stores for non-sample blocks.

f) Applied the same way as for small grocery stores, except for large supermarkets for which all are enumerated.

g) Shoprite-Chain stores, Uchumi-Chain stores, Nakumat, Checkers, Millenium, Kenjoy, G&R, etc.

Table III-2 Average rate of rice sales and average years of operation of sample rice traders in public markets in Kampala, 2012 [a]

Division	Rate of sales (t/month)		Years of operation		
	Retailers	Wholesaler	Retailers	Wholesaler	All
Central	3.8	49.8	11.6	8.9	10.2
Kawempe	4.0	71.6	9.0	10.8	9.6
Nakawa	3.0	20.8	15.2	14.0	15.0
Makindye	1.4	15.9	7.4	5.0	7.0
Rubaga	2.2	41.2	5.7	11.0	7.7
All	2.9	49.5	10.1	9.7	9.9

a) Retailers are rice traders with monthly sales of rice less than 10 tons and wholesalers (including brokers and suppliers) are those with 10 tons or more. The number of observations is 48 for retailers and 29 for wholesalers.

Table III-3 Rice sold in Kampala public markets for final consumption by division and by 'brand', 2011-12 (1000 t/year) [a]

Variety / brand	Total		Central		Kawempe		Nakawa		Makindye		Rubaga	
Domestic :												
Supa	**13.6**	(27)	3.4	(25)	2.1	(14)	3.3	(41)	0.6	(30)	4.3	(18)
Kaiso	**11.8**	(24)	1.4	(10)	2.8	(19)	1.1	(14)	0.5	(28)	5.9	(26)
Kaiso (East)	8.2	(16)	0.9	(6)	0.9	(6)	1.1	(14)	0.5	(25)	4.9	(21)
Kaiso (upland) [b]	3.6	(7)	0.5	(4)	1.9	(13)			0.0	(2)	1.1	(5)
Upland	**6.1**	(12)			2.6	(17)	0.1	(1)	0.0	(0.5)	3.4	(15)
Other lowland	**0.2**	(0.4)			0.2	(1)						
Branded (packed) [c]	**0.1**	(0.2)							0.0	(.2)	0.1	(.5)
Total	**31.7**	(64)	6.1	(45)	10.4	(70)	5.6	(70)	1.7	(86)	19.6	(85)
Imported [d]:												
Pakistan	**11.5**	(23)	4.8	(35)	2.4	(16)	1.7	(21)	0.2	(10)	2.4	(11)
Pakistan (high quality)	**0.2**	(0.4)	0.1	(1)			0.1	(1)	0.0	(0.0)		
India (high quality)	**0.3**	(1)	0.1	(1)	0.2	(1)			0.1	(3)		
Vietnam	**1.2**	(3)	0.1	(1)	0.9	(6)					0.3	(1)
Supa Tanzania	**4.2**	(8)	2.0	(15)	0.9	(6)	0.6	(7)	0.0	(1)	0.6	(3)
Kaiso Kenya	**0.7**	(1)	0.3	(3)	0.1	(0.4)					0.3	(1)
Kenya (packed)	**0.1**	(0.2)					0.1	(1)	0.0	(0.0)		
Total	**18.2**	(36)	7.4	(55)	4.5	(30)	2.5	(30)	0.3	(14)	3.6	(15)
Total	**49.8**	(100)	13.5	(100)	14.9	(100)	8.0	(100)	1.9	(100)	23.2	(100)
	(100)		(27)		(30)		(16)		(4)		(47)	

a) Estimated by multiplying the average quantity sold per rice trader and their number in each division (Table III-1). A blank cell means none and 0.0 stands for a positive figure less than 0.05. Figures in parenthesis are percentages.

b) Upland rice produced in West and North but sold under the 'brand' name of Kaiso.

c) Milled and packed by food companies.

Table III-4 Rice sold in Kampala by small grocery stores for final consumption by division and by 'brand', 2011-12 (1000 t/year) [a]

	Total		Kawempe		Nakawa		Makindye		Rubaga	
Domestic:										
Supa	**2.2**	(37)	1.2	(39)	0.1	(34)	0.5	(35)	0.4	(34)
Kaiso	**1.8**	(30)	0.9	(30)	0.1	(30)	0.5	(30)	0.3	(29)
Total	**4.0**	(67)	2.1	(69)	0.2	(64)	1.0	(65)	0.7	(64)
Imported:										
Pakistan	**1.9**	(31)	0.9	(31)	0.1	(36)	0.5	(31)	0.4	(32)
Vietnam	**0.0**	(0.7)							0.0	(4)
Supa TZ	**0.1**	(1)					0.1	(4)		
Total	**2.0**	(33)	0.9	(31)	0.1	(36)	0.5	(35)	0.4	(36)
Total	**6.0**	(100)	3.0	(100)	0.3	(100)	1.6	(100)	1.1	(100)

a) Estimated by multiplying the average quantity sold per rice trader and their number in each division (Table III-1). A blank cell means none and 0.0 stands for a positive figure less than 0.05. Figures in parenthesis are percentages.

Table III-5 Rice sold in Kampala supermarkets by division, by size and by brand or country of origin, 2011-12 (1000 t/year) [a]

	Total		Division					Size		
			Central	Kawempe	Nakawa	Makindye	Rubaga	Large	Small	Mini
Domestic:										
Branded [b]	**1.39**	(49)	0.21	0.25	0.66	0.04	0.23	0.66	0.35	0.39
Unbranded [c]	**0.16**	(6)		0.07	0.01	0.01	0.08		0.05	0.11
Total	**1.55**	(55)	0.21	0.31	0.67	0.05	0.31	0.66	0.40	0.50
Imported [d]:										
Pakistan	**0.61**	(22)	0.08	0.07	0.35	0.02	0.09	0.33	0.19	0.09
Pakistan (unbranded) [c]	**0.02**	(0.8)			0.02	0.00	0.00		0.02	0.00
India	**0.19**	(7)	0.01	0.00	0.14	0.02	0.02	0.09	0.06	0.04
Vietnam (unbranded) [c]	**0.00**	(0.1)			0.00			0.00		
Kenya	**0.17**	(6)	0.01	0.01	0.15	0.00	0.00	0.12	0.04	0.00
South Africa	**0.02**	(0.6)	0.01		0.01			0.02		
Thailand	**0.05**	(2)					0.05		0.05	
Unknown [e]	**0.23**	(8)	0.07		0.12		0.04	0.07	0.02	0.13
Total	**1.29**	(45)	0.18	0.08	0.80	0.04	0.20	0.64	0.39	0.26
Total	**2.84**	(100)	0.39	0.40	1.46	0.09	0.51	1.30	0.79	0.76
	(100)		(14)	(14)	(51)	(3)	(18)	(46)	(28)	(27)

a) Estimated by multiplying the average quantity sold per rice trader and their number in each market (Table III-1). A blank cell means none and 0.00 stands for a positive figure less than 0.0005. Figures in parentheses are percentage.

b) Packed in plastic bags with brand names printed.

c) Packed in plastic bags without brand name.

d) 'Branded', unless otherwise noted.

e) Failed to identify the country of origin.

Table III-6 Number of market rice vendors, wholesalers and supermarkets in surveyed district capitals, 2012 [a]

Region/ district	Rice vendor [b]	Whole-saler/ broker [c]	Total	Super-market	Region/ district	Rice vendor [b]	Whole-saler/ broker [c]	Total	Super-market
North-west					**Cemtral-east**				
Arua	25	5	30	7	Luwero	14		14	4
Nebbi	5	4	9	2	Mukono	13	20	33	5
North					Wakiso（Entebbe)	55	20	75	25
Lira	37	20	57	7	Mpigi	10	2	12	4
Gulu	21	15	36	10	**Central-west**				
East far					Kalungu (Lukaya)	21	11	32	3
Soroti	32	20	52	7	Masaka	11	26	37	5
Serere [d]	10		10	0	Rakai	10	15	25	1
Kumi	19		19	3	（Rakai+Kyotera）				
Pallisa	21		21	na	**South-west**				
Mbale	44	70	114	14	Mbarara	48	5	53	na
Tororo	18	10	28	15	Kabale	26	15	41	na
East near					Rukungiri	16	16	32	na
Namutumba (Busembatia)	20	5	25	0	Bushenyi (Ishaka)	5		5	na
Jinja	48	24	72	25	**West**				
Iganga	77		77	20	Hoima	57	20	77	na
Bugiri	12		12	2	Masindi	40	10	50	4

a) For districts where non-capital towns were surveyed, the name of surveyed town is shown in parenthesis.

b) Rice vendors / small food grocery stores in markets and their surroundings. For some districts, wholesalers are included.

c) Wholesalers and brokers.

d) No town market.

Table III-7 Average rate of rice sales and average years of operation of sample rice traders in the public markets outside Kampala, 2012 [a]

Region	Rate of sales (t/month)		Years of operation		
	Retailers	Wholesaler	Retailers	Wholesaler	All
North-west	0.9	33.3	9.0	11.0	9.7
North	1.2	60.5	6.1	15.8	9.3
East-far	1.8	42.6	7.9	6.3	7.5
East-near	2.3	43.4	7.3	4.5	6.9
Central-east	2.5	70.5	4.9	9.4	6.7
Central-west	1.0	17.0	6.2	4.0	5.8
South-west	1.6	20.4	7.8	10.5	8.7
West	1.8	42.7	9.2	5.0	8.0
All	1.7	45.2	6.9	8.8	7.4

a) Retailers are rice traders with monthly sales of rice less than 10 tons and wholesalers (including brokers and suppliers) are those with 10 tons or more.

Table III-8 Quantity per capita of rice sold for final consumption in sample markets, 2011-12, and supermarket density and estimated number of supermarkets, 2012, outside Kampala, by region

	Quantity per capita of rice sold in sample markets [a]	Super-market density [b]	Estimated no. of super-markets [c]
	kg/year	no./ 100,000	no.
North-west	1.5	1.0	29
North	2.9	1.0	54
East far	2.0	1.6	90
East near	2.3	2.2	74
Central-east	2.4	1.2	52
Central-west	2.6	1.0	28
South-west	2.6	1.5	53
West	3.4	1.1	54
All	3.2	1.3	433

a) Estimated from our rice trader survey.

b) Defined as the number of supermarkets per population of 100,000. Estimated using our supermarket survey data.

c) Estimated by multiplying the density and the 2012 population.

Table III-9 Rice sold in outside-Kampala public markets for final consumption by region and by variety, 2011-12 (1000 t/year) [a]

	Total	%	North-west	North	East-far	East-near	Central-east	Central-west	South-west	West
Domestic :										
Lowland varieties										
Supa	**33.4**	(32)	0.5	8.6	8.9	4.3	3.9	0.03	3.1	4.1
Kaiso	**22.0**	(21)		3.7	9.3	5.6	3.4	0.03		
Regional varieties [b]	**0.6**	(1)				0.6				
Branded (packed)	**0.7**	(1)				0.2		0.01	0.5	
Total	**56.8**	(55)	0.5	12.3	18.2	10.7	7.3	0.1	3.6	4.1
Upland varieties										
Upland	**16.9**	(16)	0.6	3.9	0.7	1.3	1.1	0.04	0.1	9.1
Regional varieties [b]	**2.8**	(3)	0.1	1.3					1.4	
Total	**19.6**	(19)	0.7	5.1	0.7	1.3	1.1	0.0	1.5	9.1
Total	**76.5**	(74)	1.2	17.5	18.8	12.0	8.4	0.1	5.2	13.2
Imported :										
Pakistan	**13.9**	(13)	2.3		0.6	1.4	3.9	0.8	2.1	2.8
Vietnam	**5.4**	(5)	0.1	0.3	0.8	0.4	0.1	2.3	0.4	0.9
India	**0.1**	(0.1)						0.04	0.1	
Supa Tanzania	**7.9**	(8)	0.3	1.2		0.03	1.1	3.8	1.4	
Kenya	**0.0**	(0.0)				0.02				
Congo	**0.2**	(0.1)	0.2							
Total	**27.5**	(26)	2.8	1.5	1.4	1.9	5.2	7.0	4.0	3.6
Total	**104.0**	(100)	4.1	19.0	20.2	13.9	13.7	7.1	9.1	16.9

a) Estimated by multiplying the regional average quantity per capita of rice sold in the sample markets by 2012 population. A blank cell means none. Unless otherwise stated, rice is sold loose.

b) Region specific varieties or brands, such as Benenego for lowland varieties, and Sindano and Kihihi for upland varieties.

Table III-10 Rice sold in supermarkets outside Kampala by brand and by region, 2011-12 (1000 t/year) [a]

	Total		North-West	North	East-Far	East-Near	Central East	Central West	South-west	West
Domestic:										
Branded [b]	**2.38**	(39)	0.01	0.11	0.34	0.12	1.20	0.02	0.48	0.10
Unbranded [c]	**0.41**	(7)		0.05	0.10		0.19		0.08	0.00
Total	**2.80**	(46)	0.01	0.16	0.44	0.12	1.39	0.02	0.56	0.10
Imported [d]**:**										
Pakistan	**1.02**	(17)	0.03	0.27	0.16	0.19	0.15	0.07	0.07	0.07
India	**0.87**	(14)	0.00	0.00	0.09	0.16	0.38	0.07	0.08	0.08
Kenya	**1.42**	(23)	0.01	0.27	0.18	0.13	0.34	0.02	0.45	0.01
UAE	**0.01**				0.01					
Unknown	**0.02**			0.02						
Total	**3.34**	(54)	0.05	0.56	0.44	0.49	0.87	0.15	0.60	0.16
Total	**6.13**	(100)	0.06	0.72	0.88	0.61	2.27	0.18	1.16	0.26

a) Estimated by multiplying the average quantity sold per super-market and the estimated number of supermarkets for each region. A blank cell means none and 0.00 stands for a positive figure less than 0.005.

b) Rice packed by rice estates and food companies

c) Packed in plastic bags without brand name.

d) Branded.

Table III-11 Rice sold to consumers in Uganda, 2011-12, by area of consumption, selling channel and variety group / brand / country of export [a]

	Kampala				Outside Kampala			Total		
	Markets	Small retailers	Super-markets	Total	Markets	Super-markets	Total			
	..... 1000 t/year									
Domestic:										
Supa [b]	14	2	0.2	16	33	0.4	34	50	(30)	(43)
Kaiso [c]	8	2		10	23		23	33	(19)	(28)
Upland [d]	10			10	20		20	29	(17)	(25)
Branded [e]	0.1		1	2	1	2	3	4.6	(3)	(4)
Total	**32**	**4**	**2**	**37**	**76**	**3**	**79**	**116**	(69)	(100)
	(27)	(3)	(1)	(32)	(66)	(2)	(68)	(100)		
Imported:										
Pakistan	12	2	1	14	14	1	15	29	(17)	(56)
Vietnam	1	0.0	0.0	1	5		5	7	(4)	(13)
India	0.3		0.2	1	0.1	1	1	1	(1)	(3)
Tanzania	4	0.1		4	8		8	12	(7)	(23)
Kenya	1		0.2	1	0.0	1	1	2	(1)	(5)
Others			0.3	0.3	0.2	0.0	0.2	0.5	(0.3)	(1)
Total	**18**	**2**	**1.3**	**21**	**27**	**3.3**	**31**	**52**	(31)	(100)
	(35)	(4)	(2)	(41)	(53)	(6)	(59)	(100)		
Total	**50**	**6**	**3**	**59**	**104**	**6**	**110**	**169**	(100)	
	(85)	(10)	(5)	(100)	(94)	(6)	(100)			
	(30)	(4)	(2)	(35)	(62)	(4)	(65)	(100)		
Per-capita (kg/year) [f]				**34.1**			**4.5**	**6.0**		
Estimated domestic rice production in paddy (1000 t/year) [g]								**235.8**		

a) A blank cell means none and 0.0 stands for a positive figure less than 0.05. Figures in parenthesis are percentages.

b) Includes local non-brand rice sold in supermarkets, some of which is Kaiso and Upland.

c) Includes other region specific lowland varieties.

d) Includes Kaiso (upland) produced in West and North.

e) Tilda sells imported rice under many brands, which is not included.

f) Rice consumed at home by rice farmers is included in the consumption of outside-Kampala. 2012 projected population was used as the denominator.

g) Estimated using the conversion rate from paddy to milled rice of 0.65 (from our rice mill survey) and the rate of farmers' home consumption of 24% (UBOS 2010, Haneishi et al. 2013c).

Table III-12 Comparison of rice retail prices between public markets and supermarkets in Kampala and outside Kampala, 2012 [a]

	Kampala			Outside Kampala		
	Mean	SD	N	Mean	SD	N
	Ush/kg			Ush/kg		
Public markets						
Domestic rice:						
Supa	3,651	267	39	3,489	319	93
Kaiso	3,121	228	32	2,975	155	65
Upland	3,060	174	15	3,083	234	83
Minimum price	*2,600*			*1,800*		
Maximum price	*5,000*			*4,600*		
Imported rice:						
Unbranded 'Pakistan'	3,599	365	40	3,642	256	14
Minimum price	*2,700*			*2,200*		
Maximum price	*7,500*			*10,000*		
Overall average price [b]	*3,463*			*3,028*		
Supermarkets						
Domestic rice:						
Company's branded rice A [c]	3,245	414	12	3,450	50	2
Unbranded Supa	3,640	301	5	3,538	308	8
Unbranded non-Supa	3,088	195	4	3,000	0	3
Minimum price	*2,600*			*3,000*		
Maximum price	*15,000*			*7,000*		
Imported rice:						
Unbranded 'Pakistan'	3,750	250	4	3,650	350	2
Minimum price	*3,500*			*3,300*		
Maximum price [d]	*32,450*			*16,000*		
Overall average price [e]	*5,873*			*5,698*		

a) The prices in public markets are of retailers. The minimum and the maximum prices are the lowest and highest prices of rice found in the sample markets and the sample supermarkets, regardless of variety, brand. SD and N stand for standard deviation and number of observations, respectively.

b) Weighted average price of all kinds on rice sold by the sample retailers in public markets, using the quantity sold as weight.

c) A large company's lowest rank branded rice.

d) Excludes pre-cooked rice packs.

e) Weighted average price of all kinds on rice sold in the sample supermarkets, using the quantity sold as weight.

Table III-13 Number of companies that pack branded rice, number of rice brands, and average number of rice items, sold in sample supermarkets, 2012

	Domestic rice			Imported rice			Total
	No. of companies [a]	No. of brands [b]	Av. no. of rice items sold per supermarket [c]	No. of companies [a]	No. of brands [b]	Av. no. of rice items sold per supermarket [c]	Av. no. of rice items sold per supermarket [c]
Kampala	9	16	6.3	45	94	10.5	16.8
Outside Kampala	5	6	2.9	37	56	7.5	10.5
All	9	17	4.5	65	123	8.9	13.5

a) The total number of companies that made branded rice packs sold in the sample super markets. Unbranded rice packs are not included.

b) The total number of rice brands sold in the sample supermarkets. Unbranded rice packs are not included.

c) The number of rice items sold per supermarket, counting the same brand but different weights separately. For example, in case 1 kg packs and 2 kg packs for a rice brand packed by a company are sold in a supermarket, we count two rice items sold in the supermarket.

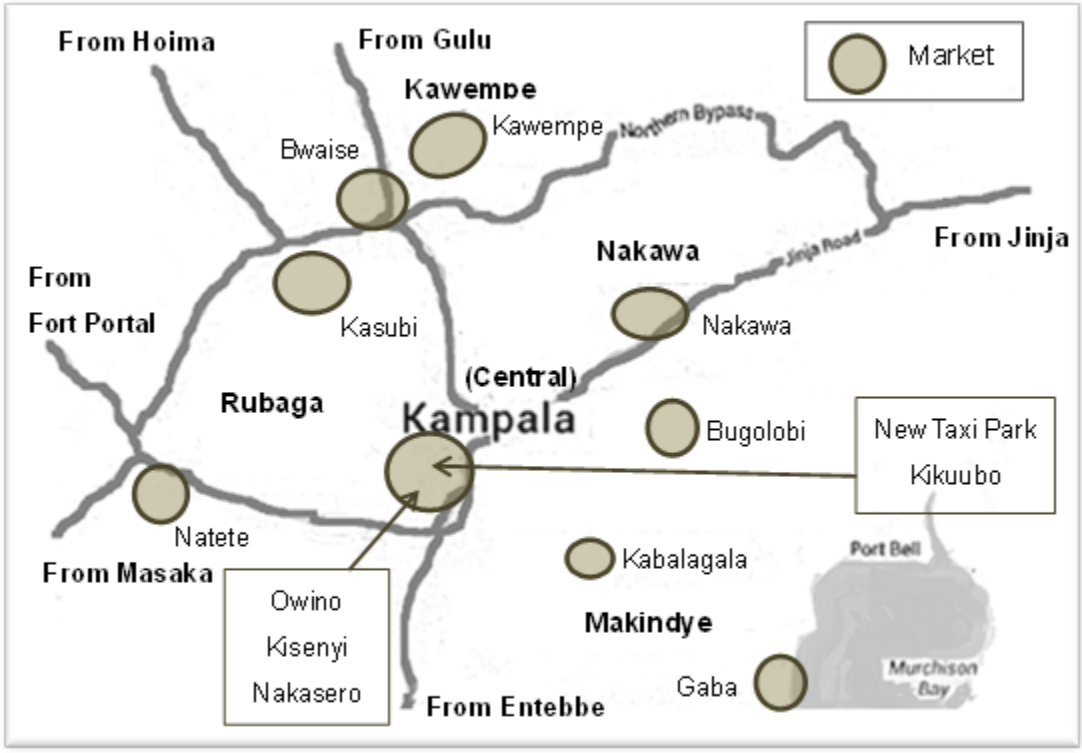

Fig. III-1 Major roads coming from districts and the location of major markets in Kampala

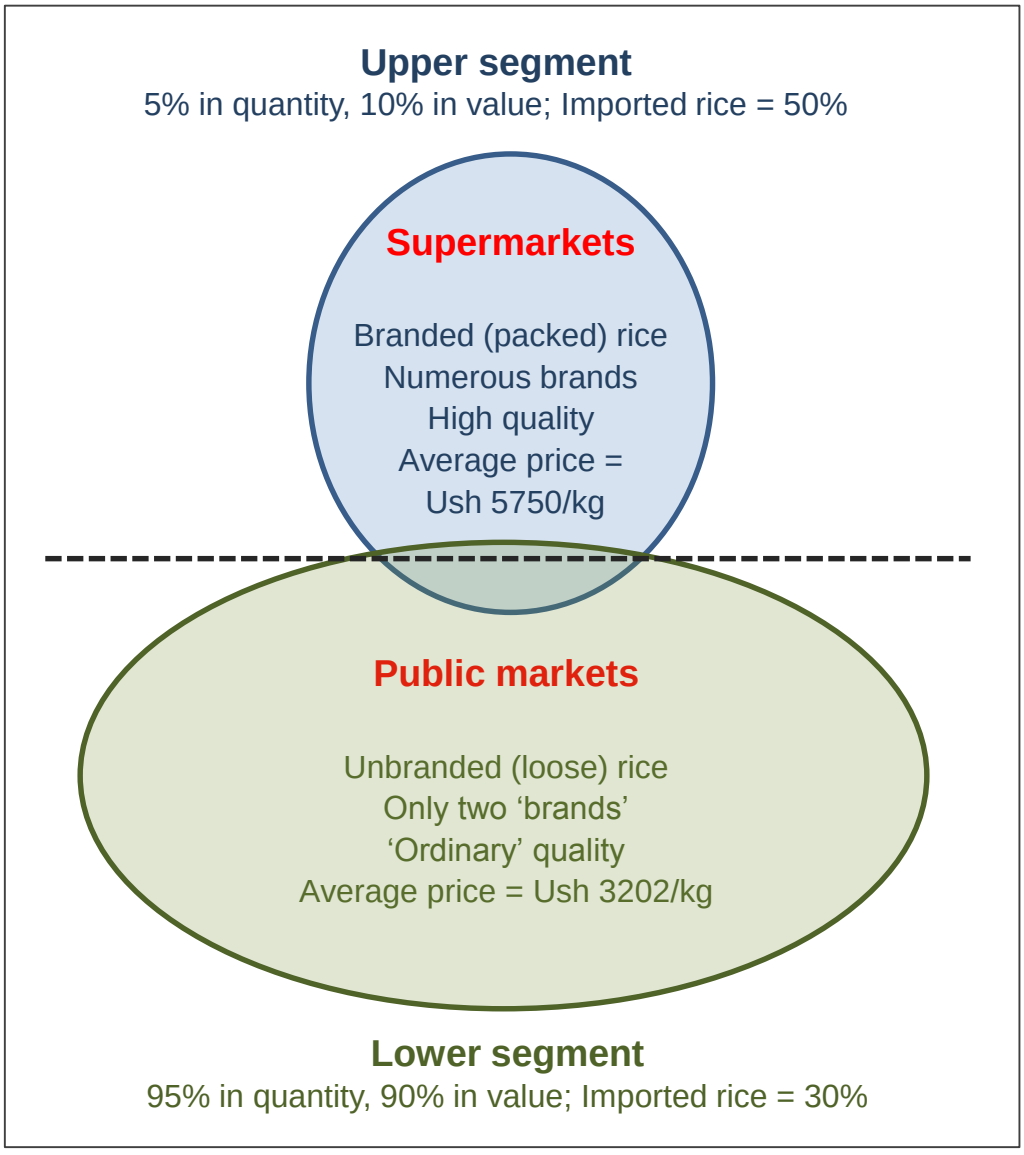

Fig. III-2 Structure of rice markets in Uganda

Chapter IV. Production and Distribution of Rice

Rice is produced all over in Uganda except for the mountainous and pastoral areas in the eastern and southwestern corners of the country (Haneishi *et al.* 2013b). How much of rice produced and marketed is brought to the main markets in Kampala and how much remains in the regions? How important rice flows from Kampala to the regions and between regions? Are all regions self-sufficient in rice or some of them net 'importer'? In this chapter, we estimate rice production in 2011-12 and how it is distributed within the country, together with the distribution of imported rice.

1. Rice Production

First, let us estimate the quantity of rice produced in Uganda. We estimate it as the quantity of rice milled by rice millers in the country during the year, by multiplying the total number of rice millers in the country and the average quantity of paddy rice milled per rice miller per year. Certainly, there could be paddy rice produced last year but carried over to this year for milling or produced this year but stored for milling in the next year. There could also be paddy rice produced in other countries and imported to Uganda for milling or *vice versa*. However, the amount of paddy rice that comes under such cases could not be more than a tiny fraction of the total domestic production.

The estimated quantity of rice milled is shown in Table IV-1 by region and by variety group. The total quantity of rice milled in 2008, estimated in the same method, is also shown in the table.[46] The total quantity of rice milled, or the total rice production, in 2011-12 is estimated to be 0.23 million tons, which has been nearly doubled since 2008. East-far is the largest producer among the regions, followed by East-near, North and West. These regions were also major rice producing regions in 2008, but the rate of increase is particularly large in North, West and East-far where upland rice cultivation has shown remarkable increases. With a rapid increase, Central-east has been emerging as a major rice producing region.[47] In terms of the quantity produced, North-west and South-west are minor rice growing regions, and rice cultivation is nearly nil in Central- west.

[46] The details of the estimation, including the number of rice millers, see Chapter VII of this report and Kikuchi *et al.* (2013b).

[47] In terms of rate of increase in rice production from 2008 to 2011-12, North-west recorded a very high rate, which may suggest some under-estimation for 2008 or over-estimation for 2011-12, or both.

In terms of rice varieties planted, of the entire rice milled by rice millers, lowland varieties take 60% and upland varieties 40%.[48] As explained in Haneishi *et al.* (2013b), in Uganda, lowland rice cultivation dominates in eastern regions, and as one goes to north and west the share of upland rice cultivation increases, ending up nearly complete domination of upland rice cultivation in western regions. Reflecting such regional patterns in rice cultivation, lowland varieties are planted mostly in East-far and East-near and upland varieties mostly in West and South-west. North, North-west and Central-east find both lowland and upland varieties.

Rice farmers plant various varieties on their land both for lowland and upland.[49] As explained in Chapter III, the rice market in Kampala distinguishes only Supa, Kaiso and Upland as varieties or variety groups. Reflecting such preferences in the rice market, the distinction of rice varieties at the rice mill level follows the same pattern. Supa, which commands a higher price in the market than Kaiso and Upland, is produced mostly in East-far, followed by North and East-near, Kaiso in East-far and East-near, and upland in West and North. Among upland rice varieties grouped into 'Upland', the most popular is NERICA 4.[50] In some local markets, some other varieties grown in the locality are found, though in a small quantity, in addition to the three main variety groups. Typical of such cases is Sindano, an upland variety, found in North and North-west.[51] Among 'other lowland varieties' planted in East-far, East-near and Central-east, Benenego is the most popular variety.

2. Distribution of Rice in the Country

Rice produced in a rice producing region is first consumed at home by rice farmers, and the rest is brought to the markets by rice traders at various market stages and reaches consumers in various places, in the rice producing region and in other regions including Kampala and foreign countries. In this section, we trace how marketed rice is distributed to consumers, together with the distribution of imported rice.

[48] It is estimated from the rice trader and supermarket surveys that 3% of the total domestic rice production is produced by large rice estates or rice companies. These estates and companies grow various varieties on their own farms and through contracting out to ordinary farmers, but their production are lumped in one cell in Table IV-1 regardless of varieties.

[49] A nationwide survey of rice farmers conducted in 2009 found about 40 different rice varieties planted by farmers (Kikuchi *et al.* 2013b).

[50] It is estimated that NERICA varieties altogether took 70% of the entire area planted to upland rice in Uganda in 2007/08 (Haneishi *et al.* 2013c).

[51] Among upland rice varieties grouped into 'Upland', the most popular are NERICA 4, which is far more than Sindano in terms of quantity produced. But, it is rare that the name of NERICA 4 is mentioned at the rice mill level: it almost always goes under the variety or brand name of 'Upland.'

(1) Destinations of rice from producing regions

Rice produced in rice growing regions is brought to rice mills by farmers or rice traders. From there, except for the portion of rice brought back to farms for home consumption, rice goes into the market channels through town brokers / suppliers / middlemen (See Fig. II-2 in Chapter II). The market channels leads rice to either one of three destinations: 1) the retail markets within the producing regions, 2) the retail markets in Kampala through Kampala wholesale markets, 3) the retail markets in other regions outside Kampala.

Table IV-2 shows the flows of marketed rice from producing regions to destinations in the form of a matrix in terms of percentage share and Figure IV-1 depicts these flows with the estimated quantity of rice. The information on the destinations of marketed rice was obtained in our rice mill survey from rice brokers and wholesalers operating in and around rice mills in the rice producing regions. The rice quantity in each flow from a producing region to a destination region was estimated by multiplying the percentage share of the destination region by the quantity of rice marketed in the producing region, which was estimated first converting the quantity of rice produced in the region shown in Table IV-1 into milled rice by assuming a uniform milling rate of 65%[52] and then deducting from it farmers' home consumption by assuming a uniform rate of 24%.[53] The quantity of rice in the table and the figure is of rice marketed through the ordinary market channels, not including rice produced by large rice estates.

For the country as a whole, 96% of rice produced and marketed is destined for destinations within the country and 4% is exported to neighboring countries (Table IV-2). Within the country, Kampala is the major destination receiving as much as 46% of rice marketed domestically. The four major rice growing regions supply about 90% of the total marketed rice. These regions send 40 to 57% of their marketed rice to Kampala and retain 35 to 46% for the retail markets within the regions. For minor rice producing regions, rice produced in the regions is mostly for local consumption within the regions. South-west, though a small rice producer (Table IV-1), is exceptional in this respect, sending 50% of rice marketed to Kampala and more than 10% to Rwanda.

