

添付資料6

## セネガル川流域農家調査結果

## The agricultural survey in the Senegal river valley

A questionnaire survey was carried out in January 2005, for 220 rice producers in 11 villages located in the Senegal river valley, with the main objective of grasping the present situation of rice farming practice.

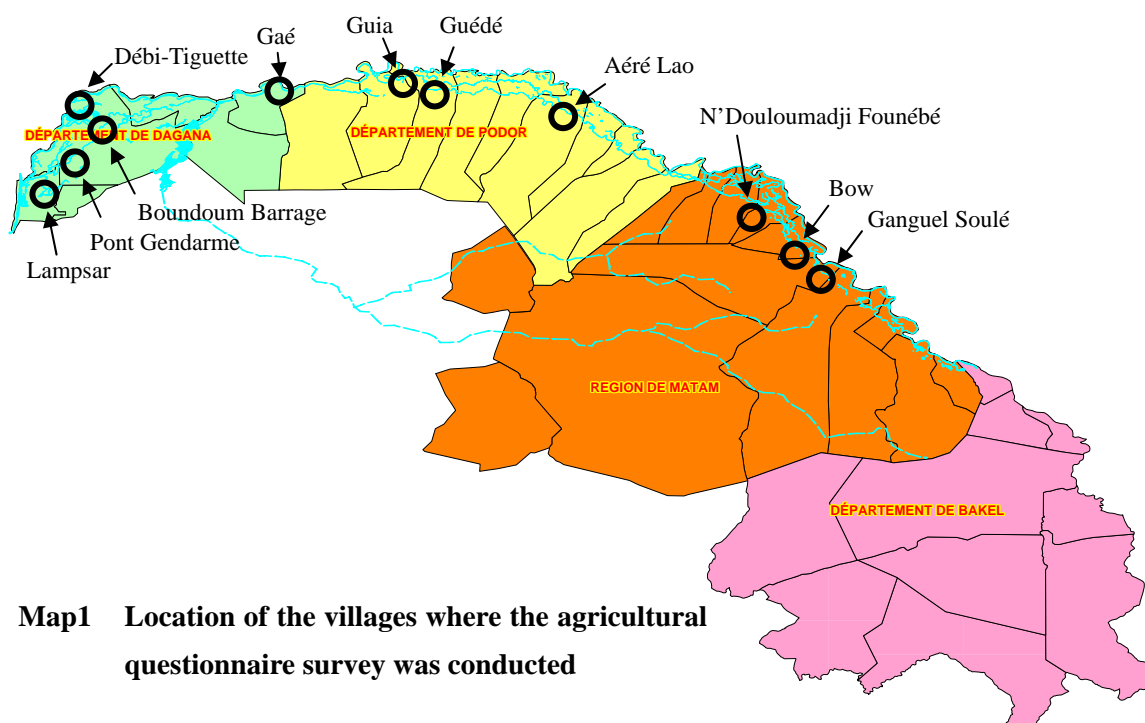
The 11 villages surveyed are listed below together with the location map.

Saint Louis: 1 village (Lampsar)

Dagana: 4 villages (Débi-Tiguette, Boundoum Barrage, Pont Gendarme, Gaé)

Podor: 3 villages (Guia, Guédé, Aéré Lao)

Matam: 3 villages (N'Douloumadji Founébé, Bow, Ganguel Soulé)



**Map1** Location of the villages where the agricultural questionnaire survey was conducted

The villages were selected in consideration of the diversity of the rice cultivation conditions in terms of farming scale, history of rice cultivation, spatial distribution, accessibility, donor's cooperation, etc. In each village, 20 farm households were interviewed. A questionnaire was prepared for this purpose (refer to the attachment to this Annex). The results of the survey were encoded into a computer for analysis.

It is noteworthy that the survey was carried out in close cooperation with DRDR Saint Louis and the Delegation of Matam, SAED.

The results are shown in the attached tables, and the summary of the analysis are described in the following.

## **1. About the family of the interviewed farmers (refer to Table 1)**

The average family size of the 220 farmers interviewed is 14.7 ranging from 4 to 40. The family size tends to larger in the villages located in the middle to upper reaches. The average family size in Ganguel soulé is the largest among the 11 surveyed villages at 20.8, followed by Guédé at 17.5 and N'Douloumadji founébé at 16.9.

The average number of economically active family members (age between 15 and 64) of all the interviewed farmers is 6.2, ranging from one to 21. It is the largest in Ganguel soulé at 9.2, followed by Guia at 7.8, Bow and Lampsar at 6.8 each. In all of the interviewed villages in Dagana, the average number of economically active population is lower than total average, ranging from 5.0 to 5.7.

## **2. Farming activities**

### **(1) Crops cultivated (refer to Table 2)**

All farmers interviewed cultivate paddy rice with the average scale of 1.5 ha, ranging from 0.1 ha to 10.0 ha. The average largest rice farming size is 4.1 ha in Débi-Tiguette, followed by 3.3 ha in Boundoum Barrage, 1.7 ha in Pont Gendarme. On the other hand, Aéré Lao farmers have the smallest rice field at 0.5 ha on average.

Paddy rice is cultivated mostly in the wet season. In Lampsar, eight farmers out of 20 interviewed practice rice cultivation in the hot dry season. 14 farmers in Boundoum Barrage out of 20 interviewed practice double cropping of rice.

Other crops cultivated include millet, sorghum, maize, cowpea and vegetables. In Ganguel soulé of Matam, 16 farmers out of 20 cultivate maize with an average area of 0.7 ha. Cereal crops other than paddy rice are mainly cultivated in Matam region.

### **(2) Animals raised (refer to Table 3)**

Animal husbandry is common practice in most of the villages interviewed. Some 70% of the farmers interviewed raise sheep or goat with 10 heads on average, 65% have horse or donkey/mule which is important transportation means with cart, 40% have 6 cattle on average, and 32% raise chicken. Other animals raised include duck and pigeon.

In general, more animals tend to be raised in the middle to upper reaches of the Senegal river: Podor and Matam.

### **3. Agricultural equipment/tools (refer to Table 4)**

More than 50% of the farmers interviewed possess a cart as transportation means.

Some 40% possess sprayers for applying agro-chemicals like pesticides. Sprayers are scarcely found in Matam where the use of chemical is not common.

Many farmers in Podor and Matam have a hoe. In particular, all the interviewed farmers of Guédé have at least one hoe, with 3.3 on average. On the contrary, almost all farmers (except one) interviewed in Dagana do not have a hoe.