It is remarkable that, although the main rice marketing channels run from the four major rice growing regions to the markets in Kampala, the channel network is extended widely all over the country (Figure IV-1). The arrows in this figure indicate the directions that rice flows from a region to another. Behind the arrows there exist the movements of rice buyers in the opposite directions. Many rice wholesalers in Kampala go to the rice

[52] The average of the milling rates in our rice mill survey. See Chapter VII.
[53] The rate of farmers' home consumption reported by the Census of Agriculture 2008/09 (UBOS 2010) and Haneishi *et al.* (2013c).

growing regions to procure rice, and so are rice wholesalers in regions outside Kampala, including foreign buyers. All the year round, but particularly in rice harvesting seasons, many rice buyers coming from all over the country swarm around rice mills and their surroundings in the rice growing regions. The region that particularly attracts rice buyers/ wholesalers from various places is East-far, where Supa, the best-selling rice variety or 'brand', is produced most. Some buyers come to this region even from very remote places in North-west and South-west.

(2) Procurement of rice by wholesalers in Kampala

The facts found in Table IV-2 and Figure IV-1 are partly cross-checked by Table IV-3 that shows the quantity of rice procured in the rice producing regions by wholesalers in Kampala. As expected, they procured nearly 100% of rice in the four major rice growing regions. A small amount of rice was detected as coming from Central-east, but none of our Kampala wholesaler samples reported any rice procurement in South-west. Except for East-near for which a large gap is found between the estimated quantity of rice destined to Kampala (Figure IV-1) and that acquired by Kampala wholesalers (Table IV-3), data both in the production and the consumption sides give fairly comparable estimates for the rest of the major rice growing regions. As for the varieties, or the 'brands', a large quantity of Supa is procured in East-far, while more than 50% of Kaiso in East-near. North supplies Kaiso and Upland, together with Supa, and West nearly specializes to Upland. As explained in Chapter III, however, a bulk of Upland and Kaiso is sold under the name of Supa in Kampala markets. This may explain partly the lower estimate of the quantity procured in East-near relative to the estimate obtained from the production side.[54]

(3) Procurement of rice by wholesalers outside Kampala

The main flows of rice in the country are from the major rice growing regions to Kampala. There are other minor, but steady flows run in the opposite directions from Kampala to regions outside Kampala. Table IV-4 shows where wholesalers in the regions outside Kampala procure rice. For domestic rice, each region obtains the largest share of rice within the region[55] and some small shares from adjacent regions. It is remarkable that the share of rice procured in Kampala is substantial in the three minor rice producing regions.

[54] Many wholesalers in Kampala go to Soroti in East-far or even as far as Lira in North in one trip to procure Supa. There is an apparent inclination among them, when answering where they procure rice, to put a higher priority on these places that are well-known for producing good quality Supa.

[55] An exception for this is Central-east where only a small quantity of rice is procured within the region. Including such cities and towns as Entebbe and Mukono, many rice wholesalers in this region have the same functions as Kampala wholesalers.

The quantity itself is not so large, as shown in Figure IV-2, but North-west and South-west receive relatively larger amounts of rice from Kampala. Rice in these flows from Kampala is, without exception, Supa, which Kampala wholesalers procured in East-far and North. The back-flows of domestic rice from Kampala are mostly to satisfy the demand for Supa in regions that do not produce it. This is why the back-flow is nil or almost nil for East-far and North.

For imported rice, wholesalers outside Kampala procure either from Kampala or directly from neighboring countries. Of the total amount of imported rice, 65% is through Kampala. The estimated quantities sent to the regions are shown in Figure IV-2. There is a tendency that the regions in the western side of the country procured relatively large amounts of imported rice through Kampala. This tendency is explained partly by the fact that rice found in this flow is mostly 'ordinary Pakistan' and some 'Vietnam', the same level 'brands' as Supa.

(4) Import and export of rice

More detailed flows of imported rice in the country are summarized in Table IV-5, together with flows of rice exported across the borders. The data on the import are from the rice trader survey in and outside Kampala, and those on export from the rice mill survey.

Imported rice in this table includes only imported rice that went through the public market channels and does not include imported rice going through the supermarket channels. In the table, two types of imported rice is distinguished: The first type is that our sample rice wholesalers bought from other importers/ suppliers/ wholesalers in Kampala and the second type is that our sample rice wholesalers went to foreign countries for direct procurement. For the direct procurement, 'Pakistan/ Vietnam/ India'[56] is rice produced in these countries, and imported and re-exported by neighboring countries. Of the total imported rice that went to consumers through the public market channels, about 60% was procured and distributed by importers/ suppliers/ wholesalers in Kampala, of which 40%, or 12,000 tons, went to consumers in Kampala and 60%, or 18,000 tons, to the regions outside Kampala. Of the directly procured from neighboring countries, 45% was procured by wholesalers in Kampala and the rest by wholesalers in the off-Kampala regions except for West. About 6% of the total imported rice or 15% of directly procured was 'Pakistan/ Vietnam/ India' re-imported from neighboring countries.

Figure IV-3 depicts the estimated quantity of rice import by receiving region, by country of origin and by variety type. The largest flow of rice import is of 'Pakistan/ Vietnam/ India' coming to the country through the Kenyan border. A bulk of Supa Tanzania

[56] Imported rice from other exporting countries, such as Thailand, is included under this heading.

reaches the country with many destinations; Kampala, Central-east, Central-west and South-west through the Tanzanian border on land and on lake. Rice imports from Congo and Rwanda were re-imports of 'Pakistan'.

The bottom part of Table IV-5 shows the estimated quantity of rice exported from the regions to bordering countries and Figure IV-4 depicts the export rice flows. Our data reveal that, though in small quantities, rice is exported to all the bordering countries, from six out of eight regions outside Kampala.[57] East-near exported rice to all the bordering countries except Congo and buyers from Sudan came to public markets in four regions to procure rice.

How are our estimates of import and export compared with the 'official' statistics? Data from two different sources are shown in Table IV-6. For rice import, the two sources give very different figures. The data of the Uganda Revenue Authority (URA) are of customs-clearance basis, so that rice imported through outside the customs channels are not included. The larger import figures of FAOSTAT should imply that they include the quantity imported through outside-customs-channels. One point to be reminded is that for both the sources, the imported rice reported includes the rice that is re-exported to adjacent countries. Our estimates of rice import, which are of the quantities consumed within the country, are closer to the URA figures. The URA figure and our estimates are largely consistent each other for the quantity of import from Asian countries as a whole, but our estimate for the import from Tanzania seems to have suffered from some under-estimation.

For rice export, the FAOSTAT and URA give quite similar figures for the total in each year, though there are some differences for the distributions among the countries of destination. Since the total quantity of the export is far less than the import, the problem of re-export is more critical in ascertaining how much of rice produced domestically was exported to adjacent countries. Even if this problem is taken into account, however, our estimates of rice export appear to have been subject to serious under-estimations, except for Kenya. Such underestimations would have been due mainly to the fact that the small samples, which we took in the sample districts bordering with Congo, Rwanda and Sudan, failed to include rice traders who handled a large quantity of domestic rice for export.

3. Production, Consumption and Regional Self-Sufficiency

We have observed consumption and production of rice. The consumption was estimated by using the data obtained from rice retailers and supermarkets in Kampala and the regions outside Kampala, while the production was estimated by using the data obtained from rice

[57] The export from North-west to Sudan and Congo is the re-export of imported rice.

millers in rice producing regions. Last in this chapter, we examine the consistency in our estimation by comparing the estimates of the two sides.

Table IV-7 summarizes the production and the consumption estimates by region for comparison. In the table, Kampala and Supermarket are defined as regions that do not produce rice. Two consistency checks are made. The first check is between the quantity of domestic rice marketed within the country and that consumed within the country. The former is obtained as the total quantity of domestic rice marketed less the total quantity of domestic rice exported. The latter is obtained as the total quantity of domestic rice sold for final consumption in the country. The two estimates at the aggregated national level are expected to be identical, but a discrepancy of 6,000 tons is found. Considering the small sample nature of our surveys, a discrepancy of around 5% could be said not large. Because of the transfers of rice among the regions, this comparison is applicable only for the national aggregate, not for the regional level.

The identity at the regional level is expected, however, for the quantity of domestic rice destined to rice traders within a region and that procured within the region by rice traders in the same region. For this, the discrepancy aggregated over the country is 10,000 tons, which is larger than for the quantity marketed within the country, but still less than 10% of the total quantity marketed. It should be noted, however, that the estimation gap is large for North, accounting for a large part of the total discrepancy. These results are a reflection of the nature of our data that the estimates on the distribution of rice among the regions are less reliable than those of production and consumption. As explained just before, our estimates of rice export is subject to under-estimations.

Such qualifications in mind, let us see the bottom line of Table IV-7, which shows the net outflow of rice for the regions. As expected, the four major rice growing regions, North, East-far, East-near and West, are net rice ‘exporters’ and the rest four regions are net rice ‘importers.’ For the country as a whole, the net import of rice is estimated to be 43,000 tons as the aggregate of the regional net ‘imports’, with a statistical discrepancy of 5,000 tons compared with the net import of 48,000 tons estimated as the import less the export.

Table IV-1 Estimated rice production by region, 2011-12 and 2008 [a]

Region	Total	Lowland varieties				Upland varieties			Estates [b]	2008 Total [f]
		Supa	Kaiso	Others	Total	Sindano	Others	Total		
		1000 t/year								
North-west	**5**	2			2	0.2	3	3		0.3
North	**40**	13	6	0.1	19	11	10	21		13
East-far [c]	**74**	34	31	4	70		4	4		35
East-near [d]	**59**	12	28	3	44		9	9	7	49
Central-east	**12**	0.3	1	1	3		9	9		5
Central-west	**0.1**						0.1	0.1		0.0
South-west	**5**						5	5		4
West [e]	**37**	0.3	1		1		36	36		16
Total	**232**	62	67	9	138	11	75	87	7	122
	(100)	(27)	(29)	(4)	(60)	(5)	(32)	(37)	(3)	

a) Estimated by multiplying the average quantity of paddy rice milled per rice miller by the number of rice millers. A blank cell means none and 0.0 stands for a positive figure less than 0.05. Figures in parenthesis are percentages.

b) Production of large estates, estimated from rice consumption.

c) The quantity of a large rice miller is added to the small rice millers' total.

d) The quantity of two large rice millers is added to the small rice millers' total.

e) The quantity of a large rice miller is added to the small rice millers' total.

f) The quantity of paddy rice milled in 2008, estimated in the same way as for 2011-12. See Kikuchi et al. (2013a).

Table IV-2 Percentage share of rice produced and marketed in regions by place of destination, 2011-12 [a]

Place destined	Producing region								Total [b]
	North west	North	East far	East near	Central east	Central west	South west	West	
Within country:									
Kampala		57	40	50	40		50	51	46
North west	100		1					0	2
North		38		1				0	7
East far		1	46						15
East near		1	3	35					9
Central east		0	1	1	60			3	4
Central west			1			100			0
South west			2	2			38		2
West		0		8				44	9
Total	100	96	95	96	100	100	88	97	96
Foreign countries:									
Sudan		4	1	1				1	1
Kenya			4	1				2	2
Rwanda				1			13		0
Tanzania				1					0
Total		4	5	4			13	3	4
Total	100	100	100	100	100	100	100	100	100
Quantity produced and marketed (1000 t) [c]	2	20	36	26	6	0	3	18	111

a) Based on data of wholesalers / brokers in rice producing regions outside Kampala.

b) Weighted average.

c) Estimated rice production in Table IV-1 adjusted for rice milling (milling rate=65%) and home consumption by rice farmers (home consumption rate=24%), not including rice produced by large rice estates.

Table IV-3 Quantity of rice procured by Kampala wholesalers in rice producing regions by region and by variety group, 2011-12 [a]

	Supa		Kaiso [b]		Upland		Total	
	..... 1000 t/year							
North-west								
North	4	(27)	2	(20)	2	(21)	8	(23)
East-far	11	(68)	1	(12)			12	(34)
East-near	1	(4)	5	(53)			6	(17)
Central-east					0.1	(1)	0.1	(0)
Central-west								
South-west								
West			2	(15)	7	(78)	9	(25)
Total	16	(100)	10	(100)	10	(100)	36	(100)

a) Based on data of Kampala wholesalers and the consumption estimates for Kampala in Table III-11. Blank cell means no report. Figures in parentheses are percentage shares.

b) Include other lowland varieties.

Table IV-4 Percentage share of rice procured by wholesalers in regions, by place of procurement, 2011-12

Place procured	Consuming region								Total [b]
	North west	North	East far	East near	Central east	Central west	South west	West	
Domestic rice:									
Kampala	32	0		1	1	17	17	1	2
North west	63								3
North	5	90	2					10	21
East far		10	98	28	74		38		42
East near				71	5				12
Central east					5				1
Central west						83			0
South west							44		3
West					15			89	17
Total	100	100	100	100	100	100	100	100	100
Quantity procured (1000 t) [b]	1	17	19	12	8	0	5	13	76
Imported rice:									
Kampala	98	100	100	14	36	77	26	100	65
Congo	2								0
Kenya			0	86					6
Tanzania					64	23	48		25
Rwanda							26		4
Total	100	100	100	100	100	100	100	100	100
Quantity procured (1000 t) [b]	3	2	1	2	5	7	4	4	27

a) Based on data of wholesalers in the regions outside Kampala. Blank cell means none and 0 stands for a positive figure less than 0.5.

b) Weighted average, using the quantity sold by region as weights.

c) For a reference, the estimated quantity of milled rice sold for final consumption in each region is shown. From Table III-9.

Table IV-5 Procurement of imported rice by wholesalers in and outside Kampala by place of procurement, and quantity of domestic rice sold by rice brokers outside Kampala for export by country of destination, 2011-12 [a]

	Kampala	Region									Total	
		Total	NW	N	EF	EN	CE	CW	SW	W		
		1000 tons										(%)
I. Import (in milled rice) [b]												
From importer/trader in Kampala [c] **:**												
Pakistan/ Vietnam/ India	11.7	13.3	2.0	0.3	1.4	0.3	1.8	2.8	1.1	3.6	25.0	(52)
Supa TZ	0.3	4.6	0.7	1.2			0.1	2.6			4.9	(10)
Kaiso Kenya	0.0	0.0									0.0	(0)
Kenya packed rice	0.0	0.0									0.0	(0)
Total	12.1	17.9	2.8	1.5	1.4	0.3	1.9	5.4	1.1	3.6	30.0	(63)
Direct procurement from neighboring countries [d] **:**												
Pakistan/ Vietnam/ India [e]												
Via Kenya		1.7			0.0	1.7					1.7	(3)
Via Tanzania		0.0						0.0			0.0	(0)
Via Rwanda		1.0							1.0		1.0	(2)
Via Congo		0.0	0.0								0.0	(0)
Total		2.7	0.0		0.0	1.7		0.0	1.0		2.7	(6)
Tanzania (Supa TZ)	6.0	6.9					3.4	1.6	1.9		12.9	(27)
Congo		0.0	0.0								0.0	(0)
Kenya (Kaiso)	2.1										2.1	(4)
Total	8.0	9.6	0.1	0.0	0.0	1.7	3.4	1.6	2.9		17.7	(37)
Total	20.2	27.5	2.8	1.5	1.4	1.9	5.2	7.0	4.0	3.6	47.6	(100)
II. Export (in milled rice) [f]												
Kenya		2.2			1.6	0.3				0.3	2.2	(40)
Tanzania		0.3				0.3					0.3	(5)
Rwanda		0.7				0.2			0.3	0.1	0.7	(12)
Sudan [g]		1.9	0.4	0.8	0.4	0.3					1.9	(35)
Congo [g]		0.4	0.4								0.4	(8)
Total		5.4	0.8	0.8	2.0	1.0			0.3	0.5	5.4	(100)

a) Based on data of wholesalers / brokers in and outside Kampala from rice trader survey. Kampala and regions at the table head stand for the places wholesalers /brokers operate. Blank cell means none and 0.0 stands for a positive figure less than 0.05.

b) Include only imported rice that went through the public market channels. Imported rice that goes through supermarket channels, about 5,000 tons, is not included.

c) Imported rice bought from importers/suppliers/wholesalers in Kampala. A small amount procured from wholesalers in Jinja is included.

d) Imported rice wholesalers went to the foreign countries to buy.

e) Re-import.

f) Based on rice mill survey. Domestic rice sold by brokers in and around rice mills in the rice producing regions to foreign buyers through border towns (Busia, Malaba, Mutukula and Katuna), except for Congo for which exported rice is re-export through Arua of imported 'Pakistan', 'Vietnam' and Supa TZ procured in Kampala.

g) Export from North-west is re-export of imported rice.

Table IV-6 Quantity (1000 t) of rice import and rice export from two different sources, 2007-2011 [a]

	FAOSTAT							Uganda Revenue Authority					
	Total	Type			Country of origin [b]			Total	Import entry point				
		Bro-ken	Mill-ed	Other	Paki-stan	Viet-nam	Tan-zania		Mala-ba	Busia	Mutu-kula	Port Bell	Other
Import													
2007	74.7	50.1	24.6	0.1	35.3	11.7	11.9	42.2	19.8	0.7	10.0	3.4	8.3
2008	63.4	33.1	30.2	0.1	21.5	11.8	13.1	30.3	13.9	0.5	10.2	3.3	2.3
2009	80.1	50.2	29.8	0.2	24.6	36.4	14.0	35.5	19.3	1.8	13.0	0.0	1.4
2010	77.2	na	na	na	36.5	12.7	23.9	42.3	15.3	2.9	16.4	7.4	0.3
2011								58.6	21.0	10.3	18.6	7.5	1.3
	Total	Country of destination [b]						Total	Export through the border with				
		DRC [c]	Rwan-da	Sud-an	Ken-ya	Other			DRC [c]	Rwan-da	Sud-an	Ken-ya	Other
Export													
2007	24.5	12.5	7.9	3.7	0.0	0.3		24.8	5.6	13.2	3.2	0.3	2.6
2008	25.2	10.0	9.5	4.3	0.1	1.3		25.4	5.6	12.3	4.0	0.3	3.2
2009	37.8	20.6	9.4	4.6	0.3	2.9		38.4	13.8	11.4	5.0	1.0	7.2
2010	33.4	23.5	1.4	5.9	1.2	1.5		34.5	15.5	2.9	5.9	2.2	7.9
2011								42.5	13.6	13.0	11.7	0.5	3.6

a) FAOSTAT data are from FAO (2012), except for 2010 for which data are from the Uganda Export Promotion Board. Data from URA are through the courtesy of the Authority.

b) Summation of all kinds of rice.

c) Democratic Republic of Congo.

Table IV-7 Total quantity of rice produced and marketed by destination and total quantity of rice consumed by place of procurement, by region, 2011-12 [a]

		Region								Kam-pala	Super-Market [f]	Total
		NW	N	EF	EN	CE	CW	SW	W			
		1000 tons										
I. Production data [b]												
Total production marketed	(1)=(2)+(3)	2	20	36	30	6	0	3	18			116
Destination												
Within region	(2)	2	7	17	9	4	0	1	8			48
Within country [c]	(3)		11	18	20	2		1	10			63
Exported	(4)		1	2	1			0	0			5
II. Consumption data [d]												
Total consumption	(5)=(6)+(9)	4	19	20	14	14	7	9	17	56	9	169
Domestic rice	(6)=(7)+(8)	1	17	19	12	8	0	5	13	36	4	116
Place of procurement [e]												
Within region	(7)	1	16	18	9	0	0	2	12			58
Within country [c]	(8)	0	2	0	3	8	0	3	1	36	4	58
Imported rice	(9)	3	2	1	2	5	7	4	4	20	5	52
Statistical discrepancy												
Domestic rice: marketed within country vs consumed	(1)-(4)-(6)											-6
Domestic rice: qt. supplied vs qt. procured within region	(2)-(7)	2	-8	-2	0	3	0	-1	-4			-10
Balance												
Out-flow vs in-flow	(3)+(4) -(8)-(9)	-3	9	18	16	-11	-7	-5	5	-56	-9	-43

a) All in milled rice.

b) From Table IV-2. Original data were obtained from rice mill survey. For East-near, the quantity of rice produced by large estates in Table IV-1, 100% of which is marketed, is added to the quantity marketed through the public market channels.

c) Other regions in the country.

d) From Table IV-4, Table IV-5 and Table III-11. Original data from rice trader survey, small grocery store survey and supermarket survey. Home consumption by rice farmers is not included.

e) The place where rice that was sold for final consumption in the regions was procured by wholesalers in respective regions.

f) Supermarkets in Kampala and outside Kampala are combined.

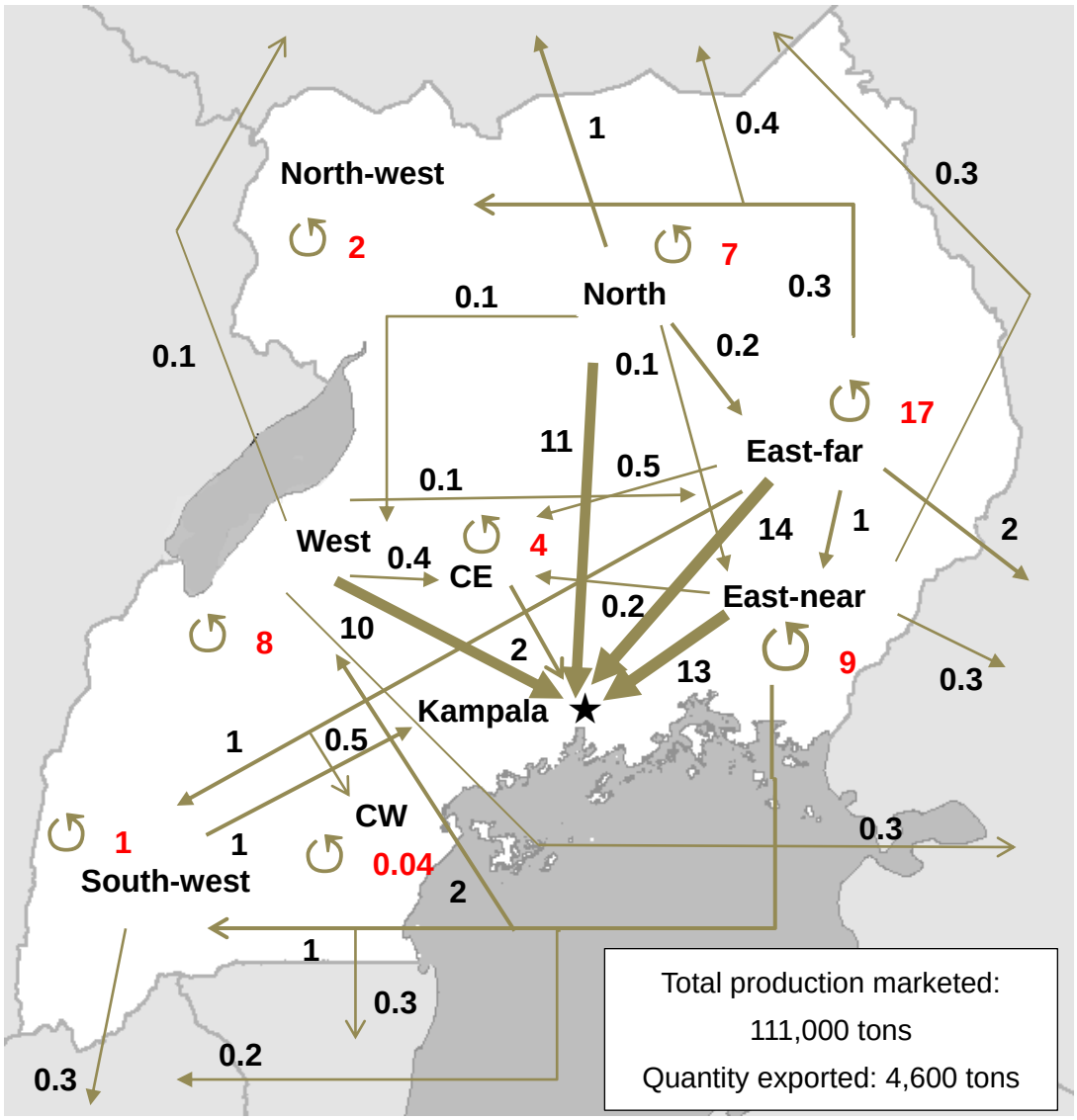

Fig. IV-1 Flows of rice produced and marketed, 2011-12

In milled rice: based on the rice-mill survey.

Figures indicate the quantity of rice (1000 t/year). Symbol ↺ means the flow within the regions. Rice produced and packed by rice estates and company is not included.

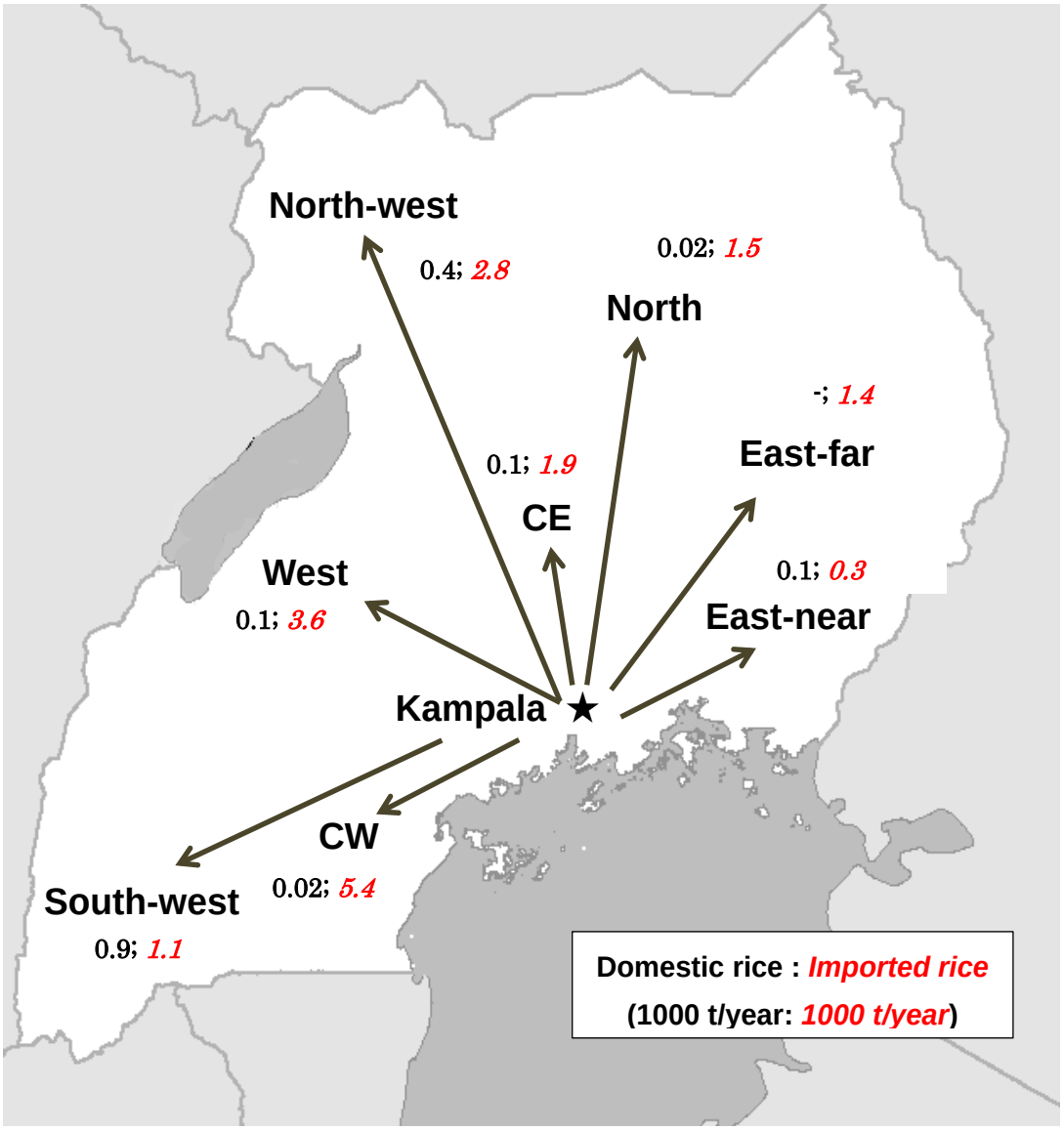

Fig. IV-2 Flows of domestic and imported rice from Kampala to regions, 2011-12

In milled rice: based on outside Kampala wholesalers' data.

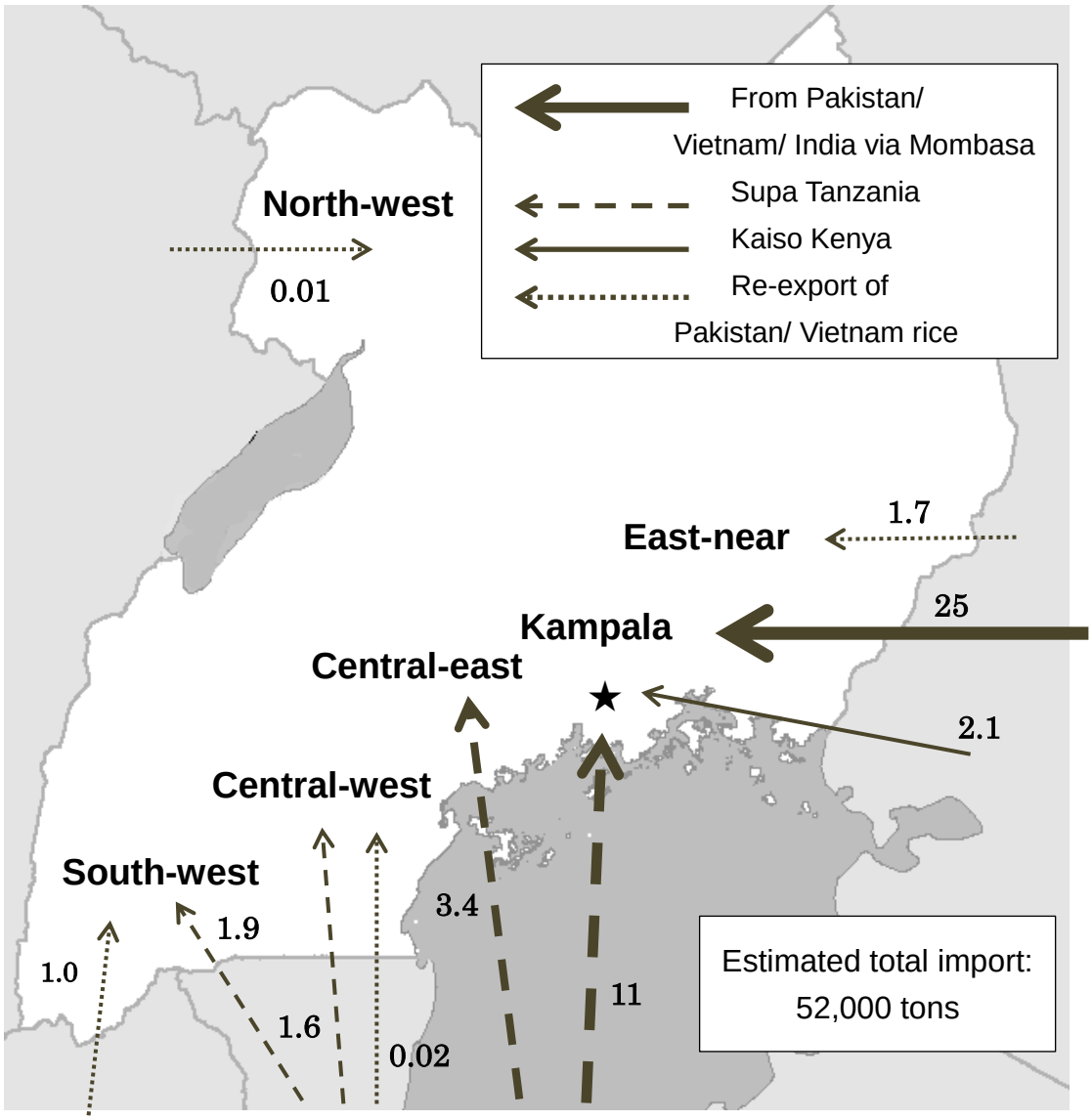

Fig. IV-3 Rice import by country of origin and by variety group, 2011-12

Figures indicate the quantity of rice (1000 t/year): In milled rice based on rice-wholesalers' data, not including the imported rice through supermarket channels.