Power equipment like threshers (batteuse), husking machines (decortiqueuse) and motor pumps, although low percentages, are mainly possessed by the farmers in large irrigation schemes such as Débi-Tiguette, Boundoum Barrage and Pont Gendarme.

It is noteworthy that many of the interviewed farmers in Guédé have more than one hoes and other agricultural tools including shovel, rake, etc.

### **4. Irrigation type (refer to Table 5)**

Interviewed farmers cultivate paddy rice under irrigation conditions. Type of irrigation differs from village to village, The farmers in Lampsar, Débi-Tiguette, Gaé, Boundoum Barrage, Pont Gendarme and Aéré Lao enjoy a high standard irrigation system (Grand aménagement and Aménagement intermédiaire) constructed by the Government with heavy investment. On the contrary, those in Guédé, Bow and Ganguel Soulé have so-called village irrigation system (PIV), which, although constructed by the Government initiative, is less quality development with less investment.

17 out of 20 interviewed farmers in Boundoum Barrage also cultivate paddy in the paddy field developed by the private initiative (PIP). In Gia, all the interviewed farmers cultivate paddy in PIP.

### **5. Land preparation (refer to Table 6)**

All the interviewed farmers use machinery service for harrow for land preparation. The service cost between FCFA17,000 and FCFA21,875 per hectare, depending on the location. Nine out of 20 interviewed farmers in Boundoum Barrage use the service for bunding at the cost of FCFA35,000 per hectare, and four farmers use the service for leveling at FCFA35,000 per hectare.

### **6. Varieties of paddy cultivated (refer to Table 7 and 8)**

The most popular variety of paddy is Sahel 202. Farmers in ten villages out of 11 villages

interviewed cultivate this variety, and the cultivated area under this variety is 133 ha or 41% of the total cultivated area (323 ha) by the interviewed farmers. The farmers in Guia and N'Douloumadji founébé use only Sahel 202.

The second most popular variety is Sahel 201 with 92 ha, or 28% of the total interviewed. In fact, this variety seems more popular in Dagana area, and is more widely planted than Sahel 202 in Débi-Tiguette and Pont Gendarme.

The third variety is Sahel 108 with 57 ha or 18% of the total interviewed. All the interviewed farmers in Guédé cultivate this variety.

Other varieties cultivated include IR1529, TCS-10 and Jaya.

While the cultivated varieties are diversified in Saint Louis and Dagana, farmers in Podor and Matam cultivate one or two varieties.

Although the reasons for the selection of variety for cropping are various among the farmers, most important criteria is high yielding habit, irrespective of the variety. As for Sahel 108, however, its physiological feature of short growth duration is the important selection criteria.

It should be noted that the farmers in Gaé may find difficulty in having their preferred varieties due to the fact that they select the varieties because of the availability of seeds. Also in Guia and N'Douloumadji founébé, they source the seeds from the previous harvest, suggesting that they have no other choice for selecting the variety.

It is interesting to note that farmers in N'Douloumadji founébé select Sahel 202 due partly to the reason for its good taste.

## **7. Sowing seeds (refer to Table 9)**

Direct sowing to the paddy field under the submerged condition is common practice in most of the village interviewed. In Aéré Lao, sowing is done under the moist field condition.

Sowing seeds on nursery bed for transplanting is also practiced in Guédé, N'Douloumadji founébé and Bow. In Bow, half of the farmers interviewed practice direct sowing and the remaining half practice transplanting.

Seedlings are transplanted to the main field at the age of 25 days to 32 days on average. The 20 interviewed farmers in Guédé answered the nursery period within the range between 23 days and 30 days, while those farmers in N'Douloumadji founébé answered between 25 days and 45 days.

## **8. Dosage and timing of fertilizer application (refer to Tables 10 and 11)**

Fertilizer application is a very common practice among the farmers interviewed. Of the 220 farmers interviewed 219 apply urea, and 194 apply DAP (di-ammonium phosphate). However, the application dosage varies a lot. Average applied amount of DAP is 121 kg/ha ranging from 20 to 700 kg/ha, and that of urea is 231 kg/ha ranging from 50 to 476 kg/ha. This wide variation of fertilizer dosage may be partly due to the financial constraint of the farmers in relation to the credit (CNCAS) and to the availability of fertilizer, both of which are the reasons for difficulty in obtaining fertilizer stated by the farmers.

The applied amount of fertilizer is slightly lower in the area where transplanting is practiced (Guédé and N'Douloumadji Founébé).

Time of fertilizer application also varies much. In case of direct sowing, DAP is applied at 16 days after sowing on average, ranging from 30 days before sowing to 80 days after sowing. In the field where transplanting is practiced, it is at 17 days after transplanting on average ranging from one day before transplanting to 30 days after transplanting.

Split urea application is a common practice except Podor. The first urea application is done at 23 days after sowing for direct sowing and 26 days after transplanting for transplanting. The second application is done at 42 days after sowing or 54 days after transplanting.

Considering the nursery period of nearly one month time, farmers who practice transplanting apply fertilizer at later stage of paddy growth comparing to those who practice direct sowing.

## **9. Irrigation and Drainage (refer to Table 12)**

Irrigation water supply condition is generally good from the farmers view point. Of the total farmers interviewed 73% or 160 farmers are satisfied with the irrigation. Satisfaction level is higher in the villages in Podor, while lower in those villages in Matam because of the insufficient amount of irrigation water supply caused by the siltation of canal or problem of diesel pump which leads to the high irrigation cost.

Irrigation water fee paid by the farmers varies from scheme to scheme ranging from FCFA40,000 to FCFA95,000 per hectare in rainy season cropping. Irrigation water fee is generally higher in the PIV where a diesel pump is set.

Drainage conditions are generally satisfactorily except NDouloumadji Founébé where there is no drainage facility.

Drainage related problems include inadequate drainage facilities, poor leveling, difficult working conditions, etc.

## **10. Control of disease/pest, weeds and birds (refer to Table 13)**

Some 63% of the farmers interviewed have problem with diseases/pest. Problem of insects prevails particularly in middle to upper stream area: Podor and Matam, while diseases are serious concern in Débi-Tiguette. Of the farmers having problem with insects, 78% use agro-chemicals to control them.

Weeding is mostly done by the use of herbicides. Some 68% of the interviewed farmers use herbicides. The use of herbicides is more common in middle to downstream area (Podor, Dagana and Saint Louis). In Matam, majority of farmers weed manually. In general the farmers who use herbicides do manual weed once in a cropping season. Exception is the farmers in Lampsar and Débi-Tiguette, where they do weed two times or more. The farmers in Matam where herbicides are not common also weed more than one time in a cropping season.

Birds are another threat to the farmers, particularly after the flowering. The farmers mainly cope with this problem by patrolling the paddy field or by standing scarecrows. The farmers of Guedé answered that they select a variety (Sahel 108) of which the paddy has an awn.

## **11. Harvest and threshing (refer to Table 14)**

Of the total of 220 farmers, only 10% or 22 farmers in three villages (Débi-Tiguette, Boundoum Barrage and Aéré Lao) use combine harvester to harvest paddy. The remaining farmers harvest paddy manually by either hiring labors or using family labors. The use of hired labor is more common in downstream area where the large scale farming is practiced.

Mechanized threshing using either combine harvester or power thresher is very common in downstream area (Saint Louis, Dagana and a part of Podor), while in upstream area, manual threshing is common.

## **12. Yield (refer to Table 14)**

Average paddy yield of all the interviewed farmers is 5.2 ton/ha, ranging from 1.0 ton/ha to 9.4 ton/ha. The average paddy yield by villages ranges from 4.0 ton in N'Douloumadji Founébé to 6.0 ton/ha in Ganguel soulé. The maximum yield in each village do not differ much, ranging from 7.4 ton/ha to 9.4 ton/ha, except for that in N'Douloumadji Founébé which is rather low with 5.6 ton/ha,

On the other hand, the lowest yields in each village differ much from 1.0 ton/ha in Guédé to 3.8 ton/ha in Bow and Ganguel soulé.

### **13. Destination of harvested paddy (refer to Table 15)**

Harvested paddy is spent for self-consumption, credit repayment, marketing, payment in kind and gift/donation. The arithmetic average share of each destination in total harvest is 42.2% for self-consumption, 27.8% for credit repayment, 14.4% for marketing, 9.1% for payment in kind and 6.4% for gift/donation, respectively. The share of self-consumption is much higher with more than 65% in the villages of Matam while much lower in Mboundoun Barrage and Pont Gendarme with less than 20%. Higher portion of harvested paddy is spent for credit repayment in Pont Gendarme and Débi-Tiguette with more than 50%.

As only three farmers out of 20 interviewed in Aéré Lao obtain credit, share of the credit repayment in total paddy spending is as low as 12%. Exceptionally low share of rice consumption for credit repayment (less than 1%) is seen in N'Douloumadji Founébé.

### **14. Rice consumption as staple food (refer to Table 16)**

All the farmers interviewed regard rice as the most important staple food mainly due to its availability. Some 70% of the interviewed farmers eat rice twice a day, 20% eat once a day, and 10% eat three times.

### **15. Credit obtained from CNCAS (refer to Tables 17 and 18)**

Of the total of the 220 interviewed farmers, 197 obtain credit from CNCAS. Total credit amount is FCFA62.7 million. Average credit amount per hectare is FCFA215,000, ranging from FCFA64,812 in Lampsar to FCFA269,000 in Débi-Tiguette.

As the cultivated area is larger in the downstream area (Dagana), the obtained credit amount is far larger there. In fact, the total credit amount of the 77 interviewed in the four villages in Dagana is FCFA45,402,782, accounting for 72% of the total credit amount of the 220 interviewed.

Many farmers interviewed have complaints against CNCAS. They are high interest rate (actually not!), complicated procedure, delay in reimbursement, indebtedness, unavailable credit, obligation of guarantee, etc.

### **16. Agricultural extension (refer to Table 19)**

More than 90% of the interviewed farmers obtain the know-how on rice cultivation from the agricultural advisors of SAED. Other information sources include neighbor farmers and CERP (Centre d'extension rural polyvalente).



Among the technical know-how obtained, useful ones are fertilizer application, seed selection, water management, disease control, harvesting time, etc.

The interviewed farmers further need to obtain the know-how on irrigation, diseases/pest control, marketing, fertilizer application, land leveling, post-harvest, etc.

### 17. Problems farmers are facing (refer to Table 20)

Among the problems the interviewed farmers identify, major ones include high production cost, diseases/pests/birds, marketing, lack of tractors, unavailable credit, low yield, lack of certified seeds, availability of fertilizer, etc.

It is noteworthy that there are only a few farmers who raised the problem of low quality of rice.

### Attached Table

Table 1 Family Size and Economically Active Family Members

#### Family size

unit: person

	St. Louis	Dagana				Podor			Matam			Average
	Lampsar	Debi-Tiquet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guéd é	Bow	Ganguel soulé	N'Douloumadji founébé	
Average	11.8	14.3	11.8	15.1	11.1	14.9	16.1	17.5	11.7	20.8	16.9	14.7
Maximum	40	22	23	30	20	25	26	30	23	36	30	40.0
Minimum	5	8	4	6	4	6	9	6	6	6	11	4.0

#### Number of economically active family members

unit: person

	St. Louis	Dagana				Podor			Matam			Average
	Lampsar	Debi-Tiquet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guéd é	Bow	Ganguel soulé	N'Douloumadji founébé	
Average	6.8	5.5	5.0	5.7	5.5	4.8	7.8	6.2	6.8	9.2	5.7	6.2
Maximum	21	12	14	16	17	8	20	15	11	18	12	21.0
Minimum	1	2	1	1	2	2	3	2	2	3	2	1.0

Source: Results of the questionnaire survey conducted by the JICA Study Team

Table 2 Cultivated Area by Crops

## Cultivated Area by Crops

unit: ha/household

	St. Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiquet	Gaé	Mboundou n barrage	Pont gendarm	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	Average
<b>Paddy (hot season)</b>												
Number	8	0	0	14	0	0	0	0	0	0	0	22
Total	7.3			30.4								37.7
Ave.	0.9			2.2								1.7
Max.	2.0			7.0								7.0
Min.	0.4			0.4								0.4
<b>Paddy (wet season)</b>												
Number	12	20	20	20	20	20	20	20	20	20	20	212
Total	11.6	81.3	19.7	65.6	34.4	9.1	20.7	19.9	16.2	17.7	17.6	313.8
Ave.	1.0	4.1	1.0	3.3	1.7	0.5	1.0	1.0	0.8	0.9	0.9	1.5
Max.	1.6	9.2	3.0	10.0	4.3	1.0	1.4	3.1	1.4	2.3	1.6	10.0
Min.	0.5	1.8	0.3	1.2	0.2	0.2	0.8	0.1	0.5	0.3	0.8	0.1
<b>Millet</b>												
Number	0	0	0	0	0	0	0	0	0	0	2	2
Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	2.0
Ave.											1.0	1.0
Max.											1.0	1.0
Min.											1.0	1.0
<b>Sorghum</b>												
Number	0	0	0	0	0	0	0	0	0	3	2	5
Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.9	2.0	8.9
Ave.										2.3	1.0	1.8
Max.										4.0	1.0	4.0
Min.										0.4	1.0	0.4
<b>Maize</b>												
Number	0	0	0	1	0	1	0	0	9	16	2	29
Total	0.0	0.0	0.0	1.0	0.0	0.1	0.0	0.0	1.1	11.8	1.0	15.0
Ave.				1.0		0.1			0.1	0.7	0.5	0.5
Max.				1.0		0.1			0.2	2.0	0.5	2.0
Min.				1.0		0.1			0.1	0.3	0.5	0.1
<b>Cowpea</b>												
Number	0	0	0	0	0	0	0	0	0	1	1	2
Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.3	0.8
Ave.										0.5	0.3	0.4
Max.										0.5	0.3	0.5
Min.										0.5	0.3	0.3
<b>Others</b>												
Number	0	0	0	5	0	0	0	0	0	2	0	7
Total	0.0	0.0	0.0	3.5	0.0	0.0	0.0	0.0	0.0	1.5	0.0	5.0
Ave.				0.7						0.8		0.7
Max.				1.0						1.0		1.0
Min.				0.4						0.5		0.4