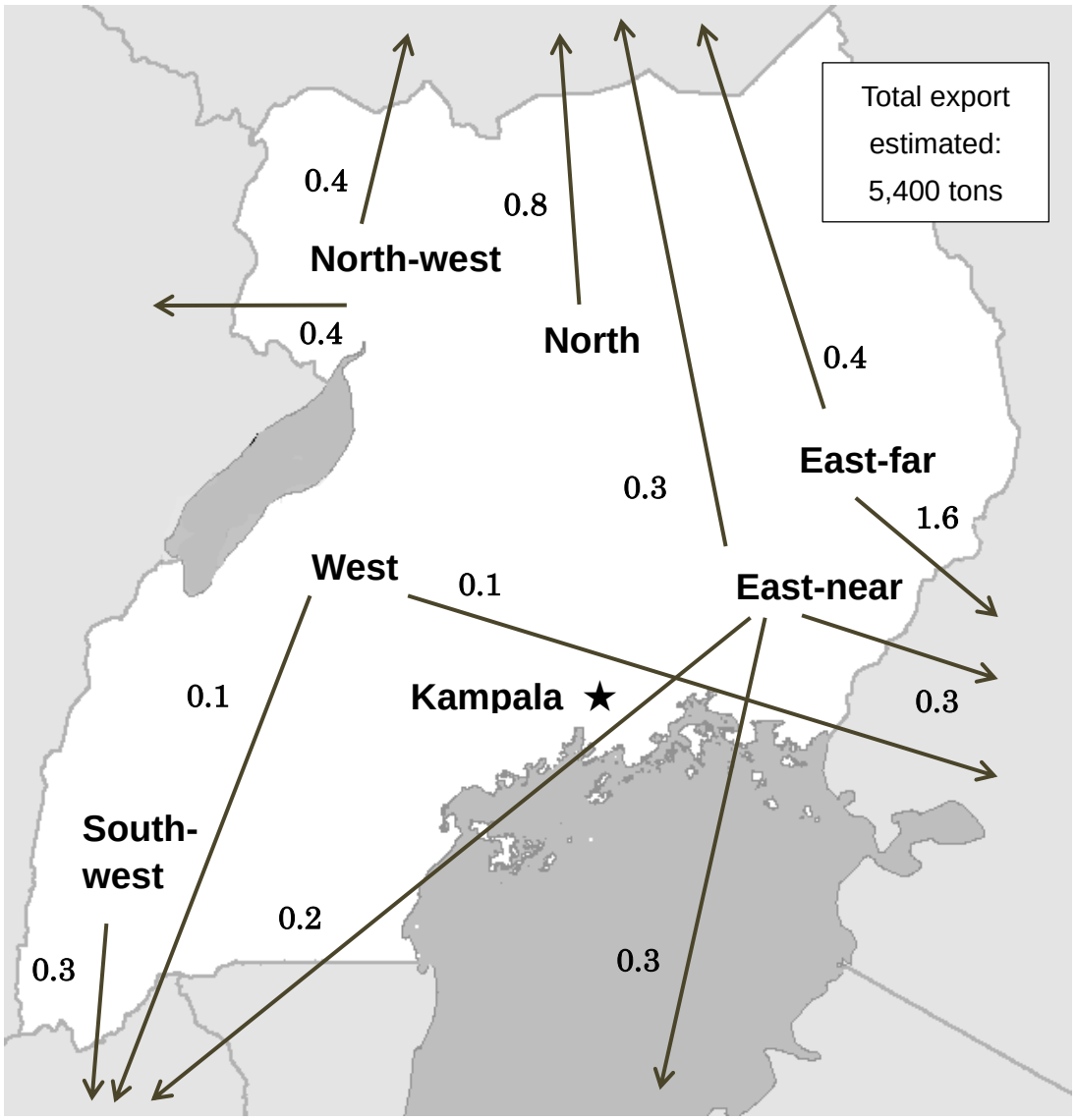

Fig. IV-4　Rice export from Uganda, 2011-12

In milled rice: based on rice-mill survey.
Figures indicate the quantity of rice (1000t/year).

Chapter V. Structure and Workings of Rice Markets

Rice produced by farmers in rice growing regions goes, through rice mills, into the market channels that reach final consumers in the regions, in Kampala and in other consumption areas (Fig. II-2). There have been some studies that shed light on the rice markets, or the rice value chain as they are sometimes referred to, in Uganda. Wilfred (2006), Fujiie (2009), PMA Secretariat (2009) and Kilimo Trust (2012) reported how rice was marketed and who were involved as agents in the process. Yoshida (2008) studied the marketing of food crops, rice as one of them, in some major public markets in Kampala and examined the movements of the market prices of these crops. Kijima *et al.* (2012b) approached the issue of rice marketing based on data collected from a rice mill survey and analyzed how well the rice markets worked in terms of the market prices.

Although each of these studies gives some insights on the markets, none of them deals with the entire spectrum of the markets extending wide from the farm-gates in rice producing regions to consumers in the urban center. None also tells, for example, how domestic rice is valued by consumers *vis-a-vis* imported rice in the rice markets. The purpose of this chapter is to present the structure and workings of the rice markets at large, first, by looking into the prices of rice of different variety groups, or "brands", in the markets at various positions in the market spectrum ranging from farm-gate to urban consumers, and second, by examining the price margins at various stages in the market chains while accounting for the costs inherent in the rice marketing.

1. Rice Prices in the Markets

In this section, let us look into the market rice prices based on the price data obtained in the rice trader and rice mill surveys. About 95% of rice marketed and consumed in Uganda goes through the public markets (Table III-11). The rice prices we examine in this chapter are confined to those in the public markets in and outside Kampala obtained during March – April 2012.[58]

[58] Our rice trader and rice mill surveys were conducted in an extended period of March to September 2012. Since the rice prices in the markets fluctuate considerably from the peak harvesting season to the lean season depending on the quantity supplied, and vary over time depending on the quantity demanded, we limit the data to be used for price examinations to those obtained in the first two months of our surveys. Even so, as we shall see later, changes in prices due to the time elements are unavoidable. Aside from the variations due to seasonal supply fluctuations, there are two periods when rice prices surge; Christmas and Easter seasons.

(1) Rice markets in Kampala

First let us observe the configuration of Kampala rice markets that consume about 30% to 40% of rice that is marketed in Uganda as a whole (Table III-11). Table V-1 shows the average prices of rice in the sample public markets in Kampala by variety group or 'brand', together with their variations and price margins. As we have observed in the previous two chapters, a distinct feature of the rice market in the public markets in Uganda is that the very limited number of rice 'brands' are found in the market: For domestic rice, Supa, Kaiso and Upland, and for imported rice, Pakistan, Vietnam and Supa TZ (Tanzania).

Supa is the most popular variety for its aromatic quality, produced mostly in East-far, North and East- near. Kaiso, another lowland variety group, is produced mostly in East-far and East-near. Upland, including various upland varieties, is produced mostly in West and North. It is rather rare to come across other brands of local rice in the public markets in Kampala. Among the 'brands' of imported rice, 'ordinary Pakistan' is most popular, the quantity consumed of which is nearly as large as Supa, followed by Supa TZ and 'Vietnam' (Table III-11). A typical rice retailer in the public markets in Kampala sells a few 'brands' of rice in his/her selling stall, e.g., Supa, 'Pakistan' and Kaiso, or Supa, 'Pakistan' and Upland. 'Vietnam' is considered as a substitute for Pakistan, and Supa TZ as a substitute for Supa or complementary to it in case of short supply during the lean season.

The rice prices shown in Table V-1 are for two stages, the wholesale and retail stages, and buying and selling prices for each. As defined earlier, the rice wholesalers are rice traders who sell rice 10 tons per month or more and the retailers are those whose rice sales are less than 10 tons per month. Since the wholesalers go to rice producing regions to procure domestic rice, their buying price is the prices they pay to rice brokers in the rice producing areas from whom they procure rice. The rice retailers procure rice from the wholesalers by visiting their stores/stalls or by their delivery services, and therefore their buying price is supposed to be the same as wholesalers' selling price. The retailers' selling price is the price paid by final consumers. For 'Pakistan' and 'Vietnam', the wholesalers procure rice from rice importers and sell it to retailers.

The table shows the mean price by 'brand' averaged over the sample rice traders in the sample public markets, who sell that brand of rice during March-April 2012. It should be noted that in addition to the changes in the rice prices within this two month survey period, there are price differentials due to quality. Although the 'branding' of the rice market is very

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Just before these important festive days, Christmas in particular, rice traders say that rice prices increase substantially. Our March-April period in 2012 included Easter which was April 8, and we refrained from the interview surveys for three days before the Easter Day.

simple, it does not mean that there is no price difference for a certain brand of rice. The quality of rice that matters in the rice market in Uganda is not so sophisticated yet, in which only three points make some quality differences: cleanliness (without stones and other odd materials), whiteness (color) and brokenness (degree of broken rice), the first point being most important. A big advantage of 'Pakistan' and 'Vietnam', which are imported from Asia where the rice milling process is with a perfect de-stoning function, is their cleanliness that does not necessitate rice retailers to make any cleaning of milled rice before selling. Though still exceptional, there are some rice wholesalers who sell a local rice variety in a few quality grades, e.g., Supa good quality and Supa poor quality. Such practices are found for all the three domestic rice variety groups, with price differences of Ush 100 /kg – Ush 200 /kg. For such cases, we take the price of the first class if the grading is in two classes and of the middle class if it is in three classes.[59] For imported rice from Pakistan, the price is of 'ordinary Pakistan', SWT-1 and its equivalent, not of high-quality rice, such as Basmati. For 'Vietnam' and Supa TZ, no case of quality differential was found.

As indicated in Table V-1, the number of observations by which we estimate the average prices of rice by 'brand' and by the market stage is not large. It is particularly so for 'Vietnam' and Supa TZ. We should always bear this smallness of our samples in mind in interpreting the data.

In the table, let us first observe the price variation. For each 'brand' of rice, in spite of the existence of possible sources of variations qualified above, the price variations are not so large, less than 10% in terms of the coefficient of variation, except for the retail level prices of imported rice. This confirms our claim that each 'brand' of rice listed in the table is a good of the same quality, for which the same market price is established.

Among the three 'brands' of domestic rice, throughout the market stages in Kampala, Supa commands significantly higher prices than Kaiso and Upland, while the prices of Kaiso and Upland cannot be distinguished statistically. These findings suggest that the rice market in Kampala formed by the public markets there contains virtually only two kinds of 'brands', i.e., Supa and non-Supa. The large inflow of imported rice does not alter this structure of the market. For the retail stage, the prices of three major 'brands' of imported rice are all not statistically different from the price of Supa, which implies that the prices of imported rice are determined in the market by the demand of consumers. In other words, their prices are set by rice retailers so as to be competitive with Supa local. The relatively larger variations of the imported rice at the retail stage may reflect retailers' trial-and-error process in their price setting. It is also interesting to observe that the prices of

[59] Some rice traders sell 'completely broken rice' at very low prices, which is included in our quantity analysis but not in the price analysis of this chapter.

Supa TZ, which are not statistically different from the price of Supa local at the retail stage, are not statistically different from those of Kaiso and Upland at the wholesale stage. This may indicate a weaker position of domestic Supa in international competitiveness relative to Supa TZ.[60]

Does the price of rice differ among the divisions in Kampala or across the producing regions where Kampala wholesalers procure rice? In order to answer these questions, we conducted regression analyses for the price data, the results of which are summarized in Table V-2. The buying and selling prices of domestic rice are regressed on to the explanatory variables that are all dummy variables but 'Date' that measures the number of days from 29 February 2012 when the first price data was obtained. This continuous variable is introduced to control possible variations in the rice prices resulted from over-time price changes. Dummy variables are used for retailers, divisions, producing regions and variety groups.

The regression results show that rice prices increase significantly over time within the study period of March-April 2012. The coefficients of the retail dummy are also significant. The estimated variety dummy variables show that the price of Supa is significantly higher than that of Kaiso but the prices of Upland and Kaiso are not distinguishable at all. If the rice market in Kampala is working well, no significant price differential is expected among the five divisions. The estimated coefficients of division dummy variables indicate that the uniformity in rice price prevails in four out of the five divisions. It is estimated that the rice price in Kawempe Division is significantly lower than in other divisions, though the price differences are not large, around Ush 150/kg. Such low prices are brought about primarily by lower prices of Upland, and of Supa at a lesser extent, in Kawempe than in other divisions. Having a locational advantage of being situated in the northern part of Kampala,[61] two large wholesale markets in Kawempe Division, Bwaise and Kawempe, receive Upland from West and adjacent districts in Central-east and Supa from North at relatively cheaper prices. The producing region dummy variables are introduced to check if there are price differentiations stemming from the 'producing area brand'. For example, some rice traders say that Supa produced in Soloti district is of good quality. The estimated results, however, detect no such price differentiations: The coefficients of all the regional dummies are not significant at the conventional significance levels, though the rice prices of North tend to be lower than other regions. Taking this and the locational advantage of Kawempe into account, the uniformity of rice price in the Kampala rice market could be said remarkable.

[60] The international competitiveness of rice production in Uganda shall be examined in the next chapter of this report.
[61] See Fig. III-1 in Chapter III.

(2) Rice markets outside Kampala

The average rice prices in public markets in the regions outside Kampala are summarized in Table V-3 in the same manner for the Kampala markets. Since the rice market outside Kampala begins with farm-gate, the farm-gate price is also included. As shown in Fig. II-1 in Chapter II, we divide outside Kampala into eight regions. The sample observations scattering over the regions, the small-sized nature of our sample is more distinct than the sample for Kampala. In particular, the number of observations is small for the farm-gate price and imported rice.

Despite the fact that the price data are collected from extensively dispersed regions, the degree of variations in the rice prices is not so different from that for the Kampala market, except for the farm-gate price. It is noteworthy that the coefficients of variation are 10% or less for all the 'brands' for the selling prices at the retail stage. It is also remarkable that the rice markets outside Kampala share the same price structure as in Kampala: It consists of a small number of rice variety groups or 'brands', virtually two 'brands', namely, Supa and non-Supa, the latter comprised of Kaiso and Upland, and imported rice is placed in the market to satisfy the demand for the higher-quality Supa 'brand'. Only a slight difference is found for 'Vietnam' that seems to take a position inferior to 'Pakistan' and Supa TZ.[62]

Regression analyses were conducted, as for Kampala data, for the buying and selling prices, pooling the data for the wholesale and retail stages (Table V-4). To secure sufficient numbers of observations, eight regions are made into four, North and North-west, East-far, West and South-west, and East-near, Central-east and Central-west. The essentially the same results as for the Kampala market are obtained for the date of price, the retail dummy and the variety dummies. The regional dummies are all insignificant, suggesting no difference in the rice prices among the regions. If the Kampala rice market where the largest amount of rice is transacted sets the rice price, the price in the rice markets in the regions sending rice to Kampala is expected to be lower than the Kampala price by the cost needed for the transportation. Such price differentials are not detected in our data. It is often said that the transportation costs take a significant share in the prices of goods in landlocked Uganda. As will be shown later in this chapter, however, the share of transportation cost in the price of rice, as far as domestic transportation is concerned, is not so large, 6%, not large enough to be detected by the data used here. With the degree of accuracy of that order, our data confirm the remarkable uniformity in the market prices of

[62] Many rice traders who sell 'Vietnam' complained about its slow speed of sales, with its stock standing for a long time in their storage. Such a tendency is also found in Kampala, but more apparent in outside Kampala.

rice across the regions.

(3) Integration of the outside-Kampala and Kampala markets

The rice markets outside as well as in Kampala function reasonably well in terms of the law of one price. Then, how are these markets integrated?

Table V-5 summarizes the rice prices at various stages of the rice market in the regions in and outside Kampala. For the rice produced domestically, the market in the regions outside Kampala extends from farm-gate to retail stages. This regional market is integrated at its third stage with the market in Kampala by market transactions between rice brokers in the regions and rice wholesalers in Kampala. The three groups of rice price found at this stage, i.e., the selling price of city /town brokers, the buying price of city/ town retailers and the buying price of Kampala wholesalers, are naturally to be identical.[63] In fact, these prices for Supa are on average all in close affinity at around Ush 3150 /kg. Table V-6 presents the results of regression analysis explaining the variation in the price of domestic rice, Supa, Upland and Kaiso, at this market stage, pooling the outside-Kampala and Kampala data. The results confirm again the significant positive impact on the rice price of the date when the price data was taken and the significantly higher prices of Supa than Kaiso and Upland. The insignificant coefficients of the retail and the Kampala dummy variables together concur with our expectation that three groups of rice prices are identical.

For imported rice, the case of 'Pakistan' of 'ordinary' quality is shown in Table V-5. Note that for 'Pakistan', the direction of the flow of rice in the market channels between Kampala and outside Kampala is opposite to that of domestic rice: wholesalers outside Kampala go to Kampala to procure it. Therefore, no significant difference is observed for the procurement price of wholesalers between in and outside Kampala. For the wholesale market (the second market stage for imported rice) and the retail market (the third market stage), the average prices in the outside Kampala markets are slightly higher than those in the Kampala markets. However, the differences are all not significant at all, as shown in Table V-6 for the case of the second market stage.[64] Since the wholesalers outside Kampala bear a higher cost for transporting the procured imported rice to their regions, it is expected that the price in the outside-Kampala markets is higher than in the Kampala markets. Our data fail to detect that difference: Although the coefficient of the Kampala

[63] Some city/ town rice brokers in the regions say that they offer cheaper prices for retailers coming from the same city/ town than for wholesalers coming from Kampala. As we will see right after, our regression analysis failed to detect such price differences.

[64] Table V-6 shows that unlike the prices of domestic rice, the price of 'ordinary Pakistan' did not increase within the period of March-April 2012. However, this does not mean that the prices of imported rice that is competitive with domestic rice are not subject to seasonal price fluctuations. For this point, see footnote #80 of this chapter.

dummy is negative, it is not statistically significant.

We have already observed in Tables V-1 and V-3 that 'Pakistan' is not distinguished from Supa in terms of price both in the Kampala and outside-Kampala markets and that the rice markets distinguish this Supa-Pakistan group from the Kaiso-Upland group. Thus, our market price data, altogether, reveal that the rice markets in Kampala and outside Kampala are integrated smoothly so that the price structure is homogeneous throughout the integrated national rice market.

2. Rice Margins and the Accounting of Marketing Costs

The inspection of market rice prices has revealed that the rice market, integrating the markets in and outside Kampala, work remarkably well as the device to determine the prices of rice of deferent 'brand', though the 'brand' structure is quite simple. This market function is born by a large number of rice traders in and outside Kampala who do buy-and-sell operations at various stages in the national rice market. In this section, we look into the workings of the rice market through examining the price margins that the rice traders receive, by accounting the costs inherent in the process of rice marketing.

As rice farmers engage in a production activity to produce rice, the rice traders involved in the marketing process engage in a production activity to produce rice marketing services in that they transfer rice across space in the marketing chains from producers to consumers.[65] Since it is a production activity, the rice traders use production inputs to produce their services. We try to account for the costs of the production inputs used in their production activities. Basic economics tells that if all associated input markets are competitive and functioning well, and if the entry to and exit from an industry are free, the profit of the producers in that industry would be null in the long-run. Therefore, if the profit of the traders were estimated, while all the production costs involved were duly accounted for, it could be an indicator of how well the concerned markets work. There have been some studies that attempted to account for the marketing costs in relation to the efficiency of the rice market (Dawe *et al.* 2008, Hayami *et al*. 1999, Unnevehr 1985), but all of them are for Asian counties; few for Africa and none for Uganda as far as we know.[66]

[65] To transfer rice across time is also an important function of the rice traders. Dealing with a 'time point,' their function across time is abstracted in this section.

[66] USDA (2012) states for the EAC countries, without showing any data, "The USDA analysis maintains …… that intermediaries within the rice supply chain gain considerable benefits and account for the large gap between farm-gate and wholesale prices. ……The USDA reports ……. that rice farmers in Kenya have an incentive to produce rice only if the 75% *ad valorem* tariff is maintained, in view of their cost structure arising from 'inefficiencies along the rice value chain' and the poor state of road infrastructure, both of which undermine competitiveness." We shall see in this chapter and next that Uganda represents a case quite contrary to the statements

(1) Costs in rice marketing

The data on the price margins at various stages of the rice market are obtained from what we have presented in the previous section. So, first in this section, we present the costs that are incurred in the process of rice marketing.

1) Transport cost

As in other parts of the world, rice in Uganda, paddy as well as milled rice, is transported and stored in sacks. Each sack weighs about 100 kg for domestic rice[67] and 50 kg for imported rice[68], and transported by trucks for a long distance, by motor cycles (bodaboda) for a short distance, and by bicycles for even a shorter distance.[69] A man can carry a sack on his shoulder, but only for a very short distance in a very short time. In fact, a sack of rice, while traveling from a farm-gate in rice producing regions to a retailer's stall in a public market in Kampala, is on-loaded and off- loaded at least four times. Without exception, these on-loading and off-loading are carried out by men.

Data on the cost of transporting rice sacks by trucks or motor cycles, obtained from the rice trader survey, are plotted in Figure V-1 in double-log scale. Regardless of the distance to be transported and of the means of transportation, the cost of transportation is negotiated on the spot between a consignor and a transporter, and the sacks are transported by the transporter to the consignor's place without the consignor on board.[70] The basis of contract is in terms of per sack, e.g., Ush 6000 /sack.

A clear log-linear relationship is found between the transportation cost per kg of rice and the distance transported. This is confirmed by the regression analyses for the cost data that used either trucks or motor cycles for the transportation (Table V-7). With the distance alone, the coefficient of determination is higher than 0.9. The dummy variable for motor cycle shows that the transportation cost for motor cycle is significantly higher than truck transport. Other factors that may affect the cost, i.e., the size of sack (100 kg sack or

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above, except for 'the poor state of road infrastructure' that Uganda shares in common with other EAC countries.

[67] The weight of a sack of rice often exceeds 100 kg, if milled rice. The size of the sack is much longer than the one used in Asia that rarely weighs more than 70 kg.

[68] For rice imported from Asia, usually 50 kg /sack, but there are cases in that a 25 kg sack is used for imported rice. Supa TZ imported from Tanzania uses a 100 kg sack.

[69] Though rare, if the quantity of rice to be transported is small, such as only one sack, public bus (taxi) may be used for a long distance.

[70] There are risks inherent in this transportation contract. The transporter may run away with the cargo. The truck of the transporter may be capsized on the way because of poor muddy roads, particularly during rainy seasons. Unlike formal international cargo services, however, no insurance contract is made for this transportation but mutual-trust between the consigner and the transporter. Though very few in number, there are cases in which wholesalers hire trucks (with drivers) for a time rate.

not), the road condition (poor or not) and the short distance transport (less than 30 km or not), are all found statistically not significant. In this section, the transportation cost is estimated by using Regression equation II in the table.

2) Other costs

Other marketing costs are summarized in Table V-8. For some items for which the costs are significantly different between Kampala and outside Kampala, they are estimated separately. For this group of data, too, some cost items suffer from the smallness in the number of observations.

Collecting paddy rice from farmers: Rice produced in a farm is brought from the farm-gate to a rice mill by farmer himself, an independent village middleman, or a village collector who is sent by some rice mill or rice broker. The payment to a village collector is typically Ush 3000 per sack of paddy rice.

Rice milling: Rice milling fee paid to the rice mill where rice is milled. The average of the sample mills in the rice mill survey.[71]

Sack, sack stitching and sack weighing: At a rice mill, milled rice is put into sacks, sack mouth is stitched and sacks are weighed. These costs are usually born by buyers from Kampala.

On- and off-loading sack: Loading and off-loading rice sacks for transportation by hired laborers. These activities being indispensable in transporting rice, these costs are a part of the transportation costs.

Trip to procure rice in districts: Rice wholesalers in Kampala go to cities and towns in rice producing districts to procure rice.[72] Their procurement trip usually takes two days to get there and back, using such public transportation as regular bus services or mini-bus services (taxi).[73] The estimated cost includes the fares for these bus services and lodging, assuming that their trip is from Kampala to towns in rice producing districts 200-300 km away (approximately the distance to Hoima or Mabale) for procuring 100 sacks of rice.

Rice cleaning: With few exceptions, the quality of rice milling in Uganda necessitates to clean milled rice by removing stones, husks and other odd materials that are mixed up with rice in the milling process or before that. Rice traders, usually retailers, perform this cleaning by hiring women who clean rice manually on a piece-rate payment per sack of rice cleaned.

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[71] For details, see Chapter VII.

[72] In some cases, wholesalers go to districts to procure maize as well as rice in one trip.

[73] Some, very limited number of large wholesalers in outside Kampala, handling not only rice but also many other consumer goods, own trucks for transporting goods from Kampala and other districts. But, Kampala wholesalers and district rice brokers rarely own transportation means.

Store rental/ storage rental: Rice traders, i.e., brokers, wholesalers and retailers in and outside Kampala keep their stores/ selling stalls and storage facilities. Many brokers and retailers outside Kampala keep only storage spaces or use them as selling spaces in common. Some wholesalers in and outside Kampala own their stores and storage facilities, but it is more popular for rice traders to rent the facilities.[74] With many exceptions for rice brokers outside Kampala, rice traders sell many commodities other than rice. The store and storage rentals for rice are estimated by multiplying the percentage share of rice and their total sales.

Taxes, duties and charges: Rice traders pay various taxes, duties and charges, such as trading license fee, produce tax, market tax, parking charge for loading and off-loading, and lubricant money for law enforcers. In case these payments are lump-sum for their sales operation as a whole, the payments are prorated to rice by using its share in the total sales.

Interest rate: Since rice trading is a cash intensive business, it is important to use an appropriate interest rate for imputing capital interests. The data on interest rates are obtained from our rice mill survey, but the number of observations is limited partly because money borrowing is not so popular. The available interest rates, most of which are of formal bank loans, range from 15% /year to 40% /year, with the average of 27% /year.[75]

(2) Market margins and traders' returns

With the estimates of the costs involved in the rice marketing, we are ready to examine the price margins at various stages of rice marketing channels. For the domestic rice market, there are five layers of market prices, which provide four rice marketing stages, each stage setting a price margin (Table V-9). Since there are two 'brands' for domestic rice, we examine the price margins separately for Supa and non-Supa (let us denote it Kaiso& Upland). The prices of these 'brands' of rice at each price layer are obtained from Tables V-1 and V-3. The prices of Kaiso&Upland were taken as the simple averages over the prices of Kaiso and Upland. For the third price layers, the simple average over the outside-Kampala brokers' selling price and the Kampala wholesalers' buying price was taken and similarly for the fourth price layer, the simple average of the Kampala wholesalers' selling price and the Kampala retailers' buying price was used.

For each market stage, estimated marketing costs are enumerated, including the capital interests imputed by using the interest rate of 27% /year. The traders' return at each stage is calculated as a balance item by subtracting from the price margin of a stage all the

[74] It is also common for a few traders as a group to rent a storage space in a sharing basis.
[75] These interest rates are just at the level of the Interest rates on credit to the private sector from Microfinance Deposit Taking Institutions (BOU 2011; p.32). Note that these rates are very low compared to those prevailing in the informal money markets in developing Asia.

costs incurred in that stage. If all the costs associated with the marketing activities at a marketing stage are wholly accounted for, this balance item is the profit of the rice traders working at this marketing stage. Because of data unavailability, however, our cost estimates do not include the labor costs of traders' themselves and their hired workers spent in the marketing operations, the returns to their management inputs, and the costs of bearing risks inherent in their marketing operations. The rice traders' returns in the table, therefore, are supposed to consist of the returns to their labor work, managerial ability and bearing the risks, in addition to their profits.

The total margin in March-April 2012 was about Ush 1100 /kg for Supa and Ush 900 /kg for Kaiso&Upland. Note first that the entire post-harvest marketing process of rice (so-called the rice value-chain) takes 29% of its final value, i.e., the retail price at the public markets in Kampala, for both Supa and Kaiso&Upland. Second, the price margins at each stage range from Ush 192 /kg to Ush 349 /kg. Third, among the marketing costs that are enumerated, rice milling is by far largest, taking 14-17% of the total price margin. If this cost is excluded, the price margin of the first stage is reduced to Ush 199 /kg for Supa and Ush 117 /kg for Kaiso&Upland, making the range of the price margin Ush 192 - 298 /kg. Fourth, reflecting the higher market prices, the margins tend to be larger for Supa than for Kaiso&Upland, which explains the enthusiasm of rice traders to handle Supa. Fifth, the total transportation costs, including loading and off- loading costs, is about Ush 200 /kg. This takes as much as 20-23% of the total margin, but if compared with the final retail price, the share of the transportation costs is 6-7%.[76]

Next, let us look at the returns to the rice traders. For the post-harvest marketing stages as a whole, the traders' returns take about one-fifth to one-third of the total price margin, or 6% to 9% of the retail price. Traders' returns at each stage range from the maximum of Ush 110 /kg for producing area brokers selling Supa to the minimum of Ush 13 /kg for Kampala wholesalers selling Supa. How large are their profits, excessive or moderate? The wide range of traders' returns may indicative that there are some problems in the estimation of the rice price at each layer and / or in the accounting of the marketing costs. Bearing such a possibility in mind, let us try to check the magnitude of traders' returns by two criteria.

The first criterion is to look at rice traders as workers. The traders' returns include the returns to the labor inputs for rice marketing worked by them and their employees as well as to their management inputs. The data on these inputs being not at hand, one way to understand their magnitude may be to compare with other labor costs involved in the cost

[76] Such a small share makes it difficult to appreciate the differences in the market rice price due to transportation costs among the spatially dispersed markets.

accounting. The labor cost of rice cleaning, worked usually by hired women, is Ush 50 /kg. On- and off- loading a rice sack, worked usually by energetic young men, cost Ush 16 /kg in outside Kampala and Ush 18 /kg in Kampala. These values do not correspond to the duration of the works,[77] but reflect the contribution the works made in producing the output, i.e., the marketing service. The summation of the costs of these simple labor works amounts to Ush 117 /kg for the entire post-harvest market chains. The traders' returns at each marketing stage are all below this total simple labor costs, and four out of eight cases, nearly equal to or less than the rice cleaning cost. Many rice traders handle both Supa and Kaiso&Upland, and their marketed quantities are roughly 50:50 (see Tables III-3 and III-9). The simple average taken for the traders' returns over the four stages and over the two variety groups is Ush 63 /kg, a little more than the rice cleaning cost. All this suggests that the rice traders' returns are not excessive.

The second criterion is to look at the rates or returns for the traders. Assuming that the traders procure rice by his/her funds at the beginning of a month and obtain the traders returns, not imputing the capital interests, at the end of month, it is straightforward to estimate the rate of returns to his/her investments. Assuming in addition that the traders handle Supa and Kaiso&Upland in equal share, the rates of returns for village level traders, outside-Kampala brokers, Kampala wholesalers and Kampala retailers are estimated to be 2.9%, 5.7%, 2.6% and 4.4%, per month, or 41%, 95%, 37% and 68%, per year, respectively. At a glance, these rates, which are all higher than 27% /year, the interest rate assumed for the imputation, may seem excessively high. However, there are many possibilities to counter this observation. As repeatedly mentioned, the traders' returns include the returns to their labor and management inputs. As an illustration, suppose that the costs of these labor and management inputs are the same as the rice cleaning labor cost, i.e., Ush 50 /kg. Deducting this cost from the traders' returns, the rates of returns are adjusted down to 11%, 58%, 12% and 39%, per year, for village level traders, outside-Kampala brokers, Kampala wholesalers and Kampala retailers, respectively. If risks that the rice traders have to bear without any formal insurance system[78] are taken into account, these rates of returns must be further discounted. Furthermore, the market prices of rice adopted in Table V-9 are of March-April 2012, off the peak harvesting season. As will be shown in the last section of this chapter, the rice prices for the second to fifth market layers in the peak harvesting season are lower and the price margins as well as traders' returns are lower accordingly,

[77] The cleaning of a sack of rice takes 4-6 hours, while loading or off-loading it is a matter of minutes.

[78] There are many risks the rice traders face: accident, robbery, cheating, and unexpected quality deterioration during transportation, misjudgments and miscalculations in rice quality, unexpected fluctuations in rice prices, etc.

giving the rate of returns, adjusted for traders' labor cost just as above, of 39% /year for outside-Kampala brokers, -12% /year for Kampala wholesalers and 11% /year for Kampala retailers. The rate of returns for outside-Kampala brokers is still higher than the interest rate of 27% /year used for the imputation,[79] but those of wholesalers and retailers in Kampala are less than that level. The negative rate of returns for wholesalers manifests that the returns to rice traders are sensitive to the fluctuation of rice price: downward price fluctuations easily make it negative.