Source: Results of the questionnaire survey conducted by the JICA Study Team

Table 3 Number of Raised Animals by Species

Raised Animals

unit: head												
	St. Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiguet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	Average
<b>Cattle</b>												
Number	3	13	5	7	5	19	5	13	1	13	13	97
Total	9	85	6	40	52	119	13	58	1	156	64	603
Ave.	3.0	6.5	1.2	5.7	10.4	6.3	2.6	4.5	1.0	12.0	4.9	6.2
Max.	5.0	17.0	2.0	18.0	30.0	18.0	7.0	24.0	1.0	50.0	10.0	50.0
Min.	1.0	2.0	1.0	1.0	1.0	2.0	1.0	1.0	1.0	3.0	2.0	1.0
<b>Horse</b>												
Number	0	11	7	5	2	18	11	10	2	15	19	100
Total	0	15	10	7	2	19	12	11	2	16	21	115
Ave.		1.4	1.4	1.4	1.0	1.1	1.1	1.1	1.0	1.1	1.1	1.2
Max.		3.0	3.0	2.0	1.0	2.0	2.0	2.0	1.0	2.0	2.0	3.0
Min.		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
<b>Donkey/mule</b>												
Number	4	4	5	12	5	15	1	3	2	6	2	59
Total	6	10	10	25	6	32	2	4	3	9	2	109
Ave.	1.5	2.5	2.0	2.1	1.2	2.1	2.0	1.3	1.5	1.5	1.0	1.8
Max.	2.0	7.0	3.0	5.0	2.0	3.0	2.0	2.0	2.0	3.0	1.0	7.0
Min.	1.0	1.0	1.0	1.0	1.0	1.0	2.0	1.0	1.0	1.0	1.0	1.0
<b>Camel</b>												
Number	2	1	0	5	0	0	0	0	0	0	0	8
Total	25	4	0	23	0	0	0	0	0	0	0	52
Ave.	12.5	4.0		4.6								6.5
Max.	14.0	4.0		10.0								14.0
Min.	11.0	4.0		3.0								3.0
<b>Sheep/goat</b>												
Number	7	11	15	10	8	20	17	17	9	18	19	151
Total	37	48	49	93	109	179	214	83	47	487	196	1,542
Ave.	5.3	4.4	3.3	9.3	13.6	9.0	12.6	4.9	5.2	27.1	10.3	10.2
Max.	10.0	10.0	10.0	35.0	68.0	16.0	42.0	17.0	13.0	180.0	50.0	180.0
Min.	2.0	1.0	1.0	1.0	1.0	4.0	5.0	1.0	2.0	2.0	3.0	1.0
<b>Chicken</b>												
Number	13	7	6	3	3	14	3	1	2	8	11	71
Total	129	45	36	29	45	43	16	2	23	65	62	495
Ave.	9.9	6.4	6.0	9.7	15.0	3.1	5.3	2.0	11.5	8.1	5.6	7.0
Max.	30.0	15.0	10.0	15.0	30.0	4.0	10.0	2.0	15.0	30.0	10.0	30.0
Min.	1.0	4.0	2.0	6.0	4.0	2.0	3.0	2.0	8.0	1.0	2.0	1.0
<b>Others</b>												
Number	4	2	0	2	2	0	0	4	0	1	0	15
Total	18	12	0	57	6	0	0	15	0	40	0	148
Ave.	4.5	6.0		28.5	3.0			3.8		40.0		9.9
Max.	10.0	8.0		50.0	5.0			5.0		40.0		50.0
Min.	1.0	4.0		7.0	1.0			2.0		40.0		1.0
	duck	duck		pigeon	duck					pigeons		

Source: Results of the questionnaire survey conducted by the JICA Study Team

Table 4 Agricultural Equipments/Tools

## Agricultural equipment/tools

	unit: piece, unit											Total Average
	St. Louis Lampsar	Dagana				Podor			Matam			
		Debi- Tiquet	Gaé	Mboundoun barrage	Pont gendarm	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	
<b>Hoe</b>												
Number	0	0	0	0	1	11	17	20	5	7	15	76
Total	0	0	0	0	1	11	17	65	5	7	22	128
Ave.					1.0	1.0	1.0	3.3	1.0	1.0	1.5	1.7
Max.					1.0	1.0	1.0	8.0	1.0	1.0	4.0	8.0
Min.					1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
<b>Plow</b>												
Number	0	2	0	1	0	0	0	1	0	0	6	10
Total	0	5	0	3	0	0	0	1	0	0	7	16
Ave.		2.5		3.0				1.0			1.2	1.6
Max.		4.0		3.0				1.0			2.0	4.0
Min.		1.0		3.0				1.0			1.0	1.0
<b>Sprayer</b>												
Number	4	18	15	16	5	13	3	14	0	1	1	90
Total	5	34	18	29	5	14	4	23	0	1	1	134
Ave.	1.3	1.9	1.2	1.8	1.0	1.1	1.3	1.6		1.0	1.0	1.5
Max.	2.0	5.0	2.0	6.0	1.0	2.0	2.0	3.0		1.0	1.0	6.0
Min.	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
<b>Thresher</b>												
Number	0	2	0	4	0	0	0	0	0	0	0	6
Total	0	2	0	6	0	0	0	0	0	0	0	8
Ave.		1.0		1.5								1.3
Max.		1.0		2.0								2.0
Min.		1.0		1.0								1.0
<b>Motor pump</b>												
Number	3	2	0	4	2	0	1	0	0	1	0	13
Total	3	2	0	5	2	0	1	0	0	1	0	14
Ave.	1.0	1.0		1.3	1.0		1.0			1.0		1.1
Max.	1.0	1.0		2.0	1.0		1.0			1.0		2.0
Min.	1.0	1.0		1.0	1.0		1.0			1.0		1.0
<b>Cart</b>												
Number	3	15	13	11	5	20	8	10	7	12	20	124
Total	3	14	15	13	5	20	8	10	7	12	21	128
Ave.	1.0	0.9	1.2	1.2	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.0
Max.	1.0	1.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	2.0
Min.	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
<b>Husking machine</b>												
Number	0	2	0	2	0	0	0	1	1	0	2	8
Total	0	1	0	1	0	0	0	1	1	0	2	6
Ave.		0.5		0.5				1.0	1.0		1.0	0.8
Max.		1.0		1.0				1.0	1.0		1.0	1.0
Min.		0.0		0.0				1.0	1.0		1.0	0.0
<b>Others</b>												
Number	5	0	0	5	4	1	7	17	1	0	1	41
Total	15	0	0	12	7	1	7	55	1	0	1	99
Ave.	3.0			2.4	1.8	1.0	1.0	3.2	1.0		1.0	2.4
Max.	8.0			6.0	4.0	1.0	1.0	6.0	1.0		1.0	8.0
Min.	1.0			1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0