Altogether, our survey data suggest that the traders' returns are 'moderate', rather than 'excessive.' In particular, for village level traders, Kampala wholesalers and Kampala retailers, the rates of returns are close to or less than the interest rate of 27% /year that is the prevailing interest rate in the credit market to which the traders have access. The data show that outside-Kampala brokers enjoy relatively higher returns. Whether these returns are 'excessive' or 'moderate' is difficult to judge with the data at hand. Their rates of returns are higher than the prevailing interest rate even in the peak harvesting season with lower rice prices, but the interest rates may be underestimating the real opportunity cost of their capital fund. The existence of risks in their market operations would discount their rates of returns, but the lack of data prevents us from estimating how much to be discounted. These points are in favor of the proposition that the brokers' rates of returns are not 'excessive.' On the other hand, compared to the information on the second stage and beyond, we have relatively less information on the first stage of the post-harvest rice market chains, not enough information in particular to exclude the possibility that rice brokers in rice producing areas exercise some oligopsonistic power against such village level rice traders as farmers and village middlemen. In this regard, further information on these points must be augmented to a more satisfactory level. It should be remarked that the degree of 'excessiveness', if any at the second market stage, is a matter of a few percent of the entire price margin between the farm-gate and the final consumer price.

(3) Factor shares in the post-harvest rice marketing process

The data in Table V-9 and in other chapters of this report make it possible to estimate the factor shares of the post-harvest rice marketing 'production' process (Table V-10). Of the cost items in Table V-9, transportation and rice milling are the services produced by other industries, and these costs are decomposed into factor payments according to the factor shares of these industries estimated in other chapters of this report. Table V-10 also shows

[79] The assumed interest rate, 27%/year, which is obtained from rice millers who have collaterals (milling machines), could be lower than the actual interest rate that the rice traders, without any collateral, actually face. The interest rates in the informal credit market without collateral could be higher that this level.

the factor shares of the rice production process for the purpose of comparison.

The current inputs, which are all spent for transportation and rice milling, take 15% of the total output, i.e., the total price margin. Therefore, the income (value-added) ratio in the rice marketing chain is 85%. Except for fuel and electricity used in rice transportation and rice milling, the rest of the total price margin is left as income to be distributed among resource contributors in the rice marketing sector. The owners of land and real properties, such as stores, stalls, storage spaces in rice marketing and rice mill workshops, receive about 10% of the margin. The factor payments for labor, including the simple labor works in the marketing process, works by truck drivers and his assistants, and workers in rice mills, constitute about one-fifth. The factor payments for capital include the payments to the owners of funds for rice procurement, of trucks for transport and of rice mills. In addition, the traders' returns in the rice marketing process are included, regarding the traders' management ability as human capital. The factor share of capital thus calculated takes just 50% of the margin. Compared to the factor share of capital for rice production, which is comprised of small farming implements and draft animals, the capital intensive nature of the post-harvest rice marketing process is distinct.

3. **Seasonal fluctuation of rice price**

The price data we have presented thus far are of March-April 2012. Even during this period, some increases in the price of domestic rice were observed. The results of the regression analyses indicate that rice prices increased by Ush 200-500 /kg during this period. How large was the price difference between the peak harvesting season and this March- April period?

Although the peak rice harvesting season is not uniform among the rice growing regions across the country, depending on differences in rainfall patterns and rice varieties planted, the period from November to January is a season when almost all rice growing regions are busy for rice harvesting, including Supa growing East-far and North, Upland growing West, and Kaiso growing East-near. The price differences at various stages of the rice market estimated from our rice trader and rice mill surveys are summarized in Table V-11. In order to even out relatively large variations, data are pooled for three domestic rice variety groups and for the prices that are at the same market stage. The rate of increase in the market rice prices ranges 30-36% for four stages of the rice market channels both in rice growing regions and in Kampala. However, all the increase rates are not different statistically, and the overall average rate of price increase is 34%.[80]

[80] Unfortunately, for the farm-gate price, the number of observations is less than 10, too small to

How price margins and the rice traders' returns change with lower prices is examined in Table V-12, assuming that the rice prices decline, but the marketing costs, except the capital interests which decline proportionately with the rice prices, remain the same as in the March-April period. The results show that both the price margins and the traders' returns decline. The rate of decline is substantially larger for the traders' returns. In particular, the traders' returns for Kampala wholesalers turn to be negative. These results show the vulnerability of the traders' returns to price declines.

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have reliable estimates of the rate of price increase. For imported rice, 'ordinary Pakistan' and Vietnam, although the number of observations is also very small (N=13) and available only for the retailers' stage, both the buying and selling prices show statistically significant increases from the harvesting season to the March-April period with the rate of increase of 14% and 9%, respectively. This suggests that the pricing of these 'brands' of imported rice, which are competitive with domestic rice, is affected by the price levels of the latter.

Table V-1 Average rice prices, price variation and price margin by 'brand' at various levels in the Kampla markets, March-April 2012 [a]

	Price (Ush/kg) [b]				Price variation (CV %)			
	Wholesale level		Retail level		Wholesale level		Retail level	
	Buy	Sell	Buy	Sell	Buy	Sell	Buy	Sell
Supa	3,153 ●	3,379 ●	3,328 ●	3,651 ●	7	6	7	7
(N)	(22)	(25)	(40)	(40)				
Kaiso	2,625 ◎	2,869 ◎	2,821 ◎	3,121 ◎	9	8	8	7
(N)	(12)	(16)	(29)	(29)				
Upland [c]	2,714 ◎	2,888 ◎	2,827 ◎	3,060 ◎	5	4	6	6
(N)	(11)	(13)	(15)	(15)				
Pakistan [d]	3,123 ●	3,254 △	3,266 ●	3,599 ●	4	5	10	10
(N)	(25)	(31)	(43)	(44)				
Vietnum	3,075 ●	3,228 △	3,250 ●	3,433 ●	3	4	7	12
(N)	(4)	(5)	(3)	(3)				
Supa TZ [e]	2,820 ◎	3,014 ◎	3,175 ●	3,520 ●	8	7	11	10
(N)	(5)	(7)	(10)	(10)				

a) Data are from the rice trader survey.

b) For each column, the average prices followed by the same sign are not different statistically by Tukey test. Figures in parenthsis are the number of observations.

c) Mostly Nerica but include other various upland varieties.

d) Pakistan SWT-1, SWT-P and their equivalent.

e) Supa imported from Tanzania.

Table V-2 Regression explaining the price variation of domestic rice in the public markets in Kampala, March-April 2012 [a]

	Buying price		Selling price	
	Coef.	Prob.	Coef.	Prob.
Date [b]	7.0	0.000 **	6.2	0.000 **
Retail dummy [c]	127.2	0.001 **	214.3	0.000 **
Variety dummy [d]:				
Supa	540.1	0.000 **	554.2	0.000 **
Upland	69.5	0.415	-32.7	0.695
Division dummy [e]:				
Kawempe	-162.9	0.002 **	-145.7	0.004 **
Central	-25.3	0.670	26.5	0.660
Nakawa	-35.7	0.581	-17.8	0.791
Makindye	-49.9	0.352	-20.9	0.694
Producing region dummy [f]:				
North	-114.7	0.174	-97.3	0.222
East far	-62.6	0.278	-58.8	0.311
West	-45.0	0.596	25.5	0.763
Intercept	2609.2	0.000 **	2818.8	0.000 **
R^2	0.702		0.716	
No. of observations	127		136	

a) The simbols, ** and *, indicate the estimated regression coefficients are statistically significant at 1% and 5%, respectively.

b) The number of days from the first day of the price survey that is Feb. 29, 2012.

c) Take 1 for retailers' price.

d) The base variety is Kaiso.

e) The base division is Rubaga.

f) The base region is East-near and Central-east. No data for South-west as a producing region.

Table V-3 Average rice prices, price variation and price margin by 'brand' at various levels in the markets outside Kampala, March-April 2012 [a]

	Price [b] (Ush/kg)						Price variation (CV %)				
	Farm-gate		Wholesale level		Retail level		Farm-gate	Wholesale level		Retail level	
	In paddy	In milled rice [c]	Buy [d]	Sell [e]	Buy	Sell		Buy	Sell	Buy	Sell
Supa	1,679	2,583 ●	2,932 ●	3,167 ●	3,143 ●△	3,489 ● △	11	9	11	12	9
(N)	(12)		(29)	(33)	(30)	(32)					
Kaiso [f]	1,443	2,220 ◎	2,465 ◎	2,628 ◎	2,763 ◎	2,975 ◎	16	11	10	6	5
(N)	(7)		(24)	(24)	(12)	(12)					
Upland [g]	1,408	2,166 ◎	2,455 ◎	2,670 ◎	2,750 ◎	3,083 ◎	22	11	10	8	8
(N)	(19)		(39)	(41)	(18)	(18)					
Pakistan			3,099 ●	3,311 ●	3,293 ●	3,642 ●		9	3	6	7
(N)			(7)	(8)	(12)	(13)					
Vietnum			2,950 ●	3,225 ●	2,992 △	3,360 △		11	7	5	10
(N)			(5)	(6)	(9)	(10)					
Supa TZ			2,825 ●	3,025 ●	3,180 ●△	3,600 ● △		13	13	4	8
(N)			(4)	(4)	(3)	(3)					

a) Data are from the rice mill and the rice trader survey.

b) For each column, the average prices followed by the same sign are not different statistically by Tukey test. Figures in parenthsis are the number of observations.

c) Assume that milling rate = 0.65.

d) The price at rice mills (the buying price of rice brokers).

e) The selling price of rice brokers.

f) Include other lowland varieties, such as Benenego, Buyu and Supa China.

g) Mostly Nerica but include other various upland varieties, such as Superica, Naric, Sindano, Kihihi, Congo (imported from DRC).

Table V-4 Regression explaining the price variation of domestic rice in public markets outside Kampala, March-April 2012 [a]

	Buying price			Selling price		
	Coef.	Prob.		Coef.	Prob.	
Date [b]	4.3	0.004	**	3.1	0.026	*
Retail dummy [c]	235.3	0.000	**	330.5	0.000	**
Variety dummy [d]:						
Supa	441.4	0.000	**	528.2	0.000	**
Upland	1.5	0.982		45.4	0.493	
Producing region dummy [e]:						
North and North-west	-94.2	0.185		-95.8	0.194	
East-far	76.4	0.275		47.2	0.509	
West and South-west	45.3	0.562		68.5	0.390	
Intercept	2352.6	0.000	**	2546.4	0.000	**
R^2	0.540			0.612		
No. of observations	152			160		

a) The simbols, ** and *, indicate the estimated regression coefficients are statistically significant at 1% and 5%, respectively.

b) The number of days from the first day of the price survey that is Feb. 29, 2012.

c) Take 1 for retailers' price.

d) The base variety is Kaiso.

e) The base region is East-near, Central-east and Central-west.

Table V-5 Average market prices of "Supa" and "Pakistan" in and outside Kampala, by market level , March-April 2012

Regions outside Kampala		Kampala	
	Ush/kg		Ush/kg
"Supa" (locally produced)			
I Farm-gate			
Farmer selling price	2,583		
II Rice mill			
Rice mill selling price	2,932		
Rice broker buying price			
III Wholesale		**Purchase in producing regions**	
Rice broker selling price	3,167	Wholesaler buying price	3,153
Retailer buying price	3,143		
IV Retail		**Wholesale**	
Retailer selling price	3,489	Wholesaler selling price	3,379
		Retailer buying price	3,328
V		**Retail**	
		Retailer selling price	3,651
"Pakistan" (imported)			
I Procurement in Kampala		**Procurement from importer**	
Wholesaler buying price	3,099	Wholesaler buying price	3,123
II Wholesale		**Wholesale**	
Wholesaler selling price	3,311	Wholesaler selling price	3,254
Retailer buying price	3,293	Retailer buying price	3,266
III Retail		**Retail**	
Retailer selling price	3,642	Retailer selling price	3,599

Table V-6 Regression explaining the variation of rice price in the inter-linked markets between outside Kampala and Kampala, March-April 2012 [a]

	Domestic rice [a]			Pakistan [b]	
	Coef.	Prob.		Coef.	Prob.
Date [c]	7.2	0.000	**	0.6	0.647
Retail dummy	27.3	0.538		4.8	0.904
Kampala dummy	60.9	0.217		-23.0	0.699
Variety dummy [d]:					
Supa	480	0.000	**		
Upland	9.3	0.854			
Intercept	2458.1	0.000	**	3267.9	0.000
R^2	0.493			0.010	
No. of observations	203			94	

a) For the data pooling brokers' selling price and retailers' buying price outside Kampala and wholesalers' buying price in Kampala (Market level III for locally produced rice in Table V-5).

b) For the data pooling the wholesalers' selling price outside and in Kampala and the retailers' buying price outside and in Kampala (Market level II for imported rice in Table V-5).

c) The number of days from the first day of the price survey that is Feb. 29, 2012.

d) The base variety is Kaiso.

Table V-7 Estimated tansportation cost function for rice in double-log form (N=125) [a]

Variables [b]	I		II		III	
	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Ln (distance)	-0.747	0.000	-0.687	0.000	-0.670	0.000
Transportation means (bodaboda = 1)			0.539	0.000	0.527	0.000
Sack size (100 kg sack = 1)					0.027	0.742
Road condition (poor = 1)					-0.067	0.498
Short distance transport (short=1)					0.079	0.717
Inercept	2.700	0.000	2.379	0.000	2.283	0.000
R^2 (adjusted)	0.926		0.937		0.936	

a) The dependent variable is the logarism of transportation rate (Ush/kg/km).

b) Distance is the milage in km that rice is to be transported, sack size dummy is 1 if rice is in a sack weighing 100 kg and 0 if 50 kg, transportation means dummy is 1 if bodaboda and 0 if truck, road condition is the share of poor (unpaved and badly maintained paved road), as against good road (well-maintained paved road) between the starting point and destination, ranging from 0 to 1, and short distance transportation dummy is 1 if the distance tranported is less than 30 km and 0 if 30 km and above.

Table V-8 Costs involved in marketing rice, 2012 [a]

	Kampala				Outside Kampala			
Village collector (Ush/sack)					3000	(10)		
Rice milling (Ush/kg)					150	(69)		
Sack (Ush/sack)					1000	(18)		
Stitching sack mouth (Ush/sack)					200	(15)		
Weighing sack (Ush/sack)					300	(15)		
On- and off-loading sack (Ush/sack)	900	(125)			800	(65)		
Trip to procure rice in districts (Ush/sack)	400	([b])						
Rice cleaning (Ush/sack)	5000	(19)						
	Kampala				Outside Kampala			
	Wholesaler		Retailer		Wholesaler		Retailer	
Store rental (Ush/100 kg)	1000	(19)	1900	(26)	800	(5)	1500	(28)
Storage rental (Ush/100 kg)	1000	(7)	1500	(10)	800	(8)	500	(8)
Tax/duty/charge (Ush/100 kg)	800	(7)	600	(11)	500	(5)	500	(28)
Interest rate (%/year)				27	(6)			

a) From the rice trader survey and the rice mill survey. The figures in parentheses are the number of observations

b) Assume a two-day trip by public transportation from Kampala to towns in rice producing districts 200-300 km away for procuring 100 sacks of rice.

Table V-9 Prices of milled rice at various levels of marketing channels and post harvest costs involved, March-April 2012

	Supa		Kaiso&Upland		Remarks
	Ush/kg	%	Ush/kg	%	
Farm-gate price	1679		1424		Paddy price.
	2583		**2193**		In milled rice (milling efficiency=0.65).
Transport	46	4	37	4	By truck. Assumed distance: 100 km for Supa and 50 km for Kaiso/Upland.
On- and off-loading	16	1	16	2	
Village collector	30	3	30	3	
Rice milling	150	14	150	17	
Capital interest	12	1	10	1	i=0.27/year; for 1 weeks.
Handlers' return	95	9	24	3	Handlers could be farmers, village middlemen, town brokers and rice millers.
Total	349	33	267	30	
Rice mill price	**2932**		**2460**		Producing-area-brokers' buying price
Transport	22	2	22	2	By truck. Assume the distance of 10 km.
On- and off-loading	16	1	16	2	
Store/Storage	16	1	16	2	
Tax/duties/charges	5	0	5	1	
Capital interest	59	6	49	6	i=0.27/year; for 1 month.
Brokers' return	110	10	91	10	
Total	228	21	199	22	
Producing-area-brokers' selling price	**3160**		**2659**		Kampala wholesalers' buying price
Transport	57	5	57	6	By truck. Assumed distance: 200 km (between Kampala and Mbale/ Hoima).
Sack	5	0	5	1	Assume usable twice.
Stitching sack	2	0	2	0	
Weighing sack	3	0	3	0	
On- and off-loading	17	2	17	2	
Store/Storage	20	2	20	2	
Trip for procurement	4	0	4	0	Two-day trip to procure rice.
Tax/duties/charges	8	1	8	1	
Capital interest	64	6	53	6	i=0.27/year; for 1 month.
Wholesaler's return	13	1	23	3	
Total	193	18	192	21	
Kampala wholesalers' selling price	**3353**		**2851**		Kampala retailers' buying price
Transport	23	2	23	3	By bodaboda. Assumed distance: 2 km.
On- and off-loading	18	2	18	2	
Cleaning	50	5	50	6	
Stall/store rental	34	3	34	4	
Tax/duties/charges	6	1	6	1	
Capital interest	67	6	57	6	i=0.27/year; for 1 month.
Retailer's return	100	9	51	6	
Total	298	28	239	27	
Kampala retailers' selling price	**3651**		**3090**		
Total margin	1068	100	897	100	Between the farm-gate and retail price.
Total transport cost	215	20	206	23	
Share in retail price		6%		7%	
Total traders' return	318	30	188	21	
Share in retail price		9%		6%	

a) Price data from Tables V-1 and V-3. Cost data from Table V-8. For the third and fourth levels for which both the sellers' and buyers' prices are available, their averages are taken. Transport cost is estimated by using the transportation cost function (Regression II in Table V-7).

Table V-10 Factor payments and factor shares in the post-harvest and 'production' processes, for domestic rice, per kg of milled rice [a]

	Post harvest [b]		Rice production [c]		Total	
	Ush/kg	(%)	Ush/kg	(%)	Ush/kg	(%)
Current inputs	146	(15)	239	(10)	385	(11)
Labor	234	(24)	1552	(65)	1786	(53)
Land & real property	112	(11)	478	(20)	589	(17)
Capital	491	(50)	119	(5)	610	(18)
Total	983	(100)	2388	(100)	3371	(100)
	(29)		(71)		(100)	

a) Simple average over Supa and Kaiso&Upland.

b) From farm-gate to retailer. Data are from Table V-9. Traders' returns are included in capital. Transportation cost and rice milling cost are decomposed into factor payments according to the following respective factor shares estimated in Chapters VI and VII of this Report:

Transportation	
Current inputs	60 %
Labor	15 %
Capital	25 %
Rice milling	
Current inputs	35 %
Labor	40 %
Capital	10 %
Land & real property	15 %

The same factor shares are applied to the cost of the trip to districts for rice procurement. Taxes, duties and charges are categorized as kinds of payments under land & real estate.

c) Factor shares are estimated from Kijima et al. (2008) and Haneishi et al. (2013a).

Table V-11 Rate of increase in the price of domstic rice from the peak harvesting season to March-April 2012 [a]

	Rate of price increase	CV [b]	Number of observations
	%	%	
Producing regions			
II. Brokers' buying price	34	17	27
III. Brokers' selling price [c]	34	16	43
Kampala			
IV. Wholesalers' selling price [d]	36	22	37
V. Retailers' selling price	30	18	29
Average for four stages	34	18	136

a) For the samples of the rice trader and rice mill surveys, for which data on the prices for both the peak and lean seasons are available. Pooled all three variety groups, Supa, Kaiso and Upland. The Roman numerals in the line-heading are the market stages in Table V-5.

b) Coefficient of variation for the rate of increase.

c) Pooled with outside Kampala retailers' buying price and Kampala wholesalers' buying price.

d) Pooled with Kampala retailers' buying price.

Table V-12 Prices of domestic rice at various stages of marketing channel in the lean and harvesting seasons and changes in price margins and the returns to rice traders [a]

	March-April 2012	Harvesting season
II. Rice mill price	2695.96	2012
Brokers' return	100	65
Margin	214	159
III. Brokers' selling price	2910	2171
Wholesaler's return	18	-16
Margin	193	144
IV. Kampala wholesalers' selling pric	3102	2315
Retailer's return	75	23
Margin	269	200
V. Kampala Retailers' selling price	3371	2516

a) The March-April prices, the averages of Supa and Kaiso&Upland, are from Table V-9. The rate of price change from the peak harvesting season to the lean season is assumed to be 34% (Table V-11). It is assumed that there is no change in the costs in the rice marketing process between the peak harvesting season and March-April 2012, except for the capital interests which declines according to the declines in the rice prices.

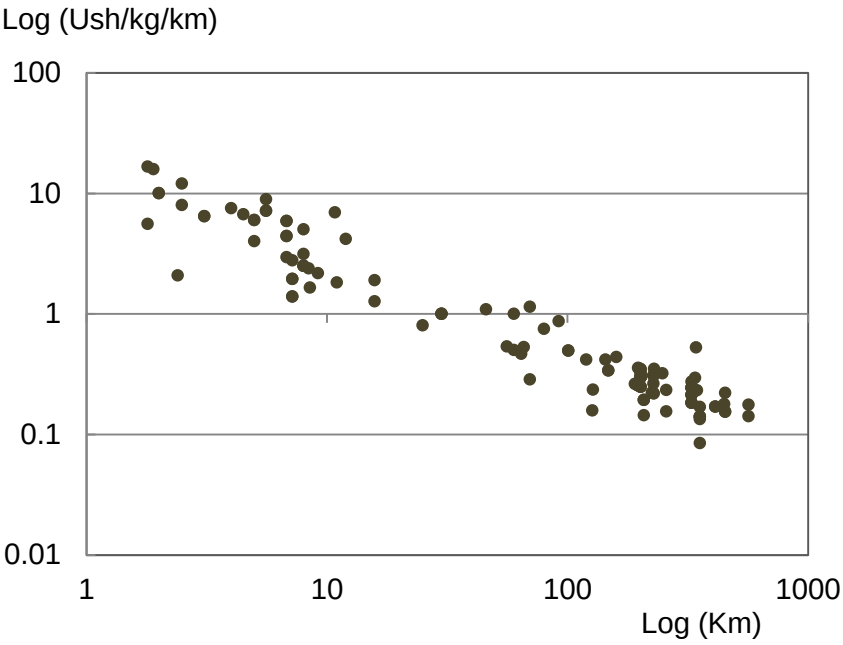

Fig. V-1 Transportation cost (Ush/kg/km) and distance transported (km)

Chapter VI. International Competitiveness of Rice Production

As we have observed in this report, 70% of the demand for rice in Uganda is satisfied by locally produced rice and the rest by imported rice. The need of producing rice domestically as an import-substitution crop has been an overriding motif throughout the history of rice cultivation in Uganda (Kikuchi *et al.* 2013b). The current national rice development policy states that an important target to increase rice production is to reduce rice imports so as to save foreign exchange, in addition to enhance the nation's food security and to reduce rural poverty (MAAIF 2009). Behind the emphasis on rice production to substitute import among policy makers and agricultural researchers, there has been a kind of anxiety that locally produced rice in Uganda may not have a competitive power against imported rice.[81]

Such anxiety is not groundless, if we remember that Uganda experienced in the last century two rice cultivation 'booms', which ended in nearly complete demise soon after the booms' had begun (Kikuchi *et al.* 2013b). Moreover, the last decade of the 20th century saw a sudden increase in rice import. The sudden and precipitous increase, as shown in Figure VI-1, would have made concerned policy makers worried about the draining of foreign exchanges due to the rice import. In fact, this increase in rice import should have worked as a strong driving force to accelerate domestic rice production in the third rice cultivation 'boom', which began in the 1970s and has continued into the present century (Kikuchi *et al.* 2013a). However, Figure VI-1 also shows that the net-import, which had been identical to the import itself until the early 2000s, started to diverge from it downwards, as rice export picked up and increased rapidly. The FAOSTAT's rice trade data used to depict the figure has problems as explained in the previous chapter, but assuming it reflects some reality, is such a trend not an indication that rice production in Uganda has a comparative advantage over imported rice? Or, is it a result of a heavy support or protection for domestic rice production by the government? Whichever is the case, whether or not rice production in Uganda is competitive with imported rice is a legitimate question, the answer to which is of pivotal importance in shaping adequate rice policies.

We have examined the market rice price at various stages in the entire rice marketing chains from farm-gates to consumers in Kampala while accounting for all the marketing costs incurred in the chains. With additional data on costs associated with

[81] Some newspaper expresses such anxiety overtly and in an easy-to-understand way (Kiwawulo 2012).

importing rice and on the foreign cost components in domestic rice production, it is straightforward to estimate the domestic resource cost ratio (DRCR), which is an indicator to judge if a country has a comparative advantage in producing a good. In this chapter, let us examine the competitiveness of rice production in Uganda through estimating the DRCR.

1. Conceptual framework

According to Chenery (1961), a country has a comparative advantage in producing a good, rice in our case, if the social opportunity cost of producing a unit of rice in that country is lower than its international price. Using the concept of net social profitability (NSP) in the cost-benefit analysis, his definition can be explained as follows. The social benefit of producing a unit of rice is evaluated using the shadow price. Since the shadow price of a tradable good, such as rice, is its international price, the social benefit of producing rice domestically is nothing but the amount of foreign exchange that can be earned when the country exports a unit of rice. On the other hand, the social opportunity cost of rice produced in a country is the value of domestic resources and tradable inputs that are used for producing a unit of rice, evaluated at their shadow prices. If the social benefit of rice is larger than its social opportunity cost or, equivalently, if the NSP, defined as the difference between the social benefit and the social opportunity cost, is positive, it is said that rice has a comparative advantage.

Classifying production inputs into two groups, tradable inputs and non-tradable domestic resources, the NSP is expressed as follows:

$$\begin{aligned} NSP &= B - C \\ &= P_w\, SER - (\Sigma_i^k a_i P_i\, SER + \Sigma_j^m b_j P_j) \\ &= (P_w - \Sigma_i^k a_i P_i)\, SER - \Sigma_j^m b_j P_j \end{aligned} \qquad (1)$$

where NSP = net social profitability of producing a unit of rice, B = social benefit of producing a unit of rice, C = social opportunity cost required to produce a unit of rice, P_w = international price of rice in foreign currency, SER = shadow exchange rate, a_i = input coefficient of i-th tradable input to produce rice, P_i = shadow price of i-th tradable input in foreign currency, b_j = input coefficient of j-th domestic resource to produce rice, and P_j = shadow price of j-th domestic resource.

Rice production has a comparative advantage when

$$B > C, \text{ or } P_w\, SER > (\Sigma_i^k a_i P_i\, SER + \Sigma_j^m b_j P_j).$$

Now, define a SER such that NSP = 0. Denoting the SER satisfying this condition as SER*, we obtain from equation (1):

$$SER^* = (\Sigma_j^m b_j P_j) / (P_w - \Sigma_i^k a_i P_i) \quad (2)$$

This SER* is called the domestic resource cost (DRC). From equations (1) and (2), it is obvious that, if SER > SER* and NSP > 0, rice production has a comparative advantage. It is more convenient to obtain what is called the domestic resource cost ratio (DRCR) by dividing DRC by SER:

$$DRCR = (\Sigma_j^m b_j P_j) / ((P_w - \Sigma_i^k a_i P_i) SER) \quad (3)$$

Rice production has a comparative advantage if DRCR < 1. Note that the DRCR is the cost- benefit ratio between the costs of domestic resources used for producing a unit of rice and the net foreign exchange that can be earned by exporting a unit of rice. We try to estimate this DRCR for rice production in Uganda. This is an old fashioned, static measure of the comparative advantage, but provides a basic data to start with.

2. Import price of rice

Among the data necessary for estimating the DRCR, the most basic, and usually hazardous to obtain, is P_w, i.e., the international price of rice in foreign currency, because the import price of rice varies greatly according to the type, grade, brand and country of origin, and also depends on the distance and means of transportation. In a country where many brands of rice are produced and imported, it is not easy to determine which brand of local rice is to be compared with which brand of imported rice of matching quality or grade to examine the competitiveness.[82] In the case of Uganda, however, our observations in the previous chapters make it clear that there are virtually only two 'brands' or 'grades' for local rice, i.e., Supa and non-Supa (Kaiso&Upland) and that the largest amount of imported rice is 'ordinary Pakistan', followed by Supa Tanzania (Supa TZ), both of which are at the same 'grade' as Supa. No other choice is left other than to take up these two 'brands' of imported rice, for which the competitiveness of local rice is examined.

The international prices are usually taken as the CIF (cost, insurance and freight)

[82] This is the reason why the unit price, which is obtained by dividing the total value of import by the total quantity of import, cannot be used for the DRC analysis.

price at the major cities with the entry points of imported goods, usually situated on the national border. In the case of land-locked Uganda, the CIF price is generally referred to as the 'Kampala CIF.' In this report, we choose the wholesale market in Kampala where the imported rice meets with the local rice, for being sold to retail-level traders, as the point of comparison between the imported and domestic rice prices,.

(1) 'Ordinary Pakistan'

'Ordinary Pakistan' is the cheapest rice among various kinds of rice imported from Pakistan.[83] For this 'grade' of 'Pakistan', we chose 'Pakistan IRRI 25% broken'.[84] The FOB (free on board) price at Karachi of this 'grade' of Pakistan rice was US$ 379 /t as of December, 2011 (FAO 2012), which was lower than Pakistan 25% broken of US$ 492 /t reported by IRRI (2012).[85]

Imported rice from Asia, including Pakistan, is usually transported in a 20-feet container.[86] The most popular transport route from Pakistan is from Karachi to Mombasa by sea and from Mombasa to Kampala, through either Malaba or Busia, by land transport. Including costs for transport, insurance and custom clearing,[87] the Kampala CIF of 'ordinary Pakistan' is estimated to be US$ 0.707 /kg (Table VI-1). Adding up the marketing costs incurred between this CIF price and Kampala wholesalers' selling price based on the data obtained in Table V-9, the Kampala wholesalers' selling price of 'ordinary Pakistan' is estimated to be Ush 2102 /kg.[88]

(2) Supa TZ

Supa TZ is mainly imported by rice traders/ wholesalers in such Kampala markets as Owino, Kikuubo and Bwaise, who go to rice granaries in Tanzania along the southern coast of Lake Victoria for procurement. Since there are two main routes through which rice is imported

[83] Excluding nearly completely 'broken' rice of 'Pakistan' rice sold in the markets in small quantity.

[84] A bulk of 'ordinary Pakistan' sold in the markets is 'Pakistan IRRI 5% broken', which is higher grade rice than 'Pakistan IRRI 25% broken'.

[85] The prices of comparable grade of rice were Thai A.1 (US$ 459/t) and Thai 25% broken (US$ 506/t) (both FOB Bangkok in 2011; World Bank 2013). The world rice price fluctuates year by year, but the price changes, as represented by Thai export prices, were not so large from 2011 to 2012: Thai 5% broken (US$ 543/t in 2011 and US$ 563/t in 2013) and Thai A1 (US$ 459/t in 2011 and US$ 525/t in 2013) (World Bank 2013).

[86] A 40-feet container is rarely used for transporting rice because of the cargo weight limitation of 20 tons that is entailed by the road conditions between Mombasa and Kampala.

[87] These costs were obtained from importers in Kampala. The freightage rate used was US$ 0.0194/t/km for sea-borne transport and US$ 0.186/t/km for land transport.

[88] A distinct feature in the CIF price of the imported rice from Pakistan is the high share of transportation costs, which is as much as 44%. In particular, the land transportation cost, transporting rice in a container from Mombasa to Kampala, takes about one-third of the CIF price.

from Tanzania; through Mutukula for land transport and through Port Bell for lake transport, we estimated the import price of Supa TZ separately for these routes. Data on the costs involved in the rice procurement in Tanzania were obtained in our rice trader survey. For the on-land transportation cost within Tanzania, the transportation cost function obtained for Uganda was used, because the mode of transportation is in 100 kg sacks, as within Uganda, without using containers. The import price of Supa TZ was estimated to be Ush 1808 /kg for the land transport case and Ush 1841 /kg for the lake transport case.[89] Confirming that the two estimates are at about the same level, let us adopt Ush 1808/kg as the imported price of Supa TZ.

(3) Import duties for rice and subsidies for rice production

Note that in the estimation above of the imported prices, no tariff is included. For Supa TZ, the Tanzanian tax imposed at the border custom offices is included, but Ugandan tax is not. At the time of our research, the tariff on rice in Uganda is as follows: i) for import from outside the East African Community (EAC)[90], the import duty of 75% levied on the CIF and withholding tax of 6% levied on (CIF + import duty + value-added tax), and ii) for import from within the EAC, withholding tax of 6% levied on (CIF + import duty + value-added tax).[91] Aside from these import duty and withholding tax, no other direct government support, such as input subsidies and deficit payment, is given for domestic rice production, except that the import duty and the withholding tax are not levied on agricultural inputs, such as fertilizers, agro-chemicals and farm implements.[92]

Since the purpose of this chapter is to examine the competitiveness of local rice production without any government interventions, the imported prices before the taxation are used. Before we proceed, however, it is worth to mention that plenty of 'ordinary Pakistan' is sold in the public markets all over in Uganda, as we have seen in the previous chapters, via the wholesale markets in Kampala, the selling price of which is Ush 3254 /kg (Table V-1), about 55% higher than the Kampala wholesaler's selling price of Pakistan IRRI 25% broken without the import duty (Table VI-1). If all of the 'ordinary Pakistan' sold in the Kampala public markets is imported with the import duty of 75%, the Karachi FOB is counted backward to US$ 0.336 /kg, about 12% lower than the FOB assumed here, suggesting that rice of quality even lower than Pakistan IRRI 25% broken is imported. The

[89] Note that the share of transportation costs for importing rice from Tanzania in the wholesalers' selling price is around 10%, far less than that of importing from Pakistan.
[90] The EAC member countries in 2011 are Uganda, Kenya, Tanzania, Rwanda and Burundi.
[91] As reported by Kiwawulo (2012), not all of imported rice goes through the formal custom channels.
[92] The information on the tariff for imports of rice and agricultural inputs is by the courtesy of the Uganda Revenue Authority.

Kampala wholesaler's selling price without the import duty based on this lower FOB is computed as Ush 1918 /kg, less than 10% difference from the one estimated for Pakistan IRRI 25% broken. In this study, we use the price of Pakistan IRRI 25% broken, while taking this lower price as a reference.

3. Costs of domestic rice production

As the cost structure of rice production in Uganda, we provided several alternative cases that reflected the diversity existing in rice cultivation in the country. Four cases in Table VI-2 are all "actual" data, obtained from earlier studies that collected rice production data from rice farmers. Although these earlier studies were conducted in different years, all the output and inputs are valued at the 2011 prices.

Case #1 is rainfed lowland rice cultivation, consisting of 60% of area planted to Supa and of 40% to Kaiso and other lowland varieties, with a yield of 1.9 t /ha, practiced in East-far, East-near and lowland areas in North, while Case #2 is rainfed upland rice cultivation, 70% of which area planted to NERICA varieties, with a yield of 1.7 t /ha, found in West, upland areas in North and Central-east. Note that their low yields correspond to the very low levels of modern agricultural inputs, i.e., fertilizers and agro-chemicals. For both cases, more than 80% of rice farmers did not apply these inputs at all, using only seeds, labor and simple farming tools and draft animals (Haneishi *et al.* 2013c). Case #3 represents a bit advanced rainfed rice cultivation with NERICA 4 as a major variety in West, North and Central-east where the modern inputs are applied by about 50% of rice farmers, resulting in a higher yield of 2.7 t /ha. It should be noted that though advanced compared to Cases #1 and #2, the intensities of the modern inputs are still low; for example, the use of fertilizer is at the level of 24 kg (one-half of a bag Urea or other fertilizers) per ha. Case #4 is the case of irrigated lowland rice cultivation practiced in the Doho Irrigation Scheme in East-far, with Kaiso as a major variety planted. Thanks to irrigation, the yield is as high as 3.7 t /ha, but the intensities of the modern inputs are as low as those of Cases #1 and #2. The last two cases thus represent 'advanced' rice cultivation, but it should be noted that for both cases, an ample room is left for increasing the rice yield through increasing the use of the modern inputs.

Case #4 shows a clear advantage of irrigated lowland cultivation in terms of yield per ha. A straight deduction from that fact is that the installation of irrigation infrastructure would help to increase the competitiveness of local rice production against rice imports. Table VI-3 provides four cases to examine how the DRCR of rice production would be changed, if irrigation facilities were installed, while taking into account the cost of installing

irrigation infrastructure. Of the four cases, the 'large-scale irrigation' and the 'rain-water-harvesting' cases are 'counter-factual' in the sense that the irrigation cost data used are not specific to Uganda and the yield levels assumed are not taken from actual farm surveys in the country. For the cases of 'small-scale' and 'micro-scale' irrigation, irrigation cost data and yield levels are based on projects actually implemented in Uganda by JICA or farmer himself with the assistance from Japan Overseas Cooperation Volunteers.[93]

Table VI-4 presents the shares of foreign resources in the inputs used in rice production, rice marketing and irrigation construction / operation and maintenance (O&M), which are necessary to estimate the DRCR.

4. Results of estimation

The estimated domestic resource cost ratios (DRCR) are summarized in Table VI-5 for the different rice production regimes and for 'ordinary Pakistan' and Supa TZ. The estimation was made for Equation (3), using the official exchange rate as the shadow exchange rate (SER) and the selling price at the Kampala wholesale market of 'ordinary Pakistan' and Supa TZ as P_w, respectively.

Let us start from looking at the four cases of actual production conditions (the upper part of the table). For Case #1 of Supa dominating rainfed lowland rice cultivation with the yield of 1.9 t /ha, with respect to 'ordinary Pakistan' imported from Pakistan, the estimated DRCR is 0.99 if Ush 2102 /kg of imported price is adopted and 1.09 if the lower imported price of Ush 1918 /kg is adopted. The cost of producing a unit of rice domestically is nearly equal to, or about 10% higher than, the benefit of earning foreign exchange by exporting it. With respect to Supa TZ imported from Tanzania, the estimated DRCR is 1.17, far exceeding 1.00. The exactly same levels of DRCRs are obtained for Case #2 of NERICA dominating rainfed upland rice cultivation with the yield of 1.7 t /ha. These results indicate that domestic rice production is competitive, or even if uncompetitive, its degree is not so serious, with respect to 'ordinary Pakistan', but unambiguously not competitive with respect to Supa TZ.[94] For Case #3 of NERICA planted in rainfed upland with some modern inputs such as fertilizer and chemicals, attaining a higher yield of 2.7 t /ha, domestic production could be said competitive with respect to 'ordinary Pakistan', but uncompetitive with respect to Supa TZ, although the DRCR is closer to 1.0. For Case #4 of irrigated lowland, domestic production is highly competitive not only with respect to 'ordinary Pakistan' but also with respect to Supa TZ.

[93] For the details of the types of irrigation infrastructure development, see Fujiie *et al.* (2012).
[94] It should be emphasized that the production cost data used for Cases #1 and #2 are obtained from a nation-wide rice production survey (Haneishi *et al.,* 2013a, 2013b).

The results thus reveal that the competitiveness of domestic rice production is fragile for rainfed rice cultivation, including both lowland and upland, which takes more than 95% of the entire rice cultivation in Uganda (Balasubramanian *et al.* 2007). In particular, Supa TZ imported from Tanzania is a real threat to the rainfed rice cultivation in the country. To elicit which factor gives a decisive impact on the competitiveness, some sensitivity analyses were attempted (Table VI-6). In order for the domestic rainfed rice production to be competitive with Supa TZ, the rice yield has to be increased from 1.9 t /ha to 2.4 t /ha for rainfed lowland with Supa (Case #1), from 1.7 t /ha to 2.1 t /ha for rainfed upland with NERICA varieties with negligible modern inputs (Case #2) and from 2.7 t /ha to 3.0 t /ha for rainfed upland with NERICA 4 with some modern inputs (Case #3), respectively.[95]

One of factors that influence the DRCR is the labor intensity in rice production. Regardless of growing regimes, high labor intensity is a distinct feature of rice cultivation in Uganda. Table VI-6 shows for Case #3 as an example that if the labor intensity could be reduced from 464 man-days /ha to 400 man-days /ha by, for instance, reducing the need of bird scaring, the rainfed upland rice cultivation would become just competitive with Supa TZ. The high vulnerability of the DRCR to the changes in the labor intensity implies that it is also vulnerable to an increase in the wage rate. In fact, if the wage rate increases by 10%, for Case #3 with the present input structure, the DRCR jumps up from 1.08 to 1.20.

In the case of irrigated lowland rice cultivation (Case #4), under the present conditions, rice production is highly competitive to Supa TZ. Even if the yield is 2.9 t /ha, instead of 3.7 t /ha, with the present input structure, rice production is still competitive. The competitiveness of this growing regime is also robust against the hike in the wage rate; an increase in the wage rate as much as about 40% still maintains the competitiveness with respect to Supa TZ. All this shows clearly the decisive importance of irrigation infrastructure for domestic rice production to be competitive. However, it should be reminded that the DRCR estimation for Case #4 treats the construction cost of irrigation infrastructure as a sunk cost.

It is true in Uganda, as in developing countries in Asia, that irrigation is one of the best means to attain higher, and stable, rice yield. However, not all types of irrigation

[95] The sensitivity analyses in Table VI-6 are conducted on the assumption that a production condition is changed while all other conditions remain intact. It may be necessary for increasing the yield to increase some inputs, e.g., fertilizers, as well. For example, for Case #3, if the yield is to be increased by increasing the fertilizer input, it entails an increase in the cost of fertilizers which have a high foreign resource component (Table VI-4). However, by virtue of high fertilizer responsiveness of NERICA 4 (a marginal increase of 60 kg/ha of yield per 1 kg/ha of additional nitrogen application; Miyamoto *et al.* 2012), the increase in yield from 2.7 t /ha to 3.0 t /ha requires only an additional fertilizer input (say, urea) of 11 kg /ha, and taking this cost increase into account, the DRCR is estimated to be 1.01; only 0.01 difference compared to the case shown in Table VI-6.

development are economically viable, if the construction cost of irrigation development is taken into account. Let us return to the bottom half of Table VI-5, in which the DRCR of irrigated rice production is estimated for four different types of irrigation infrastructure development, taking the costs of the construction and the operation and maintenance (O&M) of the irrigation infrastructure explicitly.

If the level of the investment cost is as high as that of large scale major irrigation projects implemented in sub-Saharan Africa in the last few decades, there is no chance for domestic rice production to be competitive with imported rice, even if the performance of the newly constructed irrigation system is as high as attaining 6 t/ha of yield per crop and complete double cropping per year (Case #5). As Inocencio *et al.* (2007) revealed, such a high level of performance has rarely been attained in major irrigation projects in developing countries. Even if the construction cost data are taken only from the successful irrigation projects,[96] it is estimated that the development of large scale irrigation schemes brings domestic irrigated rice production hardly competitive against Supa TZ (the DRCR in italic). This means that even if large scale projects are well planned, well designed and well implemented, with reasonably low cost, avoiding too sophisticated, lavish, unnecessary infrastructure and facilities, but yet attain the high performance after the construction (Fujiie *et al.* 2012), the possibility is still thin for large irrigation projects to bring about rice production competitive with low-cost rice producing countries. However, small- and micro-scale irrigation construction projects in lowland ecology (Cases #6 and #7) and rain-water harvesting system in upland ecology (Case #8) could be far more economically viable methods of irrigation development, in which the competitiveness in domestic rice production *vis-à-vis* imported rice is enhanced.

Altogether, the international competitiveness of domestic rice production by rainfed rice cultivation in Uganda is weak, particularly with respect to rice import from Tanzania that produces rice at a lower-cost.[97] However, the degree of un-competitiveness is not so large that a high possibility exists for rainfed rice cultivation, both lowland and upland, to be in an internationally competitive position by improving the yield level and enhancing the efficiency of rice production through adopting soil fertility enhancing cultivation technology and modern inputs such as fertilizers and chemicals. Irrigated rice cultivation, though very limited in area, is competitive even under the present input-output structure, if the costs of developing irrigation infrastructure are treated as a sunk cost. But, if we begin irrigated rice cultivation

[96] The irrigation projects that attained the internal rate of return of 10% or higher. For details, see Inocencio *et al.* (2007) and Fujiie *et al.* (2012).

[97] Our study suggests that rice imported from Pakistan, and other Asian countries, would not so much a threat to Ugandan rice even without the import duty. In this respect, our finding supports, as far as Uganda is concerned, the insistence by USDA (2012) that the EAC's 75% *ad valorem* tariff on rice imports be abolished for the benefit of consumers.

with newly constructing irrigation infrastructure, it becomes essential to consider seriously the economic viability of the method of irrigation infrastructure. Our estimation of the DRCR revealed that the type of irrigation development to be pursed in Uganda, as in sub-Saharan countries in general, is small- and micro-scale projects for lowland rice cultivation, and rain-water harvesting for upland rice cultivation

Table VI-1 Prices of inported rice from Pakistan and Tanzania, 2011 [a]

	Unit	Value / kg of milled rice	Remarks
Pakistan IRRI 25% broken (through Monbasa)			
FOB Karachi	US $ /kg	**0.379**	As of Dec. 2011. From FAO Rice Market Monitor.
Transport cost（sea）	US $ /kg	0.088	Karachi - Mombasa (4500 km)
Transport cost（land）	US $ /kg	0.224	Mombasa-Kampala (1200 km)
Insurance	US $ /kg	0.011	
Custom clearance	US $ /kg	0.006	
CIF Kampala	US $ /kg	0.707	
Handling charge+margin	US $ /kg	0.071	10%
Importer's selling price	US $ /kg	0.777	
- do -	Ush / kg	**1,944**	US $ 1.00 = Ush 2,500
Transport cost	Ush / kg	20	By truck; 7 km
On- & Off-load	Ush / kg	18	
Store, storage	Ush /kg	20	
Wholesaler's margin	Ush / kg	100	5% (include capital interest)
Kampala wholesaler's selling price	Ush / kg	**2,102**	
Supa Tanzania (land: through Mutukula)			
Rice-mill (broker) price in TZ	TZsh /kg	**850**	HV season price in Southern cost of the Lake Victoria (around Sengerema)
-do-	Ush /kg	**1,369**	TZsh 1.00=Ush 1.61
TZ tax	Ush /kg	137	10%
Sack, stiching, weighing	Ush /kg	14	
Transport within TZ	Ush /kg	70	Truck: Sengerema-Mutukula (400 km)
On- & Off-load	Ush /kg	16	TZsh 500/sack/loarding
Transport within Uganda	Ush /kg	60	Truck: Mutukula-Kampala (210 km)
On- & Off-load	Ush /kg	17	
Store, storage	Ush /kg	20	
Trip for procurement	Ush /kg	19	Trip, boading , visa (50,000 TZsh/entrance)
Wholesaler's margin	Ush /kg	86	5% (include capital interest)
Kampala wholesaler's selling price	Ush /kg	**1,808**	
Supa Tanzania (lake: through Mwanza-Port Bell)			
Rice-mill (broker) price in TZ	TZsh /kg	**850**	HV season price in Southern cost of the Lake Victoria (around Sengerema)
-do-	Ush /kg	**1,369**	TZsh 1.0=Ush 1.6
TZ tax	Ush /kg	137	10%
Sack, stiching, weighing	Ush /kg	14	
Transport within TZ	Ush /kg	37	Truck: Rice production area in TZ to Port Mwanza (50 km)
On- & Off-load	Ush /kg	16	TZsh 500/sack/loarding
Transport by lake	Ush /kg	80	Ferry: From Mwanza to Port Bell (Luzia)
On- & Off-load	Ush /kg	18	
Transport	Ush /kg	26	Truck: From Port Bell to Kampala (16km)
On- & Off-load	Ush /kg	18	
Trip for procurement	Ush /kg	19	Trip, boading , visa (50,000 TZsh/entrance)
Store, storage	Ush /kg	20	
Wholesaler's margin	Ush /kg	88	5% (include capital interest)
Kampala wholesaler's selling price	Ush /kg	**1,841**	

a) for data and estimation, see the text.

Table VI-2 Rice yield and production inputs by growing ecology and variety, 2011

Case #	(1)			(2)			(3)			(4)		
Growing regime / variety group	Rainfed lowland / (Supa 60%; Kaiso & others 40%)			Rainfed upland / (NERICA 70%; Others 30%)			Rainfed upland / NERICA 4 (High-yield farmers)			Irrigated lowland / Kaiso		
Major growing area	**East-far, East-near, North**			**West, North, Central**			**West, North, Central**			**Mbale (Doho)**		
Yield (ton paddy/ha)	**1.9**			**1.7**			**2.7**			**3.7**		
Price: Paddy (Ush/kg) [a]	1625			1430			1430			1430		
Price: Milled rice (Ush/kg) [b]	2500			2200			2200			2200		
Value of output (Ush 000/ha)	3088			2431			3861			5291		
	Qt.	Value Ush 000/ha	Share %	Qt.	Value Ush 000/ha	Share %	Qt.	Value Ush 000/ha	Share %	Qt.	Value Ush 000/ha	Share %
Production inputs:												
Seeds (kg/ha) [c]	96	156	(9)	89	127	(8)	110	157	(7)	100	143	(7)
Fertilizers (kg/ha) [d]	3.5	9	(1)	8.2	21	(1)	24	62	(3)	11	30	(1)
Chemicals (liter/ha) [e]	0.9	13	(1)	0.8	11	(1)	5	73	(3)	2	21	(1)
Sack (no.) [f]	19	10	(1)	17	9	(1)	27	14	(1)	37	19	(1)
Capital (Farm tools) [g]		60	(4)		20	(1)		20	(1)		20	(1)
Labor (md/ha) [h]	328	1,148	(70)	333	1,166	(73)	464	1,624	(72)	463	1,621	(76)
Land [i]		200	(12)		200	(12)		200	(9)		200	(9)
Transport [j]		29	(2)		26	(2)		46	(2)		56	(3)
Capital interest [k]		25	(1)		26	(2)		59	(3)		36	(2)
Total		1648	(100)		1605	(100)		2254	(100)		2144	(100)
Source of data	Haneishi et al. (2013c)			Haneishi et al. (2013c)			Haneishi et al. (2013a) Miyamoto et al. (2012) Kijima et al. (2008)			Watanabe (2009) Nakano et al. (2011)		

a) Paddy price is obtained from milled rice price by assuming 65% of milling rate.

b) The price of milled rice is from Table V-3.

c) Seed is valued at the paddy price.

d) Price of fertilizer = Ush 130,000 / 50 kg. Data are from our agricultural input supplier survey.

e) Price of chemical = Ush 14,000 / liter. Data are from our agricultural input supplier survey.

f) Price of sack = Ush 1000/sack (Table V-8). Assume usable twice.

g) Include farm tools, instruments and draft animals, valued by depreciation or at market rental rates. The value reported by Haneishi et al. (2013a) is assumed for all cases, except for Supa for which three times as much of capital inputs are assumed because of the use of draft animals in the Supa growing areas.

h) For all cases, valued at the wage rate of Ush 3,500/day, which is the average of Ush 5,500 for ordinary labor works (6 hours/day) and Ush 1,500 for bird watching work (12 hours/day). Data are from the farm survey made by Haneishi et al. (2013a) and Miyamoto et al. (2012). The percentage of 50% of bird-scaring work in the total labor inputs is from Haneishi et al. (2013a).

i) Valued at the leasehold rent reported by Haneishi et al. (2013a) for all cases.

j) Assume harvested paddy is hauled for 1 km from field to farm-gate by bicycle at the cost of Ush 1700/100 kg paddy sack, which is derived from our transportation rate function.

k) Capital interest is estimated for the expenses on fertilizers, chemicals and 50% of labor input (average share of hired labor) by applying the interest rate of 6.1%/3 month (27%/year).

Table VI-3 Rice yield and production inputs by growing ecology and variety and by type of irrigation development, 2011 [a]

Case #	(5)			(6)			(7)			(8)		
Growing regime / variety group / type of irrigation development	**Irrigated lowland /Kaiso / large-scale irrigation** [b]			**Irrigated lowland / Kaiso / small-scale irrigation** [c]			**Irrigated lowland / Kaiso / micro-scale irrigation** [d]			**Irrigated upland / NERICA/ rain-harvesting** [e]		
Yield (ton paddy/ha)	**6.0**			**5.0**			**5.0**			**3.5**		
Price: Paddy (Ush/kg)	1040			1040			1040			1040		
Price: Milled rice (Ush/kg)	1600			1600			1600			1600		
Value of output (Ush 000/ha)	6240			5200			5200			3640		
	Qt.	Value Ush 000/ha	Share %	Qt.	Value Ush 000/ha	Share %	Qt.	Value Ush 000/ha	Share %	Qt.	Value Ush 000/ha	Share %
Production inputs:												
Seeds (kg/ha)	100	143	(2)	100	143	(4)	100	143	(5)	100	143	(6)
Fertilizers (kg/ha)	100	260	(4)	50	130	(4)	50	130	(4)	11	30	(1)
Chemicals (liter/ha)	10	140	(2)	5	70	(2)	5	70	(2)	2	21	(1)
Sack (no.)	60	30	()	50	25	(1)	50	25	(1)	35	18	(1)
Capital (Farm tools)		20	(0)		20	(0)		20	(0)		20	(0)
Labor (md/ha)	463	1,621	22	463	1,621	47	463	1,621	55	463	1,621	68
Land		200	(3)		200	(6)		200	(7)		200	(8)
Transport		90	(1)		75	(2)		75	(3)		53	(2)
Capital interest		57	(1)		45	(1)		45	(2)		36	(2)
Irrigation development:												
Construction [f]		2,432	(33)		564	(16)		312	(11)		124	(5)
Operation & maintenance [g]		2,432	(33)		564	(16)		312	(11)		124	(5)
Total		7,425	(100)		3,456	(100)		2,952	(100)		2,388	(100)
Source of data	Fujiie et al. (2012) Inocencio et al. (2007)			Fujiie et al. (2012)			Fujiie et al. (2012) This study			Fujiie et al. (2012)		

a) Prices are all in 2011 prices, including irrigation investment costs.

b) Large-scale irrigation = irrigation new construction projects with the benefited area of 300 ha and above. Investment data are for 26 large-scale irrigation projects implemented in sub-Saharan Africa.

c) Small-scale irrigation = irrigation new construction projects with benefited area between 7-20 ha. Data are for 4 JICA-supported projects in Uganda.

d) Micro-scale irrigation = irrigation new construction projects with benefited area below 1 ha. Data are for 5 JICA-supported projects in Uganda and 1 project implemented by a farmer with assistance from JOCV volunteers.

e) Installing a simple rain-harvesting facilities. Data are for Kenyan farmers.

f) Average investment cost per ha in 2011 prices is annualized by using interest rate of 10% (international donor agencies' lending interest rate). For large scale irrigation, if only 13 'success' projects, the project internal rate of return of which is 10% or higher, are selected, the irrigation development cost is reduced to Ush 1,193,000/ha for construction and O&M.

g) Assume 10 % of investment cost.

Table VI-4 Share of foreign resources in the inputs used in rice production and rice marketing

	Foreign components		Foreign components
	%		%
Production inputs [a]:		Irrigation investments [b]:	
Seeds	0	Large	
Fertilizers	75	Construction investment	60
Chemicals	75	O&M	20
Sack	0	Small	
Capital (Farm tools and draft animals)	75	Construction investment	20
Labor	0	O&M	20
Land	0	Micro	
Transport	55	Construction investment	0
Capital interest	0	O&M	0
Marketing from farm-gate to Kampala [a]:		Rain-water harvest	
Transport	55	Construction investment	50
Rice milling	20	O&M	0
Village collector	0		
Store/Storage	0		
Sack	0		
Stitching sack	0		
Weighing sack	0		
On- and off-loading	0		
Tax/duties/charges	0		
Trip for procurement	50		

a) Estimated from our rice trader survey, agricultural input supplier survey and rice mill survey.
b) Estimated from Fujiie et al. (2012) and from our survey.

Table VI-5 Rice production and post-harvest costs per kg of milled rice and domestic resource cost ratio, by production ecology, type of variety and production region, as of 2nd season 2011 [a]

Production ecology / variety / region of production / type of irrigation construction	Paddy yield [b]	Produ-ction cost [b]	Post-harvest cost [c]	Irrig-ation cost [d]	Total	DRCR relative to import from	
						Pakistan [e] **(Ush 2102/kg)**	**Tanzania (Ush 1808/kg)**
	t/ha	..... Ush/kg					
Actual production conditions:							
1. Rainfed lowland / East-far, East-near, North	1.9	1312 (63)	770 (37)		2082 (100)	**0.99** **[1.09]**	**1.17**
2. Rainfed upland /West, North, Central	1.7	1429 (68)	658 (32)		2088 (100)	**0.99** **[1.09]**	**1.17**
3. Rainfed upland / NERICA / West, North, Central	2.7	1284 (66)	658 (34)		1943 (100)	**0.92** **[1.01]**	**1.08**
4. Irrigated lowland / Kaiso / Mbale (Doho)	3.7	892 (58)	658 (42)		1550 (100)	**0.72** **[0.80]**	**0.85**
With irrigation development:							
5. Lowland / large-scale irrigation project [f]	6.0	657 (26)	658 (26)	1247 (49)	2562 (100)	**1.32** ***0.90***	**1.67** ***1.09***
6. Lowland / small-scale irrigation project	5.0	716 (42)	658 (38)	347 (20)	1722 (100)	**0.80**	**0.95**
7. Lowland / micro-scale irrigation project	5.0	716 (46)	658 (42)	192 (12)	1567 (100)	**0.73**	**0.85**
8. Upland / rain-water-harvesting	3.5	941 (55)	658 (39)	109 (6)	1708 (100)	**0.80**	**0.94**

a) Domestic resource cost ratio is estimated at the Kampala wholesale market. Figures in parenthesis are percentage.
b) For data, see Tables VI-2 and VI-3.
c) From farm-gates to wholesalers in Kampala. Data are from Table V-9.
d) For data, see Table VI-3.
e) DRCRs estimated by assuming the imported price of Ush 1920 /kg are shown in bracket.
f) DRCRs estimated by assuming the irrigation development costs of 'success' project cases are shown in italics.

Table VI-6 Sensitivity analyses for the domestic resource cost ratio with respect to the Supa TZ price [a]

Case / Change in conditions	**DRCR for Supa TZ (Ush 1800/kg)**
#1. Rainfed lowland / Supa major	
Original estimate	1.38
Yield increases to 2.4 t/ha	1.00
#2. Rainfed upland / NERICA major (with negligible modern inputs)	
Original estimate	1.12
Yield increases to 2.1 t/ha	1.00
#3. Rainfed upland / NERICA 4 (with some modern inputs)	
Original estimate	1.08
Yield increases to 3.0 t/ha	1.00
Labor intensity declines to 400 md/ha	1.00
Wage rate increases by 10%	1.20
#4. Irrigated lowland / Kaiso / Doho	
Original estimate	0.85
Yield decreases to 2.9 t/ha	1.00
Wage rate increases by 37%	1.00

a) Let only the condition mentioned change, holding all other conditions the same.

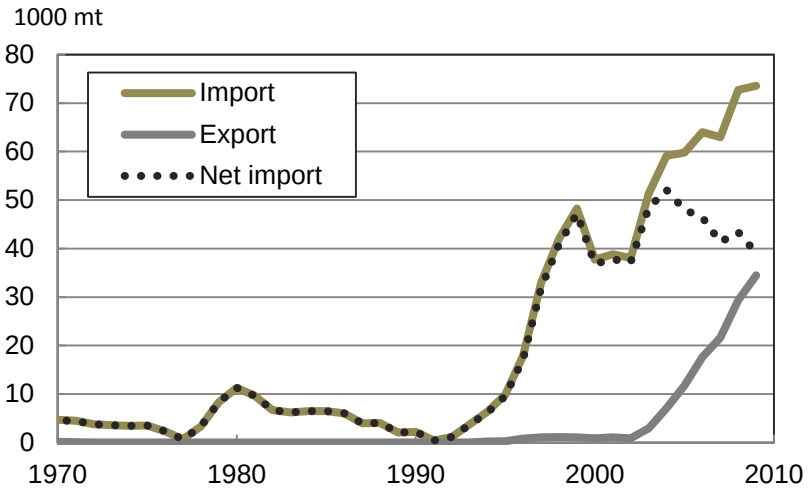

Fig. VI-1 Import, export and net import of rice in Uganda as reported in FAOSTAT, 3-year moving averages

Chapter VII. The Rice Mill Industry

As shown in Chapter III of this report, the rice consumption market in Uganda is clearly dichotomized into two segments. The lower segment, furnished by public markets in and outside Kampala handling an overwhelming majority of rice consumed in the country, finds rice of only two simple 'grades', Supa and non-Supa, sold at reasonable prices friendly to the majority of ordinary consumers in the country, whereas the higher segment, formed by supermarkets in and outside Kampala with a very small quantity or rice, is characterized by a large number of rice 'brands', the price of which is wide open towards a very high end, afforded by higher income consumers. These two segments, though dichotomized, have begun overlapping each other at the margin. As the economy develops resulting in an increase in household income, this overlapping part would enlarge in such a way that the lower segment buoying up. This process of enlarging the overlapping between the two segments is nothing but a process in that the quality of rice in the lower segment is being improved. The need for improving the quality of rice in the market is what many observers of the Ugandan rice sector unanimously point out (Wilfred 2006, Emerging Market Group 2008, PMA Secretariat 2009, MAAIF 2009, Oyee 2009, Chemonics International 2010, MJR Consult 2012).

Being at the entry point in the upstream of the post-harvest marketing chains, rice mills hold the pivotal position in the improvement of the quality of rice in the market: if rice quality is to be improved, it is a necessary condition to improve the quality of rice milling. There are many points on farm before the farm-gate that need improvements for higher rice quality, but even if all these points are remedied, it is obvious that the rice quality problems persist unless the quality of rice milling remains as it is. Naturally, almost all the studies, reports and documents cited just above claim that the present state of affairs at rice mills in the country be changed so as to improve the quality of milling. However, studies on rice mills have been few in the country, with a notable exception of Candia *et al.* (2008).

This chapter tries to fill this gap by providing information as to the present situation of the rice mill industry in Uganda at large, based on the data obtained from a series of rice mill survey conducted in all the rice producing regions in the country. Specific objectives are i) to present the evolution of the rice mill industry in the last two decades and the recent changes in the number of rice millers, ii) to look into in some details the present state of rice millers and their operations, iii) to analyze the cost and return structure of rice mill operation, and iv) to speculate the future direction of the industry. In this report, the terms, rice mill,

rice miller and rice mill owner, all mean a management body operating a rice mill plant with one or more rice milling machines, and are used interchangeably. When talking about rice mill as milling machine, we use the term 'rice milling machine', or simply 'machine.'