shovel

shovel

atomiser

shovel

shovel

shovel

rake

Source: Results of the questionnaire survey conducted by the JICA Study Team

Table 5 Irrigation Area by Type of Development

Irrigation Area

Large development

	St. Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiquet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	Average
<b>Area (ha)</b>												
Number	20	20	20	0	20	20	0	0	0	0	17	117
Total	19	81	20	0	31	9	0	0	0	0	14	174
Ave.	0.9	4.1	1.0		1.5	0.5					0.8	1.5
Max.	2.0	9.2	3.0		4.1	1.0					1.6	9.2
Min.	0.4	1.8	0.3		0.2	0.2					0.8	0.2
<b>Number of parcel (GA)</b>												
Number	20	20	20	0	20	20	0	0	0	0	17	117
Total	29	61	37	0	25	20	0	0	0	0	18	190
Ave.	1.5	3.1	1.9		1.3	1.0					1.1	1.6
Max.	3.0	8.0	10.0		3.0	1.0					2.0	10.0
Min.	1.0	1.0	1.0		1.0	1.0					1.0	1.0

PIV

	St. Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiquet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	Average
<b>Area (ha)</b>												
Number	0	0	0	20	0	0	0	20	20	20	6	86
Total	0	0	0	59	0	0	0	20	19	18	5	120
Ave.				3.0				1.0	0.9	0.9	0.8	1.4
Max.				10.0				3.1	2.5	2.3	1.6	10.0
Min.				0.8				0.1	0.6	0.3	0.3	0.1
<b>Number of parcel (PIV)</b>												
Number	0	0	0	20	0	0	0	20	20	20	6	86
Total	0	0	0	71	0	0	0	20	81	74	7	253
Ave.				3.6				1.0	4.1	3.7	1.2	2.9
Max.				8.0				1.0	10.0	11.0	2.0	11.0
Min.				1.0				1.0	3.0	1.0	1.0	1.0

PIP

	St. Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiquet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	Average
<b>Area (ha)</b>												
Number	0	0	0	17	1	0	20	0	0	0	0	38
Total	0	0	0	39	4	0	21	0	0	0	0	64
Ave.				2.3	3.6		1.0					1.7
Max.				7.0	3.6		1.4					7.0
Min.				0.4	3.6		0.8					0.4
<b>Number of parcel (PIP)</b>												
Number	0	0	0	17	1	0	20	0	0	0	0	38
Total	0	0	0	51	1	0	20	0	0	0	0	72
Ave.				3.0	1.0		1.0					1.9
Max.				12.0	1.0		1.0					12.0
Min.				1.0	1.0		1.0					1.0

Source: Results of the questionnaire survey conducted by the JICA Study Team

Table 6 Machinery for Land Preparation

Use of agro-machinery

unit: number of respondent

Type of Service	St. Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiguet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	Average
Plow	0	0	0	0	0	0	0	0	0	0	0	0
Harrow	20	20	20	20	20	20	20	20	20	20	20	220
Bunding	0	0	0	9	1	0	0	0	0	0	0	10
Puddling	0	0	0	0	0	0	0	0	0	0	0	0
Levelling	0	0	0	4	0	0	0	0	0	0	0	4

Service charge per hectare by type of service

unit: FCFA/ha

Type of Service	St. Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiguet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	Average
Plow												
Harrow	17,875	17,500	18,000	18,000	18,000	17,000	20,000	18,000	20,068	20,070	21,875	
Bunding				35,000	25,000							
Puddling												
Levelling				35,000								

Source: Results of the questionnaire survey conducted by the JICA Study Team

Table 7 Variety of paddy and source of seeds

Cultivated variety of paddy rice by area and irrigation area

unit: ha

	St. Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiguet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	Average
IR1529	0.00	18.19	1.00	3.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22.96
Sahel 201	0.50	39.59	3.98	24.80	23.02	0.00	0.00	0.00	0.00	0.00	0.00	91.89
Sahel 202	9.52	19.35	4.40	23.42	1.95	8.14	20.70	0.00	15.30	12.85	17.60	133.23
Sahel 108	8.81	3.95	2.50	16.55	0.50	0.00	0.00	19.94	0.30	4.01	0.00	56.56
Jaya	0.00	0.00	6.70	0.00	0.00	0.92	0.00	0.00	0.00	0.00	0.00	7.62
TCS-10	0.00	0.00	1.10	0.00	8.88	0.00	0.00	0.00	0.00	0.55	0.00	10.53
<b>Total</b>	<b>18.83</b>	<b>81.08</b>	<b>19.68</b>	<b>68.54</b>	<b>34.35</b>	<b>9.06</b>	<b>20.70</b>	<b>19.94</b>	<b>15.60</b>	<b>17.41</b>	<b>17.60</b>	<b>322.79</b>

Seed source

unit: number of respondent

	St. Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiguet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	Average
Last harvest	1				2	2	19	1	8	3	17	
UNIS	1	20		4					9	7		
Market	16		19		1	1	1	7			1	
Other source	2		1	16	15	17			4	13	17	3
<b>Total</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>18</b>	<b>20</b>	<b>20</b>	<b>21</b>	<b>28</b>	<b>20</b>	<b>21</b>	

supplier Union      GIE      12 purchase      Producer 12 Supplier  
CNCAS      5 GIE      5 Ndouloumadji