1. Evolution of Rice Mills and Rice Millers

It had been said until recently that the development of the rice mill industry was too slow to catch up the rapidly developing rice cultivation since the early 2000s, so that rice farmers in newly emerging rice growing areas had a difficulty to mill their rice produce to such an extent that it retarded the diffusion of rice cultivation. However, it seems that recent years have seen a rapid increase in the number of rice mills. The numbers of rice mills by region in 2007, 2009 and 2012 are shown in Table VII-1. These numbers were estimated by using data from a few sources. The relevant data were provided by Candia *et al.* (2008) for 2007, by the survey data of Kijima *et al.* (2012) for 2009,[98] and by our phone survey and rice mill survey for 2012. Since each source has missing data for some districts, we tried to supplement these missing data for each sample year by using the other sources.[99]

Table VII-1 shows that there were 645 rice mills operating in the country in 2012. More than 50% of them were found in the Eastern regions where rice cultivation had had a long history. Among other major rice growing regions, West took the share of 14%, followed by North with the share of 12%. Central-east, a region emerging as a major rice growing region, found about 10% of the total number of rice mills. Looking back, the total number of rice mills in 2007 was 418; an increase of 54% in 5 years. Compared to 2009, a 23% increase in 3 years. Among the regions, the increase in rice mills was remarkably high in North and West, 2.4 times in the former and 2.6 times in the latter since 2007. In particular, the number of rice mills in West had been more than doubled within 3 years since 2009; literally rice mills have been mushrooming. These two are regions where upland cultivation with NERICA varieties had been vigorously promoted since the early 2000s, and where it had been voiced loudly that the lack of rice mills was a serious impediment for farmers who wanted to plant rice. Even in Eastern regions where the rice mill industry had been well established in terms of the number of mills, significant expansion of the industry was observed particularly from 2007 to 2009, indicating that the rice cultivation 'boom' in the 2000s was not limited to the upland dominating areas in West and North.

More important to notice in Table VII-1 is that there is a sign that indicates a

[98] We are deeply indebted to Dr. Yoko Kijima for her letting us use the necessary data of their rice mill survey.

[99] The details of these supplemental estimations are explained in the footnotes of Appendix Table VII, together with the estimated numbers of rice mills by district.

deceleration in the increase, or even a decrease in the number of rice mills. The rate of increase in the total number of rice mills decelerated slightly from 2007-09 to 2009-12. For some regions, it started to decline. In East-near that had been the most rice mill 'intensive' region until 2009, the number of rice mills declined towards 2012. In South-west, the slight decline began even earlier. Considering the roughness in our surveys, we should be cautious in drawing a definite trend, but, as we shall see towards the end of this chapter, there are some evidences that support a conjecture that the rice mill industry in Uganda has been passing through the initial phase of rapid development, entering into the maturing phase, in which some sub-standard rice mills are forced to exit the industry.[100]

In order to attain our research objectives, including the investigation of the future trajectory of the industry, we collected data from sample rice mills drawn from the population in each region as shown in Table VII-1.[101] Our sampling ratio is about 10% for the country as a whole. It should be noted, however, that the sampling ratio varies across regions, quite low for some regions, and we omitted Central-west from the survey because its population was quite small. On account of the smallness of our sample in some regions, in what follows in this chapter, we adopt four regions, instead of the eight regions, by combining regions adjacent to each other. A series of interview surveys for these rice millers was conducted in March-September 2012.[102] Although our 70 sample rice millers include 4 large scale rice mills, this study mostly concerns 66 small rice millers, who represent the overwhelming majority of the rice millers in the country.[103] It is also noted that because of time and other constraints in the interviews, for some rice millers, some question items were skipped, which resulted in many missing data. Taking into account these qualifications and limitations of our survey, let us proceed to look into the rice mill industry.

(1) Evolution of rice mills

Table VII-2 counts the number of sample rice millers by the year of establishment and by

[100] It must be noted that there are many areas in rice producing regions where the rice mill industry is still in the midst of initial development phase, with many rice millers who are enthusiastic to expand their business. Indeed, in most places we visited in our rice mill survey, we were impressed by rice millers' energetic enthusiasm toward, and deep confidence in, their business, rarely coming across those who were pessimistic about their future.

[101] Except for a large-scale rice mill, our sample rice millers were drawn randomly from the population in the capital cities/towns of our sample districts.

[102] The questionnaires used in the rice mill survey are presented in Chapter II of this report.

[103] At the time of survey, it was known that several large-scale rice mills were under operation. As will be discussed in the last part of this chapter, the role in the rice mill industry taken by these large-scale rice mills will increase in future. Since a main purpose of this chapter is to know the present state of the rice mill industry, however, our attention shall be placed mainly on small rice mills that are the entities making up 99% of the industry in number and over 80% in quantity milled.

region, and Figure VII-1 depicts the cumulative number for the total for each year from 1990 onward. The rice miller with the oldest history among the samples has been operating since 1983, and a few of them followed in the early 1990s. Reflecting a long history of rice cultivation, these rice millers of old establishment are all found in Eastern regions. It seems that the initial spurt of the rice mill industry began in the late 1990s in Eastern regions, prior to the start of the promotion of upland rice in the early 2000s. The Northern and Western regions also find some rice mills established in the late 1990s, but for Western regions the mills established in the late-1990s are those which had been established as maize mills and started rice milling operation in the 2000s in addition to maize milling. The start of the promotion of NERICA in the early 2000s accelerated the 'rice mill boom': As much as one-third of the rice mills operating at present were established in this period. For the entire sample, only less than 20% of the rice mills are of the early origin before 2000, and it seems that the 'boom' is still continuing. The very early phase of the industry development in that the number of millers increased more than two times within half a decade seems to have been over by the mid-2000s. However, still a high rate of growth, about 50% per half decade, has continued in the first three years of the 2010s. For the country as a whole, the sign of the deceleration in the speed of growth, observed in the previous table, is not observed for the sample, though the speed seems to have started to diverge among the regions.

Rice millers can be classified by the type of rice milling machine they use. The machines can be broadly grouped into three types: Engelberg (including improved types), mill-top (one-pass) and large scale machines with grader, de-stoner, etc., in the order of machine sophistication.[104] The bottom part of Figure VII-1 shows the number of millers by type of machine.[105] In early years, all rice millers used Engelberg, and the number of rice millers using it has been increasing. However, the number of rice millers with more sophisticated mill-top machines, first appeared in the late 1990s, has been increasing faster than the number of those with Engelberg. Among the sample rice millers, the first one who installed a large scale milling machine appeared in the mid-2000s and the number has increased to four since then. As will be explained later, there are some differences between Engelberg and mill-top machines in terms of the capacity and quality of rice milling and the acquisition prices, but the differences in these respects are incomparably large between these two 'conventional' machines and the modern large scale machine.[106] In this

[104] For details of these three types of rice milling machines used in Uganda, see Candia *et al.* (2008).
[105] There are some rice millers who use both Engelberg and mill-top machines. In Figure VII-1, they are counted as mill-top rice millers.
[106] In terms of the quantity of rice milled per rice miller, small rice millers with 'conventional'

report, we call the rice millers with the 'conventional' machines small rice miller as against those with large scale machine, though there are some differences in the scale of operation among the small rice millers.[107]

(2) Rice millers

Table VII-3 shows the occupations of rice millers before and after they started rice mill business. The list reveals that the rice milling business has attracted people from a wide spectrum of occupations. A popular source of rice millers is the maize milling business: Many maize millers started rice milling as the demand for it arose. The farming sector is also a major pool that supplies rice millers. Nearly 60% of rice millers are from the farming-related sector. It is worth noting that many farmer-turned rice millers have experiences being engaged in crop trading as middlemen or brokers, which indicates that the sudden rise of the demand for rice milling has given a business chance to entrepreneurial farmers in rural areas. The rest 40% of rice millers are from various business circles. Some business circles are related to farming, such as seed production and farm-product processing, but many are totally outside of the agriculture sector. Some professionals, such as government servants, teachers and medical doctors, also joined the rice mill industry.[108] All this suggests that the prospects of high profitability in rice milling business have attracted people from various circles of society.

It also suggests that the rice mill industry is easy to enter, financially as well as technically. Since the 'conventional' milling machines often become out-of-order, the knowledge on mechanics helps the rice mill operation, but generally no special knowledge and skill are required. As far as the 'conventional' machines are concerned, the capital requirement for establishing a rice mill, just to install a rice mill machine (or machines) in a small workshop with small storage space, is not so large. These characteristics of the industry make the entry barrier to the rice mill industry low. The relatively low requirement of initial investments is reflected on the fact that the majority of the sample rice millers could finance their initial investments for establishing their mills out of own savings.

It is worth noting that the evolutional process of rapid rice mill development we observed thus far has largely been a result of the autonomous efforts made by entrepreneurs in the private sector to cope with the suddenly surging demand for rice milling

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machines mill on average about 300 t /year, whereas those with large scale machine mill 3,000 t/year to more than 10,000 t /year.

[107] In terms of the quantity milled in a year, the scale of operation of small rice millers ranges from the smallest of 24 t/ year to the maximum of 3150 t/ year. The small rice miller that mills the maximum amount operates with three top-capacity mill-top machines.

[108] Most of rice millers with large scale machine are from the non-agriculture sectors.

services nearly without any government interventions such as subsidies.[109]

2. Capital Equipment

The list of capital goods that a rice miller has to have to operate a rice mill is very simple: rice milling machine, mill workshop and storage space.

(1) Rice milling machines

The most important capital equipment for rice millers is rice milling machine. Table VII-4 shows that the 70 sample rice millers own 98 rice milling machines; 1.4 machines /miller on average. The first section of the table reveals that nearly 90% of machines under operation were installed in 2000 and after. Rice milling machines are usually expected to be replaced to new ones after 5 to 8 years of operation, but some machines are very old vintage. Engelberg is the major type of machines in number,[110] but the share of mill-top machines has been increasing in recent years.

China dominates as the country supplying rice milling machines to Uganda: Nearly 80% of machines are 'Made in China' (second section of Table VII-4). It is remarkable, however, that there are machines that were assembled in Uganda, suggesting the potentials to substitute the imported machines.[111] For the power source of milling machines, 70% of them are electricity operated, and the rest are diesel operated or electricity operated with a stand-by diesel engine (third section). Rice millers prefer electricity-operated machine to diesel-operated one for lower maintenance and energy costs, but frequent power failures that stop the mill operation often make it necessary for the millers to use diesel-operated machines or to provide stand-by generators. Most of the milling machines used by rice millers are of horse power (HP) from 20HP to 30HP: 60% of the machines fall in this range of HP (fourth section). The full range of HP for the two major types of machines operated by small rice millers is from15HP to 50HP. However, most of Engelberg machines are found in the HP classes of 20-30HP with the mode at 24-25HP, while mill-top machines distribute more evenly over the six HP classes with the mode at 30HP.

[109] Notable exceptions for this statement are technical supports and assistances rendered to rice millers and farmer groups by concerned agencies of the government, such as Agricultural Engineering and Appropriate Technology Centre, international donor agencies, such as WFP and JICA, and by NGOs, such as Sasakawa Africa Association Uganda. Some donor organizations implemented rice development projects that included the development of rice mills.

[110] Engelberg machines recently installed are all improved types.

[111] There might still be a long way to go for the machinery industry in Uganda to have a capability to make a complete assembling of sophisticated rice milling machines, but it is of essential importance for the sector to acquire such capabilities, not only for the development of the rice mill industry but also for the development of Ugandan economy in general.

The distribution of milling machines by type has clear regional patterns (fifth section). Engelberg machines are found mostly in Eastern regions of longer history of rice cultivation, while mill-top machines are mostly working in newly emerging upland rice growing areas in Western, Central and Northern regions. In particular, all the sample rice millers in Western regions use mill-top machines. In the North where there are upland as well as lowland rice areas, the two major types distribute equally. Since three out of four large scale rice mills operate within the same regions, the rice milling industry in Eastern regions are characterized by the polarization of rice millers between a large number of those with the 'old-fashioned conventional' machines and a small number of those with modern machines.

Some milling machines were bought in secondhand, but most of them were bought in brand-new. Though the acquisition price of the machines varies wide, the average prices of major type of machines are as follows (in Ush million in 2012 prices; deflated by using the GDP deflator; the models in parenthesis):

	Engelberg	Mill-top
20HP	2.8 (N 70)	5.7 (SB-10)
25HP	3.1 ((N 70)	
30HP	4.3 (N120)	7.6 (SB-50)
50HP		9.6 (SB-50)

(2) Rice mill workshop and storage space

Other capital facilities necessary for rice millers are workshop where rice milling machines are installed and storage space or warehouse where they store sacks of milled rice after milling. The size of workshop and storage of the sample rice millers are summarized in Table VII-5. On average, a rice miller operates in a workshop of 33m^2 with additional storage capacity of 42m^2. The average rent is estimated to be less than Ush 5000 /m^2 /month. For nearly 80% of rice millers, the size of their workshop is less than 50m^2, and for nearly 70% of them, the storage capacity is less than 50m^2. All this implies that the rice mill business is on average carried out with small workshop. In fact, workshops of many small rice millers are shabby buildings or humble cottages.[112] However, it should be noted that Table VII-5 does not include 4 large-scale rice mills that operate with large-scale milling machines and with well-built large workshops and storage capacity of as large as 500 –

[112] Though not including in our sample, there are itinerant rice millers who with their rice milling machine and working crew, go around rice growing areas during harvesting seasons. In their case, no workshop nor storage space are needed, but a truck, either owned or rented, is necessary.

3000 tons.

3. Rice Mill Operations

With the capital equipment explained above, rice millers operate their mills to produce milling services. In this section, let us observe the operations of rice mills in some details, for this report is the first study in Uganda to look into the operations. In what follows, we observe first the output of the sample rice mills, i.e., the quantity of rice milled, and some parameters that affect the efficiency of rice milling, second the work force engaged in rice milling, third maintenance costs, and finally the revenues that rice mills obtain for their services. Unless otherwise stated, our observations in this and the next sections are limited to small rice mills.

(1) Quantity of rice milled

On average, the quantity of paddy rice milled by the sample rice millers in the year 2011-12 was 350 tons /miller (Table VII-6). There were some regional differences: rice millers in non-major rice growing regions milled smaller quantities than major rice growing regions and among major growing regions millers in North milled the largest quantity per miller. This table also shows the percentage shares of rice milled in the peak harvesting seasons and the lean seasons. For the entire sample, 84% of rice was milled in the peak seasons and 16% in the lean seasons.

The variation around the average of the rice quantity milled per miller was large, as shown in the upper part of Figure VII-2. Except for one rice miller whose quantity of rice milled per year is 24 tons, the quantity of rice milled per miller is 70 tons or more for all others, and their distribution by scale class has a long tail toward the largest size class of 900 tons /year and more. It is interesting to observe a bi-modal pattern in the scale distribution of rice millers: More than 50% of millers operate in the scale classes from below 50 tons to 200-300 tons, making a peak, and another cluster of millers in the size classes from 300-400 tons to 600-700 tons. Such a bi-modal pattern is more distinct for rice millers with Engelberg machines.

Some rice millers operate more than one milling machine, and, naturally, rice millers with larger scale of operation tend to own more than one machine. In particular, rice millers in the three scale classes of 700-800 tons and higher operate 2 machines on average. The number of rice millers by quantity of rice milled per year per rice milling machine is shown in the bottom part of Figure VII-2. A similar bi-modal pattern is observed for rice millers with Engelberg machines, suggesting that the bi-modal pattern per miller is

primarily created by millers with Engelberg machines. For rice millers with mill-top machines, the concentration in the scale classes from below 50 tons to 200-300 tons is more than for Ebgelberg, but at the same time, there are more rice millers whose machines mill more than 700 tons /year /machine. These bi-modal patterns in the scale distribution of rice millers appear to suggest that there is the optimum scale of operation in rice milling, which differs according to the capacity of rice milling machines and the type of machine used.

As we shall see later in this chapter, the quantity of rice milled is one of critical determinants of the profitability of rice milling operation: the larger the quantity milled, the higher the returns. Therefore, it is vitally important for rice millers to secure sufficient amounts of paddy rice to be milled in their mills all year around, and rice millers make various efforts for this end. The upper part of Table VII-7 shows how rice millers acquire rice for milling. About 70% and 20% of paddy rice for milling is brought to the mills by farmers and village collectors/ middlemen, respectively, and the rest about 10% is collected by mills by going to rice growing villages to buy paddy rice from farmers or sending their agents to the villages for the acquisition. It is indicative that the direct acquisition of paddy from farmers is particularly important for rice millers in the Eastern regions, where the rice mill intensity is highest. Judging from the average cost, Ush 4000 /sack, of collecting paddy rice from villages, villages that rice millers try to collect paddy rice are on average in the radius of around as distant as 70 km.[113]

As shown in the bottom part of Table VII-7, rice millers' efforts to collect as much rice for milling as possible bring them to villages not only within the same district but in other districts or even in foreign countries. For all, about three-quarters of paddy rice milled is from within the district where the mill is operating and the rest is brought from outside the district. It seems that the rice milling market is relatively competitive in Eastern and Northern regions, so that the rice millers there try to obtain rice by visiting villages in and outside the district they operate (the middle part of Table VII-7).[114] There are some millers in East-near who go to Kenya to obtain paddy rice for milling in their mills. In contrast, in Western regions, more than 90% of rice milled by millers is brought to the mills from within the district. Coupled with the observation that the percentage of rice collected by millers' own efforts is low in Western regions, this suggests that the rice milling market in Western regions is a sellers' marketer, relatively less competitive than Eastern regions. Being at the initial nodal point along the post-harvest rice marketing chains, rice millers are generally

[113] Estimated by using the transportation function obtained in Chapter V of this report. In seasons of poor harvest, this distance could be longer

[114] The share of rice for milling obtained from other districts is also high in Central, but, as shown later in this chapter, this region is characterized by high rates of rice milling fee.

operating as rice traders as well (the bottom line of Table VII-7)[115]. Western regions are an exception in this respect; the percentage of 'pure' rice millers who specialized only to rice milling service is as high as 60%.

Aside from going out to distant villages to buy paddy rice is one of the efforts they make to secure as much rice for milling as possible. Many other efforts are made by rice millers operating in the competitive rice milling market, such as to pay farmers/ middlemen/ collectors the whole or a part of the cost for transporting paddy rice from villages to the mill, and to lend money to farmers, particularly in planting/ transplanting and weeding seasons when farmers need cash for hiring labor, on condition that rice is brought to the mill when harvested.

(2) Milling recovery and milling capacity

In addition to the quantity of paddy rice to mill, there are two technical parameters that affect the output and performance of rice milling business: milled-rice-recovery rate and milling capacity of rice milling machines.

The milled-rice-recovery rate is defined as the ratio of the quantity of milled rice after milling to the quantity of paddy rice before milling. On average for sample rice millers, this rate is 65%, which tallies exactly with the average over African countries reported in IRRI (2013). More than 70% of rice mills fall in the range of 60 – 70% (Figure VII-3). No statistically significant difference in the recovery rate is found among the regions.

The milling capacity is an indicator to measure the efficiency of rice milling machines, defined as the quantity of rice that a milling machine can mill within a unit of time. This efficiency would depend on the horsepower (HP) of machines, the source of power, the type of machine, the vintage of machine, etc. The number of milling machines by HP and by the source of power is shown in Table VII-8. For electricity-operated machines, 30 HP is the most popular horsepower. Diesel-operated machines, including those with a stand-by diesel engine, are all of small HP, 25HP or less. The milling capacity (efficiency) of milling machines is shown in the last column of Table VII-8 by HP level. As expected, the milling capacity increases, as the machine's HP becomes larger. Further to examine the determinants of milling capacity, we conducted regression analyses for the milling machines of 50HP or less, in which the machines' milling capacity is regressed on to several explanatory variables. The results are summarized in Table VII-9. In addition to the HP of machines, Engelberg dummy gives a coefficient statistically significant at the 5% level, indicating that, *ceteris paribus*, Engelberg machines are less efficient than mill-top machines.

[115] Their function as rice traders is of rice brokers outside-Kampala explained in Chapter III of this report.

All other variables tried out turn out to be insignificant. For example, the vintage of machines (year acquired) is not a determinant of the milling capacity, and the milling capacity of diesel operated machines is no less than that of electricity-operated ones. When we estimate the costs and returns of rice milling operation later, the milling capacity estimated by Regression II in Table VII-9 shall be used.

(3) Mill workers

For running rice mill operation, rice millers need workforce consisting of managers, machine operators, operator assistants and some others. Table VII-10 summarizes the number of workers employed by rice mills and their salary and wage rates. An average rice mill employs one manager, 4 milling machine operators and assistants (2 workers in a team; work in 8-12 hours sift in the busy seasons) and 4 other workers (drying/ cleaning rice, carrying rice sacks, etc.). The mode of salary/ wage payment for these employees depends on the job type; a time rate for manager, piece rate for other workers and time or piece rate for machine operators. The time rate payment is usually in monthly salary for managers and monthly or daily wage for operators. The piece rate wage is paid either in cash or in kind per sack of milled rice worked.

(4) Maintenance

All rice mills practice the maintenance of rice milling machines, such as greasing and changing spare-parts, such as bearings, screen, rubber roll, etc., with certain intervals. However, the expenditure and the interval of the maintenance vary greatly among the rice mills (Table VII-11). The average maintenance expenditure is larger and the average maintenance interval is shorter for Engelberg type than for mill-top type, though the differences for both are not statistically significant.

Regression analyses are conducted to examine factors that affect the maintenance expenditure reveal that it is a function of quantity of rice milled, in the double-log form (Table VII-12). The coefficient of the logarithm of quantity milled is positive and highly significant. Moreover, the coefficient is not statistically different from unity, which means that the maintenance expenditures increase just proportionally to the increase in the quantity of rice milled increases. In addition to the quantity milled, the milling capacity gives a positive, significant coefficient. The coefficient of Engelberg dummy turns to be not significant. The coefficient of maintenance interval is positive, indicating the longer the interval the larger the maintenance expenditure, but not statistically significant at conventional significance levels. The inclusion of this variable in Regression VI, however, improves the adjusted R^2 substantially. We are going to use this regression equation to predict the

maintenance expenditure.[116]

(5) Revenues

Finally in this section, let us observe the revenue side of rice mill operation. In addition to milling fee as the main source of revenue is milling fee, the sale of rice bran, a by-product of rice milling process, is a minor source for rice millers.[117]

Milling fee is the return that the rice mills receive for their milling service. Without exception, it is in the rate per kg of rice milled. The rice here can be either paddy or milled, depending on when rice sacks are weighed, before or after milling, the latter case being more common. Figure VII-4 depicts the number of rice millers by the level of milling fee per kg of milled rice. For the country as a whole, it ranges wide from the lowest of Ush 70 to the highest of Ush 230. The fee is usually set in a certain even number, such as 100, 150 or 200. Unlike the prices of rice, which are fairly uniform across regions, the level of milling fee differs significantly among regions. Eastern regions are characterized by low levels of milling fee, while Central region by high levels. Western regions also belong to the high milling fee regions,[118] and Northern regions embrace the three typical fee levels almost equally. Such differences appear to reflect the difference in the competitiveness of the rice milling market. In Eastern regions, where more than 50% of rice mills in the country are concentrated (Table VII-1), the high degree of competition seems to have brought down the milling fee rates; all the rice mills whose milling fee rate is less than Ush 100 /kg are found in the Eastern regions, two in East Near and one in East Far. In contrast, the high fee regions, Central and Western regions, are newly emerging rice growing regions.[119]

Rice milling process generates rice bran at a rate about 15% of rice milled. It can be sold as animal feeds or as material for organic fertilizer. Buyers of bran are not only local pig and poultry farmers but also feed traders in various places including Kampala and

[116] It is obvious that the simultaneity, or endogeneity, would exist between the dependent variable and the quantity milled / the milling capacity. In other words, the maintenance expenditure and the quantity milled could be both cause and effect each other; a larger quantity milled would necessitate a higher maintenance expenditure, while a higher maintenance expenditure would make a larger quantity milled possible. A similar argument is applicable to the relationship between the maintenance expenditure and the milling capacity. It is well known in econometrics that the application of the ordinary least squares (OLS) method to such data results in a biased estimation (Greene 2011). We use the OLS results assuming that the observational errors in our data outweigh the biases resulted from the simultaneity.

[117] Rice husk, another by-product of rice milling process, could be of some value, but few rice millers sell it for earnings.

[118] Two rice millers in Western regions who set the fee at Ush 100 are from South-west where the rice milling market is relatively isolated from other regions.

[119] The average milling fee rates by region are as follows: Northern Ush 150, Eastern 120, Central Ush 178, and Western Ush 141. However, large variations in the rates within each region make only the difference in the rates between Central and Eastern statistically distinguishable.

Kenya. Since the price of rice bran at rice mill was, on average, around Ush 80/kg, its value takes around 10% of the milling fee. Who takes rice bran after milling differs among regions. For instance, in Western regions, no sample rice millers takes rice bran, leaving its disposal to farmers. On average for the entire samples, the bran is taken by rice mills and farmers about equally.

4. Costs and Returns

With the information on the capital equipment and operation of rice mills obtained thus far, we are ready to estimate and analyze the cost and return structure of rice milling business.

(1) Costs, revenues and rates of returns

The estimation of the cost-return structure was made for rice millers who operate with one milling machine, assuming two typical cases with respect to machine and scale of operation: (a) Engelberg 20HP (electricity-operated) with 100 tons /year of paddy rice milled and (b) Mill-top 50HP (electricity-operated) with 500 t /year of paddy rice milled. For each case, two levels of milling fee are assumed: i) Ush 100 /kg and ii) Ush 150 /kg. As observed in Figure VII-2, two groups of rice millers are discerned in terms of the scale of operation measured by the quantity of paddy rice milled per milling machine per year; the small-scale operation group with the quantity milled less than 300 t /year and the large-scale operation group with more than that level. More than 50-60% of sample rice millers fall in the scale classes between 50-300 tons and another 30-40% in the scale classes more than 300 tons. The case (a) represents the 'small-scale' operation and the case (b) 'large-scale' operation. Engelberg 20HP is a popular machine used for the 'small-scale' operation and Mill-top 50HP (Model SB-50) is the most popular 50HP machine, and 50HP is the largest HP adopted by small rice millers. The basic data used in the estimation are summarized in Table VII-13 and the results of estimation are presented in Table VII-14. The details of cost estimation are explained in the footnotes of Table VII-13.

Table VII-14 elicits the basic cost-return structure of rice milling operation. For 'small-scale' operation, the largest cost item is electricity bill that takes 35% of the total cost, while for 'large-scale' operation, labor costs take the largest share of as much as 39%, followed by electricity. For both cases, maintenance costs take only a share as small as 2-5%. The share of fixed costs is 33% for Engelberg and 25% for mill-top, the majority of which is accounted for by the rent for workshop and storage for both types. The depreciation cost of the milling machine takes a share as small as 4-6% of the total cost for both types, which demonstrates the low entry barrier of the milling industry.

The most remarkable finding in the table is that the revenue of rice milling operation depending on the level of milling fee adopted, the profitability of rice milling operation depends critically on the fee rate rice millers can adopt. For both cases, if Ush 150 /kg, the as much as 30-32% of the revenue is left to the rice miller as surplus, whereas if the fee is Ush 100 /kg, the surplus is nearly nil or even negative. Accordingly, the rate of return to the initial capital investment for the machine changes from 107% to -5% for Engelberg and from 166% to 2%, as the fee changes from 150 to 100.[120] This implies that rice millers, who enter the rice mill industry in the early stage of development when the milling fee is high reflecting the excess-demand situation in the rice milling market, can enjoy a high rate of returns. As the number of rice mills increases and the level of milling fee goes down as a result of competition, the profitability of rice mill operation dwindle down quickly.

(2) Break-even scale of operation

Another critical factor in determining the profitability of rice milling operation is the scale of operation, i.e., the quantity of rice milled per year. The revenue functions for four levels of milling fee and the estimated cost functions of Engelberg 20HP are depicted in Figure VII-5. Note that the milling fee of Ush 70 /kg is the minimum rate actually adopted by some rice millers in the Eastern regions. The cost function[121] crosses the four revenue functions from the above and positive surpluses are generated beyond these break-even points.

The break-even scale of operation at which the revenue and the cost become equivalent can be more clearly shown by depicting the revenue-cost ratio line obtained from the revenue and the cost functions (Figure VII-6). Note that the revenue-cost ratio line is nonlinear because of the maintenance cost which is determined by the quantity of rice milled in the double-log form.[122] In the figure, four cases are shown, i.e., Engelberg 20HP, Engelberg 30HP, Mill-top 20HP and Mill-top 50HP, and the break-even scale for these cases are summarized in Table VII-15.

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[120] Note that for Engelberg 20HP case, it is assumed that the mill owners take a role of manager, but his/her time spent for this is not imputed. If this were accounted for, the loss would be even larger under the milling fee of Ush 100 /kg. It is also noted that the costs for workshop and storage space is accounted for by applying the average rent. If these facilities are owned by the mill owners, these costs are rent income received by the owners.

[121] The cost function is of the following form:

$$C(Q) = FC + VC(Q),$$

where C(*) is a cost function, Q is the quantity of rice milled (in paddy), FC is fixed costs consisting of rent for workshop and storage space, capital depreciation and manager's salary, and VC(*) is variable costs consisting of operation costs, labor wages and maintenance costs, all of which are a function of the quantity of rice milled.

[122] Though it looks like a linear function, the cost function depicted in Figure VII-5 is also not linear.

For the most popular milling fee rate of Ush 100 /kg, the break-even scale is 90-100 t /year for small HP machines and 300-400 t /year for large HP machines, regardless of the type of machine. Any scale more than these gives a positive surplus to the mill owners. For the fee rate of Ush 150 /kg, the break-even scale is reduced to 40 t /year and 120-150 t /year, respectively. These results are consistent to the fact that around 60% of rice mills operate their milling machine in the scale range of 50-300 kg /year and another 30% in the range of 300-700 t /year (see Figure VII-2). If the milling fee rate is lowered to Ush 70 /kg as observed in Eastern regions, the quantity of rice that rice millers have to mill to clear the break-even scale increases to 550 t /year for Engelberg 20HP and 260 t /year for mill-top 20HP, and more than 2000 t /year for large HP machines for both types. These results suggest that if the competition in the rice milling market becomes so harsh that the fee rate is reduced to such a low level, single-machine small- scale rice millers whose scale of operation is less than 200 t /year might have to exit the rice milling industry, giving their market shares to relatively larger scale rice millers with the quantity of rice milled of 600 t /year or larger.

Another way for rice millers to deal with the lower level of fee may be to increase the number of rice milling machines, as some rice millers are actually doing. An approximate break-even scale per machine for a double-machine rice mill can be estimated by cutting the fixed costs per machine into half, which gives the break-even scale per machine that is about half of the single-machine mill; under the milling fee of Ush 70 /kg, 270 tons for Engelberg 20HP and 130 tons for mill-top 20HP. This makes double-machine millers' break-even scale per mill 540 tons and 260 tons, respectively.

5. Where heading?

The rice mill industry in Uganda has developed at a remarkable pace since the early 2000s. The high profitability of rice milling business and a low entry barrier have attracted entrepreneurs from various social circles, not only agriculture related but also non-agriculture sectors. Now, the industry seems to have been approaching a maturing stage. In newly emerging rice growing regions of West, Central and the upland dominating part of North, the industry is still on the way to maturity, but in Eastern regions and the lowland dominating North, with relatively longer history of rice mill development, coupled with the recent 'rice-mill boom', the industry is at a mature stage. The levels of rice milling fee lower than Ush 100 /kg in Eastern regions, in contrast to the higher levels of Ush 150 /kg to Ush 200 /kg prevailing in newly emerging rice growing regions, are an apparent sign of the degree of competition that the rice milling market is undergoing, and in this respect, the

maturing stage is nothing but the stage of adjustments. Considering the rapid pace of the development, it is anticipated that the newly emerging rice growing regions will go into that stage very soon.

The scale economy inherent in the rice mill operation inevitably makes the changes that occur in this adjustment stage a shift of rice mills towards larger scale of operation. The emergence of large scale rice mills in Eastern and Northern regions is a genuine sign of the direction that the rice mill industry is heading. For small rice mills, the changes that would take place are sifts from 'old fashioned' Engelberg to mill-top machines, or even more modern machines and from small HP to large HP machines or single machine to multi-machine operations. Small rice mills with a small HP machine would remain in a smaller number for filling up the demand for milling service derived from the demand for rice coming from consumers for whom the quality of rice does not matter.

As we have observed in Chapter III, although the quality of rice is not so important yet in the national rice market, the demand for rice of higher quality will increase steadily as the Ugandan economy grows. Such a shift in the rice market would accelerate the adjustments in the rice mill industry. As the quality of rice becomes important, the level of milling fee may be differentiated according to the quality of rice milling that a rice mill can supply.[123] This would also work as a pressure for small rice mills with a small HP machine to exit the industry, strengthening the polarization of the industry into small rice mills with small scale of operation to satisfy the indigenous demand and those with large scale of operation, including large scale rice mills, aiming at the national market. As all large scale rice mills are equipped with pre-cleaners, de-stoners, separators and graders, there is a trend among small rice mills to introduce these facilities. In order for the rice mill industry to be a socially sound and economically appropriate industry, it is highly desirable to develop these facilities as technologies as divisible as possible, so that small rice mills can improve their rice milling quality step by step countervailing the scale economy of the large scale rice mills.

[123] Such cases seem to be burgeoning in some major rice growing areas, such as Eastern and northern regions, but it was not at the extent yet that could be detected by our data.

Table VII-1 Number of rice millers in 2007, 2009 and 2012, by region [a]

Region [b]	No. of millers			Rate of change		No. of millers interviewed in 2012 [f]	
	2007 [c]	2009 [d]	2012 [e]	2009/ 2007	2012/ 2009		
	no.	no.	no.	ratio	ratio	no.	(%)
North-west	19	26	29	1.36	1.15	2	(7)
North	32	45	76	1.40	1.70	13	(17)
East-far	125	148	186	1.19	1.26	23	(12)
East-near	136	179	173	1.32	0.96	9	(5)
Central-east	40	54	60	1.34	1.12	15	(25)
Central-west	3	4	4	1.33	1.00		
South-west	30	28	27	0.93	0.96	2	(7)
West	34	40	90	1.18	2.24	6	(7)
Total / average	418	523	645	1.25	1.23	70	(11)

a) For estimation details, see Appendix Table VII.

b) For the districts included, see Table II-4 and Appendix Table VII.

c) The basic data are from Alphonse et al. (2008). Supplemented for districts not covered, by the data obtained from Kijima's survey, our phone and rice mill surveys.

d) Data from Kijima's survey, supplemented for some districts for which data were missing.

e) Data from our phone survey, supplemented for un-surveyed districts by applying the rate of change (region average) obtained from the market survey and the phone survey.

f) The number of sample rice mills in our rice mill survey. The figures in parenthesis are the sampling ratio in percent.

Table VII-2 Number of sample rice millers by the year of establishment by region, cumulative number, rate of growth, and percentage operating as rice traders

	Region						Cumu-lative no.	Rate of growth
	North & North-west	East-far & East-near	Central	West & South-west	Total			
Year of establishment:						%		ratio
1980s		1			1	(1)	1	
1990-94		2			2	(3)	3	2.0
1995-99	2	6		1	9	(13)	12	3.0
2000-04	4	6	9	2	21	(30)	33	1.8
2005-09	6	6	5	3	20	(29)	53	0.6
2010-12	3	11	1	2	17	(24)	70	0.3
Total	15	32	15	8	70	(100)		

Table VII-3 Occupation of rice millers before starting rice mill and major occupation now

	Job before	Job now	Remarks
Rice mill		18	Full-time in rice milling business
Maize mill	10	8	
Farmer	10	7	Size of farm (400acs, 15acs, 10acs, 7.5acs, 2acs), livestock farmers
Farmer+trader	4	2	Farming + crop trader, middleman, broker
Farmer+business	2	2	Farming + non-farm business
Farm trade	4	2	Crop broker, trader, middleman
Rice mill worker	4		Two succeeded farther' mill
Business	12	11	Banker, bus owner, car repair shop, construction, farm product processing, import&export, metal fabrication, seed production, sight-seeing industry, shop owner, taxi company
Government servant / officer	6	3	
Medical Doctor/Veterinary	2	1	
NGO	1		
Teacher	1	2	
Farmers' association	1	1	Established and operated by a farmers' association
	57	57	

Table VII-4 Number of milling machines by type and by country made, power source, horse power and region, 2012

	Engelberg	Mill-top	Large scale	Total	
				no.	%
Total	51	41	6	98	100
1. Year installed:					
1990-94	4			4	4
1995-99	5	1		6	6
2000-04	18	10		28	29
2005-09	14	17	2	33	34
2010-12	10	13	4	27	28
2. Made in:					
China	34	37	5	76	78
Uganda	5			5	5
Japan [a]	2	2		4	4
India/England/Brazil	2		1	3	3
Unknown	8	2		10	10
3. Power source:					
Electricity	37	28	6	71	72
Diesel	12	10		22	22
Both		2		2	2
Unknown	2	1		3	3
4. HP					
15-16	1	6		7	7
20-22	11	8		19	20
24-25	14	4		18	19
30	10	10		20	21
40	5	4		9	9
50	1	4		5	5
200 and over			1	1	1
Unknown	9	5	5	19	18
5. Regional distribution					
North/North West	11	11	3	25	26
East Far/East Near	36	5	3	44	45
Central	4	11		15	15
West/South West		14		14	14

a) According to respondents' answer, not necessarily the real origin of manufacturers.

Table VII-5 Number of rice millers by size of workshop and storage, 2012 [a]

	Workshop		Storage	
	no.	%	no.	%
Smaller than 10 m^2	1	5		
10 - 19m^2	7	32	8	36
20 - 29m^2	4	18	1	5
30 - 49m^2	5	23	3	14
50 - 99m^2	3	14	2	9
100m^2 and larger	2	9	5	23
None			3	14
Total	22	100	22	100
Average size (m^2)	33		42	
Average rent (Ush/m^2/month)	4,637			

a) For 22 rice millers for whom relevant data are available. Four large-scale rice mills are not included.

Table VII-6 Quantity of paddy rice milled per rice miller by region and percentage milled in peak and lean seasons, 2011-12 [a]

	No. of obser-vations	Average quantity milled (t/year /miller)	% of rice milled in		
			Peak season	Lean season	Total
North west	2	161	93	7	100
North	14	523	84	16	100
East far	20	390	88	12	100
East near	7	304	78	22	100
Central	14	197	87	13	100
South west	2	205	60	40	100
West	6	351	78	22	100
All	65	352	84	16	100

a) For 65 small rice millers, excluding one small rice mill with a large quantity of rice milled.

Table VII-7 Acquisition of paddy rice for milling by rice millers, by region, 2011-12 [a]

	North & North-west	East-far & East-near	Central	West & South-west	All
Who brought paddy to rice mills ? :					
No. of observations	14	20	4	6	44
Average share (%):					
Farmers [b]	66	66	86	58	67
Middlemen / traders [c]	32	18	9	39	24
Mill [d]	3	17	5	3	9
Total	100	100	100	100	100
Where paddy from ? :					
No. of observations	2	11	4	2	19
Average share (%):					
Within the district [e]	75	69	69	94	76
From other districts [f]	25	31	31	6	24
Total	100	100	100	100	100
Average no. of districts from which paddy was acquired [g]	3	2	1	0	2
% of rice millers who operate as rice traders [h]	100	74	100	40	74

a) For small rice millers for whom relevant data are available.

b) Brought by farmers.

c) Brought by village collectors / middlemen and town traders.

d) Acquired from farmers by mills by going and / or sending agents to villages.

e) Acquired paddy for milling from within the district where the mill is situated.

f) Acquired paddy from other districts, including foreign countries (Kenya and DRC).

g) Not including the own district.

h) For 42 rice millers.

Table VII-8 Number of rice milling machines by power source and HP and the average milling capacity, 2012

HP	Electricity	Diesel [a]	Un-known	Total	Average milling capacity [b]
		…… no ……			100 kg/hr
15 [c]	2	5		7	2.5
20 [d]	10	9		19	3.2
25 [e]	12	6		18	4.8
30	22			22	5.4
40	9			9	6.4
50	5			5	9.7
More than 200	1			1	25.0
Unknown	10	4	3	17	na
Total [f]	71	24	3	98	4.8

a) Include milling machines provided with both electricity motor and diesel engine.

b) In terms of milled rice.

c) 15-16 HP.

d) 20-22 HP.

e) 24-25 HP.

f) The average milling capacity is for the machines of 50 HP or less.

Table VII-9 Regression results of explaining milling capacity (100 kg/hour) [a]

	I		II	
	Coeff.	Prob.	Coeff.	Prob.
HP	0.156	0.000 ***	0.166	0.000 ***
Engelberg dummy [b]	-0.932	0.033 *	-0.928	0.026 **
Year established [c]	-0.081	0.108		
Milled rice recovery rate (%)	0.040	0.229		
Year acquired [d]	-0.059	0.343		
Made-in-China dummy [e]	0.498	0.456		
Diesel dummy [f]	-0.305	0.579		
Intercept	116.74	0.349	0.422	0.560
R^2 (adjusted)	0.420		0.423	
No. of observations	80		80	

a) For milling machines of 50 HP or less. In terms of milled rice output.
b) Engelberg=1, mill-top=0.
c) The year the rice mill was established.
d) The year the milling machine acquired.
e) Made-in-China=1, others=0.
f) Diesel & diesel+electricity=1, electricity=0.

Table VII-10 Average number of employees of rice millers, mode of wage payment and average wage rate, 2011-12 [1)]

Job category	Average number per miller	Mode of payment		Average wage rate				Remarks
		Time rate	Piece rate	Time rate		Piece rate		
				Monthly	Daily	In cash	In kind	
				Ush/mo.	Ush/day	Ush/sack	kg/sack	
Manager	0.7	100	0	150,000				
Operator/assistant	3.7	75	25	150,000	7,500	1,000	2	kg in milled rice
Other worker	3.7	8	92	50,000		400		
Total	8.2							

1) For 23 small rice millers for whom relevant data are available.

Table VII-11 Average expenditure for maintenance and maintenance interval by type of machine, 2011-12 [a]

	Engelberg	Mill-top
Average maintenance expenditure (Ush 000/year)	905	607
(S.D.)	(925)	(563)
Maintenance interval:	..... no.....	
7 days or less	3	0
15 days	3	1
30 days	5	3
40-80 days	0	2
90-120 days	1	2
180 days	1	1
Total	13	9
Average (days)	39	62
(S.D.)	(50)	(49)

a) For 23 rice millers for whom relevant data are available. Four large-scale rice mills are not included.

Table VII-12 Regression results of explaining maintenance expenditure (Ush 000/year) [a]

	V		VI	
	Coeff.	Prob.	Coeff.	Prob.
ln (Quantity milled; t/year)	0.994	0.004 ***	0.945	0.002 ***
Milling capacity (100 kg/hour; milled rice base)	0.169	0.270	0.189	0.097 *
Maintenance interval (days)	0.006	0.266	0.005	0.267
HP	0.018	0.518		
Engelberg dummy	-0.082	0.870		
Diesel dummy	0.195	0.732		
Intercept	-0.971	0.680	-0.270	0.885
R^2 (adjusted)	0.267		0.364	
No. of observations	23		23	

a) The logarithm of maintenance expenditure is regressed on to the explanatory variables listed.

Table VII-13 Data for estimating costs and returns in rice mill operation for two types of milling machine [a]

	Engelberg	Mill-top
Milling machine:		
Source of power	Electricity	Electricity
HP	20	50
(KW)	15.0	37.5
Milling capacity (kg/hour) [b]	282	874
Milled-rice-recovery rate [c]	0.65	0.65
Machine's usable lifetime (year) [d]	5	8
Workshop (m^2) [e]	20	30
Storage (m^2) [e]	30	40
% of paddy rice collected by mills [f]	10	10
Rate of bran output (%) [g]	15	15
Mill's share of bran (%) [g]	40	40
No. of employees [h] :		
Manager		1
Operator	2	2
Other worker	2	4
Prices:		
Price of milling machine (Ush million) [i]	2.8	9.6
Rice bran (Ush/kg) [g]	80	80
Electricity rate (Ush/KWh) [j]	575	575
Milling fee (Ush/kg of milled rice) [k]	100 / 150	100 / 150
Rate of paddy collection from villages (Ush/kg) [l]	20	20
Wage rate [h] :		
Manager (Ush/month)	150,000	150,000
Operator (Ush/kg)	10	10
Other worker (Ush/kg)	4	4
Salvage value of milling machine (Ush/machine) [m]	40,000	150,000
Rent for workshop/storage (Ush/m^2/month) [e]	5,000	5,000
Quantity milled (paddy rice: tons/year) [n]	100	500
Maintenance expenditure (Ush 1000/year) [o]	167	2563
Total hours of milling operation (hours/year) [p]	268	432

a) For small rice millers.

b) Estimated using the milling capacity function (Regression II in TableVI-7).

c) From Fig. VII-3.

d) Typical usable life. The capital depreciation by the linear depreciation over the usable lifetime.

e) From Table VII-5.

f) From Table VII-10.

g) Average of sample millers.

h) From Table VII-11.

i) Average acquisition price converted to 2012 prices by the GDP deflator.

j) Ush 487.6/KWh + tax (18%). The rate of power charge is of 'intermediate', among the charges for peak, intermediate and off-peak.

k) From Fig.VII-4.

l) Average cost that millers collect paddy rice from villages.

m) Average scrap value = Ush 500/kg. Capital depreciation of milling machine is obtained after deducting the salvage value of the machine from the machine price.

n) Assumed for the 'small-scale' and 'large-scale' operation.

o) Estimated using the maintenance function (Regression VI in Table VII-12).

p) Quantity milled (milled rice) / milling capacity + time for idling, adjustment etc. of 20% of the milling time.

Table VII-14 Costs, revenues, owner's surplus and rate of return for average rice millers, 2011-12 [a]

	Engelberg 20HP				Mill-top 50HP			
	Fee=100		Fee=150		Fee=100		Fee=150	
	..... Ush million/year (%)							
Cost [b]:								
Operation costs:								
Electricity		2.39	(35)			9.63	(29)	
Paddy collection from villages		0.30	(4)			2.50	(7)	
Labor costs:								
Manager *						1.80	(5)	
Operator		1.26	(19)			6.30	(19)	
Other worker		0.50	(7)			5.04	(15)	
Total		1.76	(26)			13.14	(39)	
Maintenance expenditure		0.13	(2)			1.82	(5)	
Rent for workshop & storage *		1.80	(27)			5.40	(16)	
Capital depreciation *		0.39	(6)			1.18	(4)	
Total		6.77	(100)			33.67	(100)	
Revenue:								
Milling fee	6.30	(93)	9.45	(95)	31.50	(93)	47.25	(95)
Rice bran	0.48	(7)	0.48	(5)	2.40	(7)	2.40	(5)
Total	6.78	(100)	9.93	(100)	33.90	(100)	49.65	(100)
Mill owner's surplus	0.01	(0)	3.16	(32)	0.23	(1)	15.98	(32)
Rate of return (%) [c]	0		158		2		166	

a) For small rice millers.

b) Cost items with * are fixed cost.

c) For the investment on milling machine.

Table VII-15 Break-even scale by milling fee rate and by machine type & HP

Milling fee	Engelberg 20HP	Mill-top 20HP	Engelberg 30HP	Mill-top 50HP
	..... tons/year			
Ush 70	550	260	> 2000	> 2000
Ush 80	200	150	800	1200
Ush 100	100	90	300	400
Ush 150	40	40	120	150
Ush 200	30	30	70	100

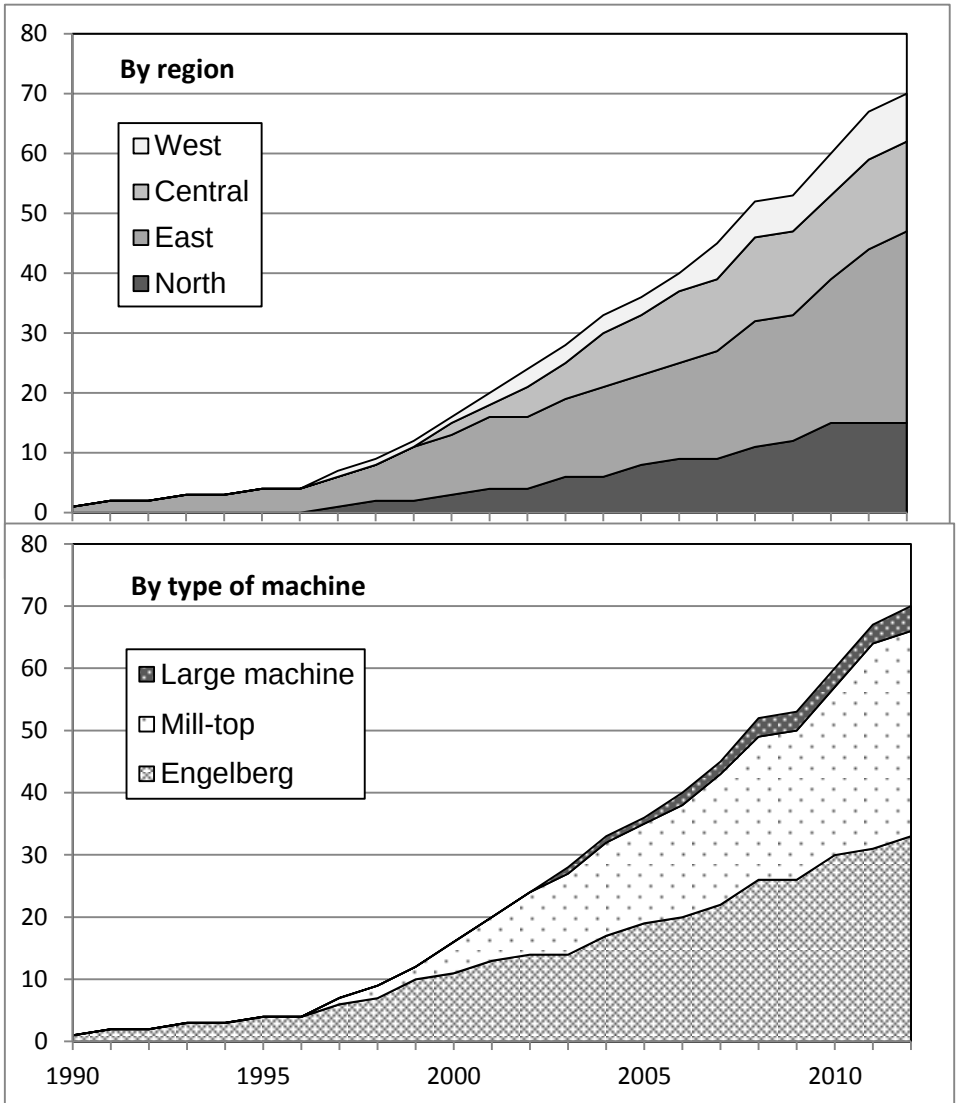

Fig. VII-1 Cumulative number of sample rice millers by year of establishment

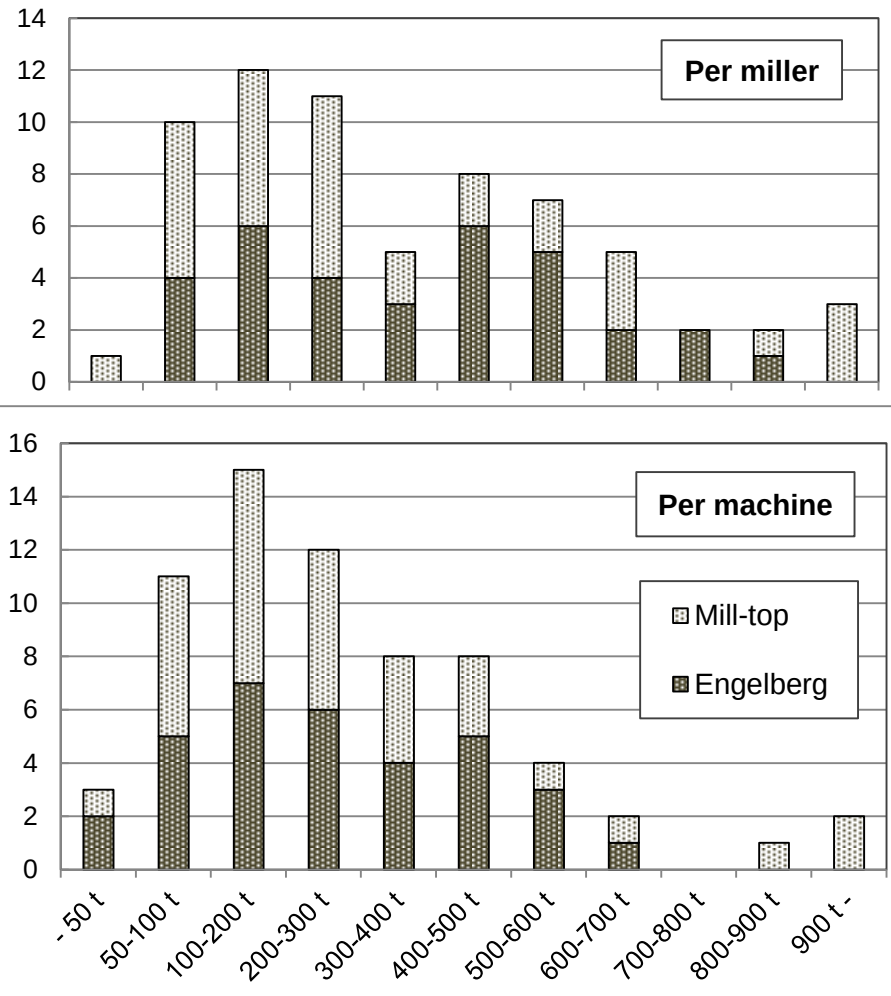

Fig. VII-2 Number of rice millers by quantity of paddy rice milled per year, per miller and per milling machine

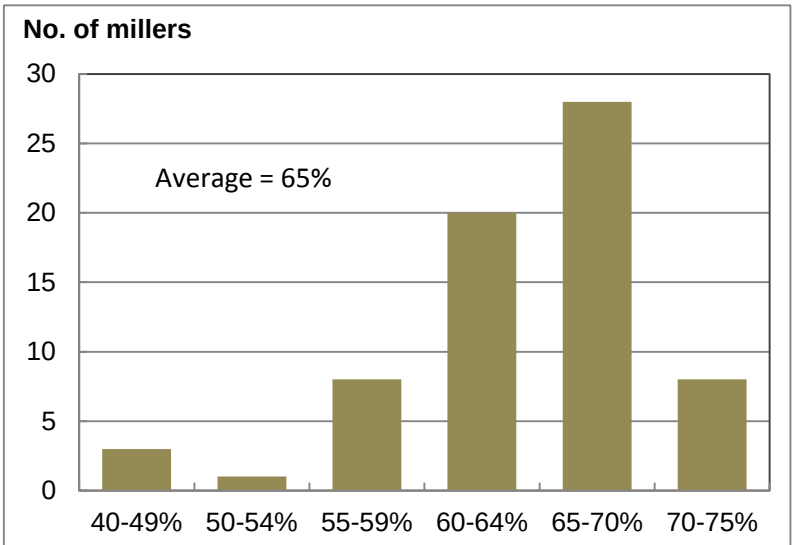

Fig. VII-3 Number of rice millers by the level of milled-rice-recovery rate, 2011-12

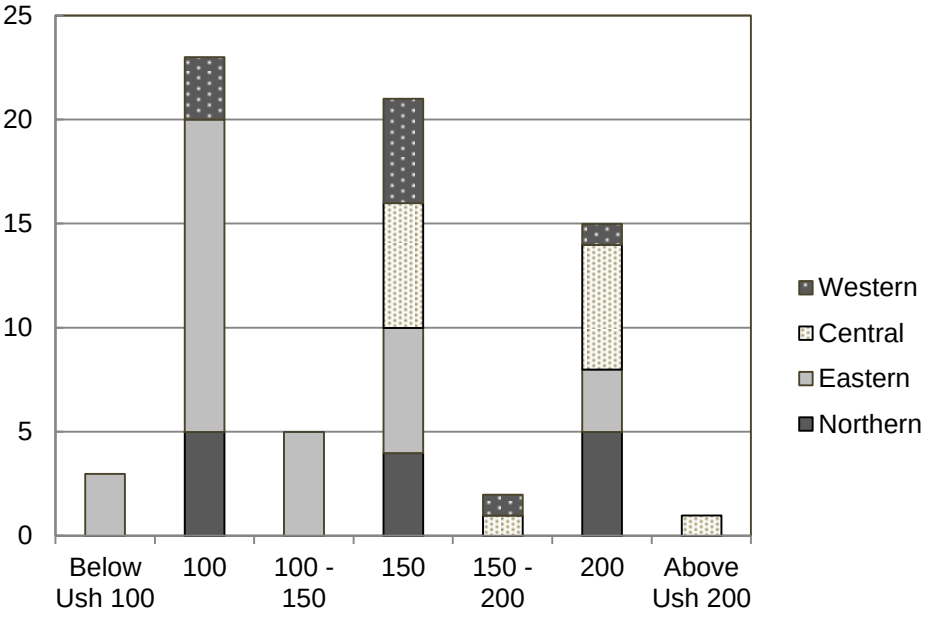

Fig. VII-4 Number of millers by the level of milling fee (Ush/ kg of milled rice)

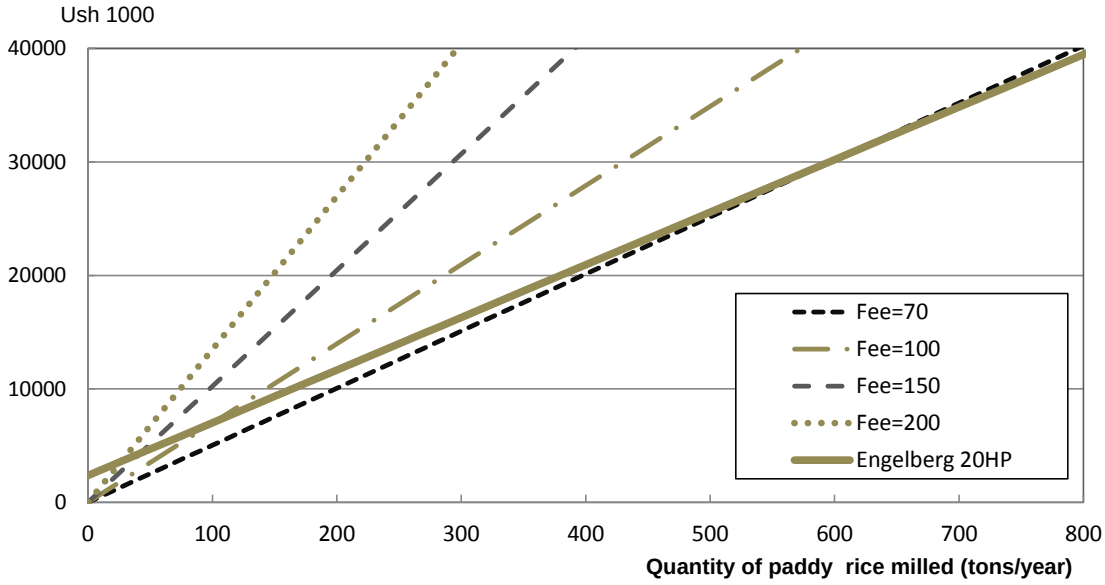

Fig. VII-5 Revenue functions for four levels of milling fee and cost function of rice miller with Engelberg 20HP

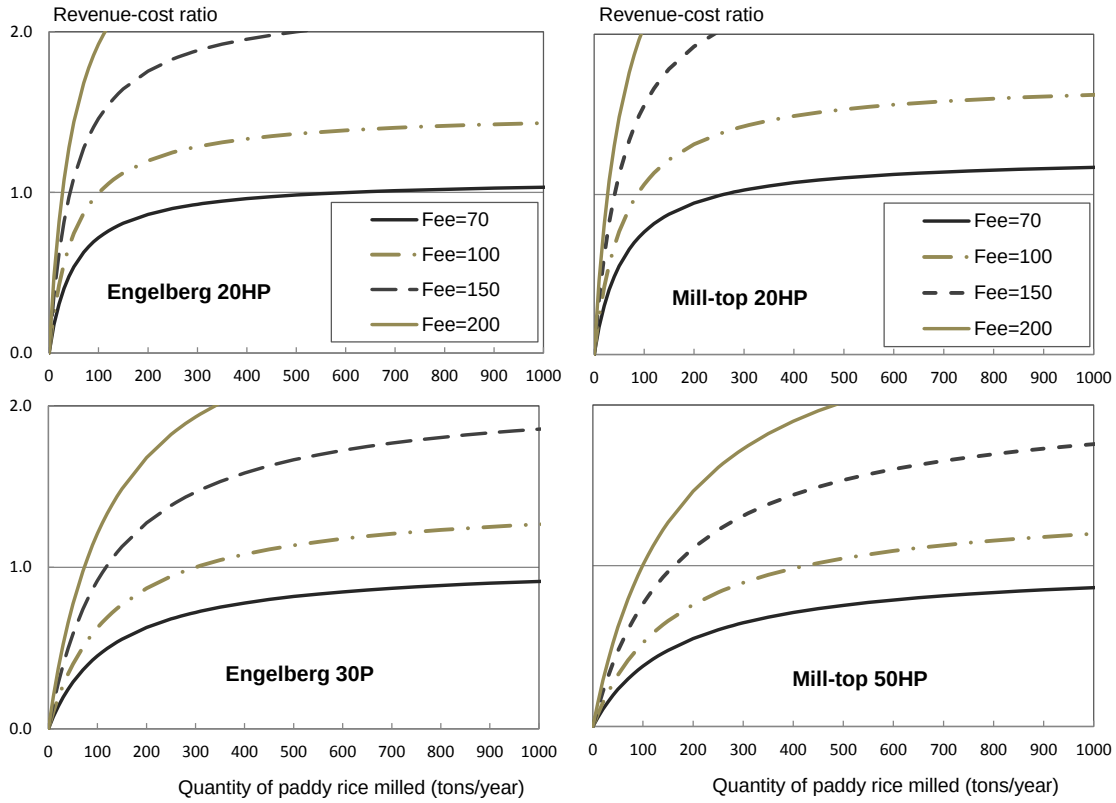

Fig. VII-6 Revenue-cost ratio of rice mill operation by type and HP of milling machine and by level of milling fee

Chapter VIII. Summary and Conclusions

This is a report of a reckless attempt to draw a full view, however rough it is, of the rice sector in Uganda, based on a set of primary data collected, through interview surveys, from 382 participants in the rice marketing chains stretching from the farm-gate in rice producing districts to the consumer markets in Kampala. Included in the participants are rice brokers, rice wholesalers, rice vendors, rice retailers, rice millers, supermarkets, agro-input suppliers, transporters and rice importers, both in districts and in Kampala. The components by which the full view is drawn are the structure of rice consumption by region and by brand, the quantity of domestic rice production by region and by variety group, the distribution of rice among the regions in the country and between foreign countries, the structure and workings of rice markets including all stages of the post-harvest marketing chains, the international competitiveness of domestic rice production and the rice mill industry that takes the strategic position in the post-harvest rice marketing chains.

Major findings and their implications are summarized by component as follows:

The structure of rice consumption

1. It is estimated that the total rice consumption in Uganda in 2011-12 was 170,000 tons, of which 70% was satisfied by domestic production and 30% by import. Of the total consumption, 35% was consumed in Kampala and 65% in outside Kampala, which leads to the estimates of per capita rice consumption per year of 6 kg for the country as a whole, 34 kg for Kampala and 5 kg for outside Kampala.
2. The structure of the rice market in Uganda is clearly segmented into two: higher segment and lower segment, the former consisting of supermarkets and the latter of public markets and small grocery stores. In the upper segment, high quality, expensive rice is sold in packs beautifully labeled with numerous brands, whereas in public markets and small grocery stores, reasonably-priced rice of 'ordinary' quality is sold, with rare exceptions, in loose. Of the total quantity of rice sold in the country, mere 5% is sold in supermarkets and the rest 95% sold in the lower segment.
3. The rice market in the lower segment, in Kampala and outside Kampala alike, is characterized by a small number of rice 'brands'. For domestic rice, there are virtually only two' brands', Supa and non-Supa. The latter consists of two sub-'brands', Kaiso and Upland, but they are hardly distinguished in terms of their prices. Supa is most

preferred ‘brand’ by Ugandan consumers, commanding a higher price than non- Supa ‘brand’. Since a bulk of rice imported from Pakistan, Vietnam and Tanzania is priced to be competitive to local Supa, for rice as a whole, there are only two ‘brands’, as far as the price is concerned.