Source: Results of the questionnaire survey conducted by the JICA Study Team

Table 8 Criteria for Selecting Variety

**Criteria for selection**

IR1529

	Saint Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiquet	Gaé	Mboundoun Barrage	Pont Gendarme	Aéré Lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji Founébé	Average
Good taste		2										2
Easy marketing		7										7
High yield		9		3								12
Short duration												0
Availability of seed			1									1
Other		1										1
<b>Total</b>	<b>0</b>	<b>19</b>	<b>1</b>	<b>3</b>	<b>0</b>							<b>23</b>

Sahel 201

	Saint Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiquet	Gaé	Mboundoun Barrage	Pont Gendarme	Aéré Lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji Founébé	Average
Good taste		1			1							2
Easy marketing		3			0							3
High yield	1	8		12	11							32
Short duration			2		2							4
Availability of seed		1	4		1							6
Other		12			0							12
<b>Total</b>	<b>1</b>	<b>25</b>	<b>6</b>	<b>12</b>	<b>15</b>							<b>59</b>

Sahel 202

	Saint Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiquet	Gaé	Mboundoun Barrage	Pont Gendarme	Aéré Lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji Founébé	Average
Good taste		3			1					3	15	22
Easy marketing		4			0							4
High yield	8	8	1	7	2	12	20		15	16	15	104
Short duration	2				0							2
Availability of seed		2	4		0	5			8	2	4	25
Other		1			0				13	4		18
<b>Total</b>	<b>10</b>	<b>18</b>	<b>5</b>	<b>7</b>	<b>3</b>	<b>17</b>	<b>20</b>	<b>0</b>	<b>36</b>			<b>116</b>

proposed easy processing into cous-cous

Sahel 108

	Saint Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiquet	Gaé	Mboundoun Barrage	Pont Gendarme	Aéré Lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji Founébé	Average
Good taste					0					2		2
Easy marketing					0			1				1
High yield	1				0			18				19
Short duration	8	2	2	12	1			1		4		30
Availability of seed		1	2		0							3
Other					0							0
<b>Total</b>	<b>9</b>	<b>3</b>	<b>4</b>	<b>12</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>20</b>				<b>49</b>

Jaya

	Saint Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiquet	Gaé	Mboundoun Barrage	Pont Gendarme	Aéré Lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji Founébé	Average
Good taste												0
Easy marketing												0
High yield			3									3
Short duration												0
Availability of seed			1			4						5
Other												0
<b>Total</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>0</b>							<b>4</b>

TCS-10

	Saint Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiquet	Gaé	Mboundoun Barrage	Pont Gendarme	Aéré Lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji Founébé	Average
Good taste					0					1		1
Easy marketing					2							2
High yield					5							5
Short duration					5					1		6
Availability of seed			1		0							1
Other					0							0
<b>Total</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>12</b>							<b>13</b>

Source: Results of the questionnaire survey conducted by the JICA Study Team

Table 9 Sowing Methods

Sowing Method

unit: number of respondent

	St. Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiquet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	Average
Direct Sowing	20	20	20	20	20	20	20	0	10	20	0	170
Transplanting	0	0	0	0	0	0	0	20	10	0	20	50
Total	20	20	20	20	20	20	20	20	20	20	20	220

Field conditions at direct sowing

unit: number of respondent

	St. Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiquet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	Average
Submerged	20	20	20	20	20	1	20	0	10	15	0	146
Moist	0	0	0	0	0	19	0	0	0	0	0	19
Dry	0	0	0	0	0	0	0	0	0	5	0	5
Total	20	20	20	20	20	20	20	0	10	20	0	170

Nursery Period of Seedlings (days)

unit: number of respondent

	St. Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiquet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	Average
Count	0	0	0	0	0	0	0	20	10	0	20	50
Average								29	25		32	
Maximum								30	29		45	
Minimum								23	20		25	

Source: Results of the questionnaire survey conducted by the JICA Study Team



Table 10 Fertilizer Application

Dosage of Fertilizer (kg/ha)

	St. Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiquet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	Average
DAP (18-46-0)	DS*	DS	DS	DS	DS	DS	DS	TR*	DS/TR	DS	TR	DS/TR
Number	14	20	20	20	20	17	18	5	10/10	20	20	159/35
Ave.	96	106	205	140	144	92	143	96	96/97	105	78	128/86
Max.	150	150	700	200	350	100	200	200	100/100	160	100	700/200
Min.	42	50	50	100	50	20	100	50	60/71	90	50	20/50
UREA (46-0-0)	DS	DS	DS	DS	DS	DS	DS	TR	DS/TR	DS	TR	DS/TR
Number	20	20	20	20	20	19	20	20	10/10	20	20	169/50
Ave.	226	295	234	275	216	216	210	171	247/243	248	208	241/200
Max.	476	300	450	300	350	250	250	300	250/284	266	250	476/300
Min.	65	200	100	200	50	50	200	50	220/150	200	200	50/50

Remarks: \* DS: Direct sowing; TR: Transplanting

Time of fertilizer application

	St. Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiquet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	Average
DAP (18-46-0)	DAS*	DAS	DAS	DAS	DAS	DAS	DAS	DAT*	DAS/DAT	DAS	DAT	DAS/DAT
Number	14	20	20	20	20	17	18	5	10/10	20	20	159/35
Ave.	34	18	9	28	21	24	-8	30	3.8/17.2	22	16	17/16
Max.	60	80	30	35	45	25	-3	30	15/21	30	20	80/30
Min.	21	-30	-1	20	11	10	-15	28	-1/15	13	7	-30/-1
UREA 1 (46-0-0)												
Number	20	20	20	20	20	19	18	20	10/10	20	20	167/50
Ave.	32	24	31	28	31	23	22	29	16/17	22	21	26/23
Max.	60	30	60	35	65	25	30	30	20/21	30	25	65/30
Min.	21	15	15	20	11	10	13	25	15/15	13	15	10/13
UREA 2 (46-0-0)												
Number	16	5	16	20	14	0	0	0	10/10	17	20	98/30
Ave.	59	56	54	59	59				37/40	49	44	54/42
Max.	81	60	90	70	70				45/49	54	45	90/45
Min.	40	45	25	45	45				30/35	35	35	30/25

Remarks: DAS: Days after sowing; DAT: Days after transplanting

Source: Results of the questionnaire survey conducted by the JICA Study Team

Table 11 Procurement of Fertilizers

## Source of Fertilizer Purchase

unit: number of respondent

	St. Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiquet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	Average
Merchant			1		3	4	1				1	10
Distributor	19	20	19	4	17	10	19	19	20	1	19	167
Others	1			16		5		1		19		42
Total	20	20	20	20	20	19	20	20	20	20	20	219
				Union		GIE				GIE		