4. The quality of rice that matters in the ‘ordinary’ rice market in Uganda is not so sophisticated yet. Only three points make some quality differences: cleanliness (without stones and other odd materials), whiteness (color) and brokenness (shape), the first point being most important. A difference between domestic rice and imported rice, both found in public markets, is the cleanliness of rice: the latter is assured in this respect. Rice retailers in the lower segment of the rice market try to clean it manually before selling, but its cleanliness is by no means the same as for imported rice.
5. Though the national rice market is segmented, the two segments are overlapping. A small quantity of high quality, packed and branded rice with higher prices is found in public markets, and ‘ordinary’ rice, procured from the ‘ordinary’ post-harvest market chains, is sold in simple packs with ‘ordinary’ prices in supermarkets. A definite prospect for the rice market in future is that the extent of overlapping between the two segments increases over time. Under that process, the quality of a massive quantity of rice circulated in the lower segment is getting improved.
6. How fast this change proceeds depends on how fast the economy develops. As the economy develops and household income goes up, the consumers’ preference for higher quality rice increases. Such changes are conveyed, through the rice market, to the rice traders and rice producers, to deal with the demand. This is bound to occur without any government intervention. The rice market in Uganda, as we observe, works well to such an extent that it absorbs such changes spontaneously. Since rice farmers generally sell their produce after milling, they know the quality of their rice. Therefore, the need of the rice market for higher rice quality would reach the field level smoothly.

Production and distribution of rice

7. The estimation based on the quantity of rice milled in the country gives an estimate of the total domestic rice production in 2011-12 of 232,000 tons, which nearly tallies with the estimate obtained from the rice consumption side data, with a statistical discrepancy of 4,000 tons. Comparing to the total production in 2008, estimated in the same way, rice production in Uganda is nearly doubled with an annual growth rate of 17%.
8. Among the eight regions in the country, East-far is the largest rice producers, followed by East-near, North and West in that order. The rates of increase in production since

2008 have been precipitous in all these major rice producing regions, except for East-near. Central-east has been joining this major group. In contrast, rice cultivation is nearly nonexistent in Central-west. In Uganda, in addition to ordinary rice farmers (smallholders), some estates and food companies produce rice.

9. Reflecting the demand in the consumer market, rice varieties recognized by rice mills are limited to a small number. The three variety groups, i.e., Supa, a lowland variety produced mainly in East-far, North and East near, Kaiso, a lowland variety produced almost exclusively in Eastern regions, and Upland, produced mainly in West and sold under the same 'brand' of 'Upland', take 30% each of the total rice production. The rice production by estates and food companies takes 3%. The rest consists of locally recognized varieties or brands, such as Sindano in North, Benenego and Buyu in Eastern regions and Kihihi in South-west.
10. Supa being the most preferred variety in the market, a bulk of non-Supa varieties is disguised as, or mixed up with, Supa. The percentage of Supa obtained from the consumption side data is about 50%, while it is about 30% in the production side. The 20% gap is filled up by Kaiso and Upland, particularly the latter.
11. Of the rice produced in the regions and put in the rice market chains, 50% remains in the region for the local consumption, 46% goes to the Kampala markets, and 4% is exported to neighboring countries. The market channels extending from the major rice growing regions to Kampala contain a bulk of rice, but aside from the major channels, smaller market channels are densely spread like a cobweb between the regions all over the country and across the borders. In these channels, rice is circulated in both ways, between the regions as well as between the regions and Kampala. Found in the channels between the regions and Kampala moving from Kampala to the regions is a bulk of imported rice, and Supa re-sold by Kampala wholesalers to wholesalers in the regions. All the regions, except for Central-west, directly export rice to adjacent countries across the border.
12. Among the regions, four major rice growing regions are net 'exporter' of rice and the remaining four regions are net 'importer'.

Structure and workings of rice market

13. A salient feature of the rice markets in Uganda is competitiveness. Along the post-harvest rice marketing chains spread like a cobweb all over the country, found are a large number of rice traders, such as village collectors, town brokers/ wholesalers, town retailers, Kampala wholesalers/ suppliers, and Kampala vendors/ retailers. Many of them go around in the cobweb marketing channels for procuring rice year round.

Around rice mills in rice growing regions, many town brokers and buyers from Kampala and other regions always gather and rice is transacted between them in cash. In short, it resembles to the typical competitive market explained in economics textbooks.[124]

14. For the markets in Kampala, the market prices of rice during March-April 2012 at the wholesale and retail stages are examined. The brands include Supa, Kaiso, Upland, 'ordinary' Pakistan, Vietnam and Supa Tanzania (Supa TZ). For each 'brand' of rice, the price variations are small, indicating that each 'brand' of rice is a good of the same quality, for which the same market price is established. Among the three 'brands' of domestic rice, throughout the wholesale and retail markets in Kampala, Supa commands significantly higher prices than Kaiso and Upland, while the prices of Kaiso and Upland cannot be distinguished statistically. These findings confirm that the rice market in Kampala formed by the public markets contains virtually only two kinds of 'brands', i.e., Supa and non-Supa.
15. The large inflow of imported rice does not alter this structure of the market. For the retail stage, the prices of three major 'brands' of imported rice are all not statistically different from the price of Supa, which implies that the prices of imported rice are set by rice retailers so as to be competitive with Supa local. Altogether, the price structure of the Kampala rice markets is simple, in which there are only two price strata, one is for Supa and imported rice and the other is for non-Supa, i.e., Kaiso and Upland.
16. The rice prices in each price stratum show a remarkable uniformity across public markets in five different divisions in Kampala, except for Kawempe Division, which, being situated in the northern part of Kampala, has a locational advantage to receive rice sent from the rice producing regions in North and West at cheaper prices. There is no price differentiation as to from which producing regions rice comes, which indicates that there is no 'producing area brand'.
17. For the rice markets outside Kampala, the rice prices of the same six 'brands' at the three market stages are examined. Our data reveal a remarkable uniformity in the market prices of rice across the regions. Despite the fact that the price data are collected from extensively dispersed regions, the degree of variations in the rice prices is as small as in the Kampala markets, and the rice prices are not different among the regions for the same 'brands'. The price structure in the rice markets in the regions is

[124] A big difference from what the (old) textbooks explain is that the present day rice traders are equipped with mobile-phones, the use of which is a powerful means to minimize the information asymmetry in general and on price information in particular. Of the respondents in the series of our surveys, all but a rice retailer in a Masindi market had one or more mobile phones. For the role played by mobile phone in agricultural marketing, see Muto and Yamano (2009).

also the same as in Kampala, including the role played by imported rice that is placed in the market to satisfy the demand for the higher-quality stratum.

18. For the domestically produced rice, the market in the regions outside Kampala extends from farm-gate to retail stages in the regional markets. This regional market is integrated at its third stage with the market in Kampala by market transactions between rice brokers in the regions and rice wholesalers in Kampala. Our data confirm that the three groups of rice price found at this stage, i.e., the selling price of city/ town brokers, the buying price of city/ town retailers and the buying price of Kampala wholesalers are identical. The rice markets in Kampala and outside Kampala are integrated smoothly, so that the price structure is homogeneous throughout the integrated national rice market. With respect to the formation of the uniform price, the rice markets in Uganda work excellently well.
19. With the data at hand on the rice prices at all stages in the rice market chains from the farm-gate all the way through to the retailers in Kampala markets, we examine the price margins at all the stages by accounting for marketing costs inherently incurred in the process rice is brought from the farm-gate to the consumers. Many cost items are involved, such as rice milling, transportation, loading and offloading rice sucks, rent for storage space, taxes and duties including lubricant payment for traffic officers, rice cleaning by picking out stones, etc., aside from rice traders' management inputs and various risks involved in the transactions in the market chains.
20. Taking the most popular 'brand' of Supa as an example, at the time of our survey in March-April 2012, the farm-gate price was Ush 2600 per kg of milled rice in a rounding number, and the selling price at the Kampala retail markets was Ush 3700 /kg, making the total price margin Ush 1100 /kg or about 30% of the final price. There are four stages in the post-harvest rice marketing chains, each marketing stage taking a margin ranging from Ush 200 /kg to Ush 300 /kg.
21. In the entire market chains from the farm-gate to the Kampala retailers, rice in a sack, which weighs 100 kg /sack, is transported, loaded and offloaded at least four times. The total transportation costs including on- and off-loading, however, is not so large, if the arduous works for long-distance truck driving on poor roads and carrying heavy sacks on shoulders are considered: It takes 20% of the total margin or 6% of the final price.
22. At each stage, by subtracting from the margin at that stage all the marketing costs incurred in that stage, estimated are the returns to the rice trader who works at that stage as a middleman. The total of the returns left for the rice traders at each stage is Ush 320 /kg; 30% of the total margin or 9% of the final price. The returns to the rice

traders at each stage, on average for the four stages, Ush 80 /kg, is supposed to include the returns to their labor work, managerial ability and the costs for bearing the risks, in addition to their profits. From various criteria, it is difficult to regard this level of returns to rice traders excessively high. In particular, if various risks that rice traders have to face, such as price fluctuation, unexpected rice quality, and accident and theft during transportation, are considered, this level may be said reasonable or even humble. Indeed, in the previous peak harvesting season when the rice prices were lower than the March-April 2012 by about 30%, the returns to rice traders fell down to Ush 31 /kg /trader /stage, which is lower than the labor cost of rice cleaning, usually worked by hired women, of Ush 50 /kg.

23. It is a very popular, pervasive, persistent, stereo-typed belief deep-rooted among farmers and general public that middlemen working in the post-harvest marketing chains absorb an exorbitant profit out of their trading activities. The rice value-chain, the term often heard recently, seems to be based, at least partly, on the same belief as this popular belief, because the concept assumes that there are a lot of opportunities to increase the 'value' of rice in the chains between the farm-gate and the consumers. If we set aside some value-added production activities, such as food processing, the only source from which some 'value' can be extracted is the returns to rice traders. Our scrutiny of the entire rice post-harvest market chains reveals that such a belief is an illusion. In the marketing chains, neither rice traders absorb an excessive profit, as perceived by the popular belief, nor there is any gold mines buried, as assumed by some proponents of the rice value-chain theory. In the post-harvest rice marketing chains, the traders' returns are 'moderate', not 'excessive', for all the market stages, except for the second stage. Whether the brokers' returns in rice producing areas is 'moderate' or 'excessive' is left pending because of data limitation, but the degree of 'excessiveness', if any, is a matter of a few percent of the entire price margin between the farm-gate and the final consumer price.
24. The rice marketing is a production process where rice traders combine factor inputs to produce a product, that is, the marketing service in that they transfer rice over spaces and over time. As in other production processes, the owners of the factor inputs used in this production process receive their remunerations according to their marginal contributions. For the entire rice post-harvest marketing chains in Uganda, the factor shares, which show how the income (value-added) generated in the production process (= the total price margin less the value of current inputs used) is distributed among resource contributors, are estimated as follows: current inputs, such as electricity used in rice milling and fuels in transportation, 15%; labor, such as labor for loading and

offloading, rice milling, driving trucks for transportation, and cleaning rice, 24%; land and real property, such as rent for storage space, stores, rice mill workshop, and trucks, 11%; capital, including the costs of capital inputs such as rice milling machine and truck, capital interests for funds used in the rice transactions and the returns to rice traders, 50%. As compared to the rice production process, a distinct feature of the rice marketing is that it is a capital intensive production process as indicated by its high factor share of capital.

25. Any changes in technology and prices in this production process would change factor combinations, which in turn results in changes in income distribution. For example, the improvements in the road infrastructure, which is the 'technology change' most wanted not only for the rice marketing but also for many other economic activities, would reduce the marketing costs by reducing the transportation costs and the risk in transportation. It should be clear that in a competitive market like the rice market, *ceteris paribus*, the fruits of such a technology change would be reaped by the final consumers through the reduction in the market price of rice.
26. As revealed by the examination of rice consumption, the shift of the demand for higher quality rice is already going on and will be much more strengthened in the future. If the rice-value-chain theory implies that the quality of rice must be improved, so that farmers and participants in the post-harvest marketing chains can receive higher value-added through higher rice prices, it is partly right. They can receive forerunners' profit in the process of the quality improvements, which may last long, though. In the long-run, however, the gain stemming from the improvements will be transferred to the consumers, as is the case of technology change, through the reduction in the market price of rice of good quality.

International competitiveness of rice production

27. With the data on the marketing costs made available in our study, we examined the international competitiveness of domestic rice production *vis-à-vis* imported rice by estimating the domestic resource cost ratio (DRCR). 'Ordinary Pakistan' (the cheapest rice imported from Pakistan' and Supa TZ are selected as the imported rice to be compared with domestic rice. The Kampala CIF price, measured at the Kampala wholesale market, is estimated to be Ush 2100 /kg for Pakistan (without the import levy of 75%) and Ush 1800 /kg for Supa TZ (without the with-holding tax of 6%). For the production costs of domestic rice, eight cases are provided, of which for four cases, data are taken from earlier studies that collected rice production data from farmers cultivating rice under various conditions, and for other four cases, data are obtained from various

irrigation projects in order to know how the competitiveness would be if irrigation infrastructure is installed.

28. The estimated DRCRs reveal that the competitiveness of domestic rice production is fragile for rainfed rice cultivation, including both lowland and upland, which takes more than 95% of the entire rice cultivation in Uganda. 'Ordinary Pakistan' is not a serious problem even without the import levy, but Supa TZ imported from Tanzania is a real threat to the rainfed rice cultivation in the country. The sensitivity analyses indicate that in order for the domestic rainfed rice production to be competitive with Supa TZ, the rice yield has to be increased from 1.9 t /ha to 2.4 t /ha for rainfed lowland production with negligible modern inputs, from 1.7 t /ha to 2.1 t /ha for rainfed upland production with negligible modern inputs and from 2.7 t /ha to 3.0 t /ha for rainfed upland with NERICA 4 with some modern inputs.
29. In the case of irrigated lowland rice cultivation actually practiced in the Doho irrigation scheme, rice production is highly competitive to Supa TZ, if the construction cost of irrigation infrastructure is treated as a sunk cost. The estimation that includes the construction costs reveal that if the level of the investment cost is as high as that of large scale major irrigation projects implemented in sub-Saharan Africa in the last few decades, the chance is slim for domestic rice production to be competitive with imported rice, even if the performance of the newly constructed irrigation system is as high as attaining 6 t /ha of yield per crop and complete double cropping per year. It is shown, however, that small- and micro-scale irrigation construction projects in lowland ecology and rain-water harvesting system in upland ecology could be far more economically viable methods of irrigation development, in which the competitiveness of domestic rice production is made sufficiently strong to outpace Supa TZ.
30. Altogether, the international competitiveness of domestic rice production by rainfed rice cultivation is weak, particularly with respect to rice import from Tanzania that produces rice at a lower-cost under irrigated conditions. However, the degree of un-competitiveness is not so large that a high possibility exists for rainfed rice cultivation, particularly rainfed upland, to be in an internationally competitive position by improving the yield level and enhancing the efficiency of rice production. Irrigated rice cultivation in Uganda is very limited in area, less than 5% of the total planted area to rice. It is possible to develop irrigated rice cultivation by developing irrigation facilities, but the type of irrigation development feasible in Uganda is limited to small- and micro-scale projects for lowland rice cultivation, and rain-water harvesting for upland rice cultivation, for which it is critical to attain high yield of rice per unit of land. Regardless of irrigated or rainfed, what is most essential to increase the competitiveness in domestic rice

production is to increase the productivity of rice production, and under the present rice production conditions in Uganda, the most feasible way for increasing the productivity is to increase yield per unit of land.

The rice mill industry

31. Our market study makes it clear that the improvement in the quality of rice in the public markets that form the vast lower segment of the national rice market is the inexorable future of the rice sector in Uganda. Being at the entry point in the upstream of the post-harvest marketing chains, rice mills hold the pivotal position in the improvement of the quality of rice in the market: if rice quality is to be improved, it is a necessary condition to improve the quality of rice milling. There are many points on farm before the farm-gate that need improvements for higher rice quality, but even if all these points are remedied, it is obvious that the rice quality problems persist unless the quality of rice milling remains as is. Considering the well-functioning rice market, the need of quality improvement would be conveyed aptly to rice millers when it arises.
32. The rice mill industry in Uganda has developed at a remarkable pace since the early 2000s. The high profitability of rice milling business and a low entry barrier have attracted entrepreneurs from various social circles, not only agriculture related but also non-agriculture sectors. Now, the industry seems to have been approaching a maturing stage. In newly emerging rice growing regions of West, Central and the upland dominating part of North, the industry is still at a late development stage, but in Eastern regions and the lowland dominating North, with relatively longer history of rice mill development, coupled with the recent 'rice-mill boom', the industry is at a mature stage. The levels of rice milling fee lower than Ush 100 /kg in Eastern regions, in contrast to the higher levels of Ush 150 /kg to Ush 200 /kg prevailing in newly emerging rice growing regions, are an apparent sign of the degree of competition that the rice milling market is undergoing, and in this respect, the mature stage is nothing but the stage of adjustments. Considering the rapid pace of the development, it is anticipated that the newly emerging rice growing regions will go into that stage very soon.
33. The scale economy inherent in the rice mill operation inevitably makes the changes that occur in this adjustment stage a shift of rice mills towards a larger scale of operation. The emergence of large scale rice mills in Eastern and Northern regions is a genuine sign of the direction that the rice mill industry is heading. For small rice mills, the changes that would take place are sifts from 'old fashioned' Engelberg to mill-top machines, or even more modern machines and from small HP to large HP machines or single-machine to multi-machine operations. Small rice mills with a small HP machine

would remain in a smaller number for filling up the demand for milling service derived from the demand for rice coming from consumers for whom the quality of rice does not matter.

34. Although the quality of rice is not so important yet in the national rice market, the demand for rice of higher quality will increase steadily as the Ugandan economy grows. Such a shift in the rice market would accelerate the adjustments in the rice mill industry. As the quality of rice becomes important, the level of milling fee may be differentiated according to the quality of rice milling that a rice mill can supply. This would also work as a pressure for small rice mills with a small HP machine to exit the industry, strengthening the polarization of the industry into small rice mills with small scale of operation to satisfy the indigenous demand in the localized markets and those with large scale of operation, including large scale rice mills, aiming at the national market.
35. The low entry barrier that is a characteristic of the rice mill industry is due largely to the fact that the need for the initial investments is relatively small. As the scale of operation becomes large as the scale economy requires, the rice milling machines may also become large. In fact, the present large scale machines used by large scale rice mills are already very large, and sophisticated, as compared to the machines used by small rice millers. If the shift to a large scale operation necessitates the use of such large, expensive machines, it inevitably makes the entry barrier higher than at present. The result of the shift under the present conditions of the rice sector could be to purge small scale rice mills completely out of the industry, and replace the present competitive rice milling market by the oligopolistic one, which is not desirable socially as well as economically. One way to cope with such a situation would be to develop efficient small to medium scale machines with quality improvement features such as de-stoning and grading, and foster multi-machine rice mills so that small scale rice millers can enjoy the scale economy step by step, countervailing against the scale economy of large scale rice mills.

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Appendix Table 1. Regions adopted in this study

Region	District [a]	Area planted to rice in 2008-09 (ha/year) [b]	New districts created in 2010 [c]
Kampala	Kampala	0	
North West	Maracha (Nyadri)	684	
	Yumbe	581	
	Koboko	358	
	Arua	231	
	Nebbi	148	Zombo
	Moyo	54	
North	Amuru	7,771	
	Lira	6,703	Alebtong, Otuke
	Pader	3,036	
	Gulu	2,941	
	Oyam	1,104	
	Kitgum	659	Agago, Lamwo
	Dokolo	595	
	Adjumani	534	
	Apac	514	Kole
	Abim	0	
	Amolatar	0	
	Kaabong	0	
	Kotido	0	
	Moroto	0	Napak
	Nakapiripirit	0	Amudat
East Far	Pallisa	6,247	Kibuku
	Soroti	2,017	
	Tororo	1,773	
	Butaleja	1,761	
	Busia	1,438	
	Mbale	1,358	
	Budaka	749	
	Amuria	922	
	Kumi	472	
	Bukedea	392	
	Sironko	180	Bulambuli
	Kaberamaido	111	Kween
	Katakwi	105	
	Bududa	0	
	Bukwo	0	
	Kapchorwa	0	
	Manafwa	0	
East Near	Bugiri	5,853	
	Iganga	3,676	Luuka
	Mayuge	2,566	
	Kaliro	2,555	
	Kamuli	1,839	Buyende
	Namutumba	1,583	
	Jinja	746	
Central East	Mukono	1,065	Buikwe, Buvuma
	Kayunga	752	
	Wakiso	449	
	Luwero	149	
	Mpigi	116	Butambala, Gomba
	Kiboga	57	
	Nakaseke	50	
	Kalangala	0	
	Mityana	0	
	Nakasongola	0	
Central West	Masaka	0	Bukomansimbi, Kalungu, Lwengo, Sembabule, Kyankwanzi
	Mubende	0	
	Lyantonde	0	
	Rakai	0	
South West	Rukungiri	831	
	Kanungu	566	
	Bushenyi	0	Buhwenju, Mitooma, Rubirizi, Sheema
	Isingiro	0	
	Kabale	0	
	Kisoro	0	
	Mbarara	0	
	Ntungamo	0	
West	Hoima	5,919	
	Kibaale	1,762	
	Masindi	1,070	Kiryandongo
	Kamwenge	127	
	Bundibugyo	110	Ntoroko
	Kasese	50	
	Kabarole	37	
	Ibanda	31	
	Bullisa	0	
	Kiruhura	0	
	Kyenjojo	0	Kyegegwa

a) Districts prior to the administrative reorganization of 2010.

b) Area planted to rice in the 2008/09 Csnsus, with the figure for the 2008 2nd season of Amuria adjusted (Kikuchu et al. 2013).

c) Districts created by the 2010 administrative reorganization.

Appendix Table II Number of rice millers in Uganda, 207, 208 and 2012, by district [a]

	2007	2009	2012		2007	2009	2012
Northwest (8%/yr) :				**East near** (6%/yr) :			
Arua	2	4	4	Bugili	49	49	56
Koboko	2	2	3	Iganga	24	43	23
Maracha	*3*	*3*	4	Jinja	7	*7*	9
Moyo	2	3	3	Kaliro	19	*19*	24
Nebbi	0	*2*	3	Kamuli	10	34	10
Nwoya	*6*	*7*	9	Mayuge	15	*15*	41
Yumbe	4	4	3	Namutumba	12	*12*	10
North (11%/yr) :				**Central eas**t (8%/yr) :			
Adjumani	2	2	19	Kalangala	1	*1*	*1*
Amolatar	0	0	0	Kampala	2	*2*	*3*
Amuru	2	6	5	Kayunga	3	10	3
Apac	0	3	2	Kiboga	5	*5*	*7*
Dokolo	0	*3*	4	Luwero	10	*10*	20
Gulu	9	*9*	14	Mityana	1	3	*1*
Kitgum	0	*1*	1	Mpigi	3	5	*4*
Lamwo	0	0	0	Mukono	3	3	7
Lira	19	*19*	29	Nakaseke	8	10	10
Oyam	0	*1*	1	Wakiso	4	*4*	4
Pader	0	*1*	2	**Central west** (0%/yr) :			
East far (11%/yr) :				Masaka	2	2	*2*
Amuria	1	2	3	Mubende	0	1	*1*
Budaka	12	*12*	*18*	Rakai	1	1	*1*
Bukedea	2	3	*3*	**Southwest** (1%/yr) :			
Busia	2	*2*	1	Bushenyi	4	2	1
Butaleja	40	*40*	60	Kanungu	11	*11*	*12*
Kapchorwa	2	*1*	0	Rukungiri	15	*15*	14
Katakwi	0	*1*	2	**West** (20%/yr) :			
Kween	*1*	*1*	2	Hoima	14	17	60
Kumi	1	*7*	9	Ibanda	0	1	*2*
Mbale	14	*14*	12	Kabarole	4	5	3
Pallisa	32	33	*48*	Kamuwenge	5	3	1
Serere	*2*	*3*	4	Kasese	1	4	*7*
Sironko	2	5	1	Kibaale	5	*5*	12
Soroti	12	16	12	Kyenjojo	1	*2*	*2*
Tororo	1	*8*	11	Masindi	4	*4*	3

a) Original data are from Alphonse et al. (2008) for 2007, Kijima (2012) for 2009 and PRiDe Phone Survey and PRiDe Rice Market Survey for 2012. The percentage figures in parentheses after the region name are the average rates of change in the number of rice millers, estimated based on Alphonse et al. (2008) and the two PRiDe Sueveys. An extra large rice mill of a company in Bugili is not included for all the three years.

Figures in italic are estimated by adopting one of the following methods:

i) For districts, for which the data are missing in 2007, extrapolate either from 2009 or from 2012 by using the region's average rate of change;

ii) For districts for which data are missing in 2012, extrapolate either from 2007 or from 2009 by using the rate of change;

iii) For districts for which data are missing in 2009, interpolate by using the rate of change.

iv) For districts for which the number of rice millers in 2009 is less than that in 2007, assume that there was no change in the total number of the millers.

Appendix: Questionnaire 1

Rice Market Survey 2012 (Vender/small retailers) JICA PRiDe Project

Date of interview: _____ Place (market) of interview: _____

Name of person interviewed: _____ Age: Sex: Experience (yrs): _____

Name of shop/company: _____ Building/Street/Shop#: _____

Contact phone: _____

	Rice sold/handled					Price (HV time / Now)			
	Variety	Qt. at shop /stock	Unit	District produced	Bought from	Buying	Unit	Selling	Unit
1									
2									
3									
4									
5									
6									
7									

	Variety	Turn-over rate		Costs								
		Rate	Unit	Transport	Unit	On-loading	Off-loading	Weigh-ing	Sewing	Sack	Cleaning	Tax
1												
2												
3												
4												
5												
6												
7												

Other costs (if any) _____

Rent: _____

Storage cost: _____

Appendix: Questionnaire 2

Rice Market Survey 2012 (Trader/wholesaler/middleman/broker) JICA PRiDe Project

Date of interview: _____ Place (market) of interview: _____

Name of person interviewed: _____ Age: Sex: Experience (yrs): _____

Name of shop/company: _____ Building/Street/Shop#: _____

Contact phone: _____

	Rice sold/handled					Price (HV time / Now)			
	Variety	Qt. at shop /stock	Unit	District/country produced	Bought from	Buying	Unit	Selling	Unit
1									
2									
3									
4									
5									
6									

	Variety	Turn-over rate		Costs								
		Rate	Unit	Transport	Unit	On-loading	Off-loading	Weigh-ing	Sewing	Sack	Cleaning	Tax
1												
2												
3												
4												
5												
6												
7												

	Variety	Sold to	Where buyers from (place %, place %, …; including foreign countries..)
1			
2			
3			
4			
5			
6			
7			

Other costs (if any) _____

Appendix: Questionnaire 3

Rice mill survey 2012

JICA PRiDe Project

Date _____

Name of miller _____

Address _____

Name of respondent _____ **Phone** _____

1 Are you the owner or manager of the mill ? _____

2 When did this mill start operation? _____

3 How many rice millers in this town/trading center? In the year you started _____ Now _____

4 How many rice milling machines do you operate? _____

5 **Type of milling machine**

Year installed	Type	Rubber or iron	Made in	Where bought	price (if bought now)	Electricity /Diesel		Horse power	Capacity (bag or kg / hour)

6 What did the owner do before starting rice mill? _____

7 What is the major business of the owner now? _____

8 Milling fee _____ /kg of milled rice or paddy Rice bran taken by farmers or mill

9 Milling rate _____ kg of milled rice / 100 kg of paddy

10 Month of operation Peak _____ Lean _____ No operation _____

11 Qty of rice milled (bag/d or /w) for last 1 yr

Peak months	Lean months
Unit (/d or /w); specify	

12 Distribution of paddy milled by source (%)

Brought by farmer	
Brought by middlemen	
Collected by the mill	
Where collected from (place %, place %)	

13 Distribution of paddy milled by variety

Variety	%	From where (place %, place %, …; including foreign country)

14 Is this mill trading rice at the same time? Yes No How many % of milled rice? %

If yes, (even if no, ask buying and selling prices by varieties)

Variety	%	Paddy or milled	Buying price				Selling price		Sold to whom & where (place %, place %, …; including foreign country)
			Paddy		Milled rice				
			Now	Peak	Now	Peak	Now	Peak	

Appendix: Questionnaire 4

Rice mill survey 2012 (Phase II)

JICA PRiDe Project

Date _____

Name of miller _____

Address _____

Name of respondent _____ Contact phone # _____

1 Are you the owner or manager of the mill ? _____

2 When did this mill start operation? _____

3 What did the owner do before starting rice mill? _____

4 What is the major business of the owner now? _____

5 Rice milling only or maize milling also? Rice only Rice + maize

6 If rice+maize, percentage share of rice / maize in the total milling fee revenue? Rice %; Maize %

7 How many rice milling machines do you operate? _____

8 Milling machine

Year installed	Type	Made in	Where bought	New or second-	Price (when bought)	Price (if bought now)	Electricity /Diesel	Horse power
1.								
2.								
3.								
4.								

Rated capacity	Actual capacity (bag or kg / hour)	Maintenance: Frequency	Maintenance: Costs for maintenance (parts, labor, others)	Usable life (years)	Value when scrapped *	Other remarks
1.						
2.						
3.						
4.						

* Scrap value (if any)

9 Mill workshop _____ m^2 Rent: How much? (if rented)** Ush / year or month

10 Storage? Yes or No If Yes, _____ m^2 Rent: How much? (if rented)** Ush / yr or mo

** If owned, ask the rent if rented in.

11 Milling fee / kg of milled rice or paddy (If different by season, ask separately)

12 Rice bran (subsidiary income for the mill)

Bran taken by farmers or by mill? Yes or No

If Yes, how many % of total rice bran generated taken by the mill? _____ %

The rate of bran per 100 kg sack of paddy rice? _____ kg / 100 kg of paddy

Price of rice bran: Ush _____ / kg of rice bran

13 Recovery rate _____ kg of milled rice / 100 kg of paddy

14 Month of operation and quantity milled (last one year)

Year / Month	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
Operated?												
Qty. milled												

15 Distribution of paddy milled by variety

Variety	%	Remarks

16 Operation costs

Fuel / electricity Ush _____ / hour of operation Fixed payment Ush _____ /mo

Oil etc. if diesel operated _____ liters diesel / hour of operation; Ush _____ / liter of diesel

Other operating costs, if any, _____ _____

17 Persons engaging in rice milling:

	No.	Work days / month: Busy season	Work days / month: Lean season	Work hours / day: Busy season	Work hours / day: Lean season	Salary/wage **
Owner						NA
Manager						
Operator						
Regular worker						
Temporary workers/ assistants/ helpers						

** Specify the rate: per month, per day, or per hour; or per sack milled? Paid or not paid in the lean season or when no operation?

Appendix: Questionnaire 5

Super-market Suirvey 2012 JICA PRiDe Project

Date:

Name of super-market: Location: ______________

#	Variety / Brand of rice sold	Price	Qt.at shop	Country of origin	Rate of sales	Unit	Remarks

Appendix: Questionnaire 6

JICA PRiDe Project

Transporter Survey 2012

Date: _____

Place of interview _____

Name of respondent _____ Phone _____

Name of company _____

Address _____

1. Lorry / truck driving

Owned/ hired	Type	Capacity	How much if bought now	Maintenance cost		Tax/duty	Other expenses
				Ush	Frequency		

2. Present trip

From where	To where	Distance	Fuel (diesel/gasoline)		Other expenses		Salary/wages		Allowance		Cargo
			Liter	Ush			Driver	Assistant	Driver	Assistant	

3. Fuel efficiency

	Fully loaded	Empty
Paved road		
Unpaved road		

4. Remarks:

Appendix: Questionnaire 7

Agro-inputs / farm implements survey 2012

JICA PRiDe Project

Date: Place: Name of shop:

For non-Kampala input dealers

	Unit	Selling price	Where bought	Buying price	TP cost
Round up					
Urea					
DAP					

For Kampala input dealers

	Unit	Selling price at Kampala	Imported component	Place of origin	Import price at the origin	Transport cost			Other costs
						Type of packing	From the origin to the border	From the border to Kampala	
Chemicals Round-up Fertilizers Inorganic (Urea) Organic Chicken manure Farm implement Hoe Panga (hatchet.) Planting fork Sprayer Tarpaulin (Nylon sheet)									