## Easiness of fertilizer procurement

unit: number of respondent

	St. Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiquet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	Average
Easy	9	5	12	6	17	15	18	16	11	6	20	135
Not easy	11	15	8	14	3	4	2	4	9	14	0	84
Total	20	20	20	20	20	19	20	20	20	20	20	219

## Reason for difficulty in procuring fertilizers

unit: number of respondent

	St. Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiquet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	Average
Credit		1	1	10		4			6	5		27
Fertilizer availability	11	15	6	4	3		2	4	4	2		51
Bad road		7										7
Transport			1									1
Remoteness									3			3
Delay in credit reimbursement										7		7

Source: Results of the questionnaire survey conducted by the JICA Study Team

Table 12 Irrigation and Drainage

## Irrigation Water Fee (Rainy Season)

unit: FCFA/ha/cropping

	St. Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiguet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	
Average	41,178	62,500	60,000	70,250	65,000	75,000	57,250	80,000	92,665	61,951	43,575	
Max	43,750	62,500	60,000	85,000	65,000	75,000	60,000	80,000	95,000	61,951	43,575	
Min	40,000	62,500	60,000	67,500	65,000	75,000	55,000	80,000	91,300	61,951	43,575	

## Satisfaction on water distribution

unit: number of respondent

	St. Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiguet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	
Satisfied	13	16	16	16	19	19	20	19	8	7	7	160
Not satisfied	7	4	4	4	1	1	0	1	12	13	13	60
Total	20	20	20	20	20	20	20	20	20	20	20	220

## Reason for Unsatisfaction

unit: number of respondent

	St. Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiguet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	
Quantity		3	3						1	4	12	23
Quality										1		1
Availability	7		1						7		5	20
High water cost		1		4	1	1		1	8		10	26
Other reasons									2	8		10
Total	7	4	4	4	1	1	0	1	18	13	27	80

GMP wez silted canal  
Canal silt organization  
old GMP

## Drainage Condition

	St. Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiguet	Gae	Mboundoun Barrage	Pont Gendarm	Aere Lao	Guia	Guede	Bow	Ganguel	N'Douloumadji Fonnebe	
Easy	17	16	19	18	20	20	20	20	13	17	8	188
Difficult	3	4	1	2	0	0	0	0	7	3	12	32
Total	20	20	20	20	20	20	20	20	20	20	20	220

## Problems related to drainage

- Bad facilities (Lampsar)
- Poor levelling (Debi-Tiguet, Pont Gendarme)
- Low workability (Mboundoun Barrage, Pont Gendarme, Bow, Ganguel, N'Douloumadji)
- No drainage facility (N'douloumadji)

Source: Results of the questionnaire survey conducted by the JICA Study Team

Table 13 Crop Protection

Problem of Diseases/Pests

unit: number of respondent

	St. Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiquet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	Average
Problem	8	15	16	7	0	17	0	19	18	18	20	138
No Problem	12	5	4	13	20	3	20	1	2	2	0	82
Total	20	20	20	20	20	20	20	20	20	20	20	220

Reason for Problem

unit: number of respondent

	St. Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiquet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	Average
Insects	7	1	16	7		11		18	17	15	20	112
Diseases	1	15				3		1	6	4		30
Both						1						1
others						1				9		10
Total	8	16	16	7	0	16	0	19	23	28	20	153

Rats

Countermeasures to weeds

unit: number of respondent

	St. Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiquet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	Average
Herbicides	20	20	19	20	20	2	20	18	0	11	0	150
Weeding			10	7		18		1	20	11	20	87
Total	20	20	29	27	20	20	20	19	20	22	20	237

Weeding frequency

unit: number of respondent

	St. Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiquet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	Average
Once	3	5	8	7	20	13	0	18	3	10	5	92
Twice	3	7	1	0	0	6	0	0	7	9	13	46
Three times	0	8	0	0	0	1	0	0	1	1	2	13
> Three times	12	0	2	1	0	0	0	0	2	0	0	17
Total	18	20	11	8	20	20	0	18	13	20	20	168

Means of bird scaring

unit: number of respondent

	St. Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiquet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	Average
Watchman	14	13	20	18	16	12	5	8	18	15	20	159
Scarecrow	1	17		10	3	8	17		11	6	15	88
Birdnet					1			2		1		4
Variety								10				10
Others	7											7
Total	22	30	20	28	20	20	22	20	29	22	35	268

bewitch

Source: Results of the questionnaire survey conducted by the JICA Study Team

Table 14 Harvest and Threshing

Harvest method

unit: number of respondent

	St. Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiguet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	
Combine H.	0	6	0	4	0	12	0	0	0	0	0	22
Hired labor	7	12	11	16	9	2	1	2	1	0	20	81
Family labor	13	14	10	0	16	6	19	18	19	20	19	154
Total	20	32	21	20	25	20	20	20	20	20	39	257

Threshing Method

unit: number of respondent

	St. Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiguet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	
Combine H.	0	6	0	4	0	12	0	0	0	0	0	22
Thresher	20	14	20	16	20	1	2	0	0	1	3	97
Manual	0	0	0	0	0	7	18	20	20	19	17	101
Total	20	20	20	20	20	20	20	20	20	20	20	220

Yield

unit: ton/ha

	St. Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiguet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	
Average	5.2	5.8	4.4	5.5	4.9	5.2	4.9	4.8	5.9	6.0	4.0	5.2
Max	9.0	7.8	7.8	7.5	8.6	9.4	8.0	8.5	8.3	7.4	5.6	9.4
Min	1.5	3.7	1.9	2.3	2.2	3.0	2.0	1.0	3.8	3.8	2.3	1.0

Source: Results of the questionnaire survey conducted by the JICA Study Team

Table 15 Destination of the Products

Destination of Harvested Paddy Rice

	St. Louis	Dagana				Podor			Matam			Average*
	Lampsar	Debi-Tiguet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	
Self-cons.	37.4%	24.5%	31.0%	12.6%	17.7%	24.3%	55.4%	41.6%	65.4%	78.3%	76.2%	42.2%
Credit repay.	13.8%	52.9%	48.6%	41.1%	56.7%	11.9%	31.4%	15.6%	22.9%	10.6%	0.7%	27.8%
Sell out	23.8%	6.3%	1.3%	26.4%	11.8%	57.1%	5.4%	16.8%	0.9%	1.5%	6.9%	14.4%
Pay in kind	16.6%	11.0%	11.8%	10.7%	9.6%	5.6%	4.5%	24.3%	0.7%	0.2%	5.1%	9.1%
Gift/donation	8.3%	5.2%	7.4%	9.2%	4.1%	1.0%	3.3%	1.7%	10.1%	9.4%	11.1%	6.4%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Remarks: \* Arithmetic average

Source: Results of the questionnaire survey conducted by the JICA Study Team

Table 16 Position of Paddy as Food

Frequency of daily rice eating

unit: number of respondent

	St. Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiguet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	
Once	0	0	0	16	0	12	2	2	0	11	0	43
Twice	20	14	8	0	20	8	16	18	19	7	19	149
Three times	0	6	12	0	0	0	0	0	0	2	0	20
<b>Total</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>16</b>	<b>20</b>	<b>20</b>	<b>18</b>	<b>20</b>	<b>19</b>	<b>20</b>	<b>19</b>	<b>212</b>

Most Important Staple Food

unit: number of respondent

	St. Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiguet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	
Millet	0	0	0	0	0	0	0	0	0	0	0	0
Rice	20	20	20	20	20	20	19	20	20	20	20	219
Both	0	0	0	0	0	0	1	0	0	0	0	1
<b>Total</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>220</b>

Criteria for selecting rice as the most important staple food

	St. Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiguet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	
Taste	1	0	0	0	0	7	0	4	2	3	2	19
Availability	19	20	20	20	20	17	4	16	20	20	18	194
Easy prep.	0	0	0	0	0	8	16	0	0	0	19	43
Energy saving	0	0	0	0	0	0	0	0	0	1	0	1
Other	0	0	0	0	0	0	0	0	5	0	0	5
<b>Total</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>32</b>	<b>20</b>	<b>20</b>	<b>27</b>	<b>24</b>	<b>39</b>	<b>262</b>

Source: Results of the questionnaire survey conducted by the JICA Study Team

Table 17 Credit Amount

Credit amount from CNCAS for year 2004

unit: FCFA/household

	St. Louis		Dagana			Podor			Matam			Total
	Lampsar	Debi-Tiquet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	
1	85,190	1,710,000		378,280	289,000		154,000	272,928	170,000	260,000	84,130	
2	95,990	691,200	90,000	1,488,678	246,500		140,000	1,025,000	103,000	74,000	132,180	
3	75,000	630,000	30,000	737,790	170,000		203,000	70,000	129,750	85,000	139,205	
4	22,845	1,100,000	204,000	415,050	246,500		238,000	186,000	100,656	96,095	145,240	
5	61,175	798,675	270,000	322,420	170,000		231,000	77,400	102,000	185,000	147,500	
6	86,436	1,869,200	72,000	433,000	127,000		154,000	193,750	88,500	97,200	120,450	
7	25,760	318,420	90,000	810,000	646,000		98,000	228,000	119,000	205,000	122,125	
8	176,960	1,287,000	156,000	213,167	739,500		133,000	75,000	68,000	98,000	100,255	
9	32,555	1,314,000	48,000	1,450,000	289,000		119,000	290,000	170,000	200,000	147,370	
10	40,950	600,000	114,000		1,190,000		133,000	60,000	85,000	90,000	100,125	
11	48,390	790,000	150,000	1,025,000	221,000	195,000	175,000	315,000	10,500	100,000	147,205	
12	48,390	400,000	108,000	887,400	306,000		105,000	150,000	175,000	185,000	147,250	
13	65,095	1,500,000	36,000	1,101,600	1,139,000		77,000	95,000	238,000	250,000		
14	54,430	2,000,000	132,000	367,200	331,500	185,000	119,000	288,000	136,000	450,000		
15	53,950	1,828,322	72,000		339,500		91,000	180,000	153,000	232,500	147,540	
16	59,975	678,500	210,000		246,500		175,000	45,350	136,000	228,790	107,800	
17	24,300	562,500	300,000	749,700	348,500	185,000	126,000	45,000	131,250	165,000	147,350	
18	115,255	2,070,000	600,000	642,000	561,000		126,000	35,000	171,500	99,000	127,250	
19	50,330	1,050,000	240,000	633,600	340,000		224,000	37,500	112,000	222,500	147,250	
20	26,825	696,330	72,000	573,250	340,000		126,000	110,000	96,000	560,000	147,250	
Number	20	20	19	17	20	3	20	20	20	20	18	197
Total	1,249,801	21,894,147	2,994,000	12,228,135	8,286,500	565,000	2,947,000	3,778,928	2,495,156	3,883,085	2,357,475	62,679,227
Ave.	62,490	1,094,707	157,579	719,302	414,325	188,333	147,350	188,946	124,758	194,154	130,971	318,169
ha	0.96	4.07	1.01	3.43	1.72	0.79	1.04	1.00	0.81	0.88	0.89	1.48
Ave/ha	64,812	269,168	156,100	209,673	241,237	238,397	142,367	189,610	154,022	219,632	147,342	214,986

Source: Questionnaire survey conducted by the JICA Study Team, 2005

Table 18 Problems on Credit

Problem in relation to credit

unit: number of respondent

	St. Louis		Dagana			Podor			Matam			Total
	Lampsar	Debi-Tiquet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	
High interest rate	4	1			19	1	19	16	3		2	65
Complicated procedure	7			18	1	1	11	1	1		3	43
Unavailable credit	1	1	6		9	2	4	1	1		1	26
Obligation of guarantee			1	13			9	1			1	25
Delay in reimbursement				8			15	4	5	1	4	37
Indebtedness	19		1	10	1				1		2	34
Other reasons				1					2	5		8
Total	31	2	8	50	30	4	58	23	13	6	13	238

Source: Questionnaire survey conducted by the JICA Study Team, 2005

Table 19 Paddy Cultivation Techniques

Source of obtaining technology

unit: number of respondent

	St. Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiquet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	
ANCAR	0	0	1	0	0	0	0	0	0	0	0	1
Neighbor farmers	11	0	0	0	0	5	0	0	0	1	0	17
SAED	15	20	19	19	20	15	20	20	19	19	20	206
Trained farmers	2	0	0	0	0	0	0	0	0	0	0	2
Text or manual	0	0	0	0	0	0	0	0	0	0	0	0
Others	1	0	0	5	0	0	0	0	3	2	0	11
<b>Total</b>	<b>29</b>	<b>20</b>	<b>20</b>	<b>24</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>22</b>	<b>22</b>	<b>20</b>	<b>237</b>

Others	Lampsar:	CERP	Bow:	traditional knowledge
	Mboundoun barrage:	CERP	Ganguel soule:	personal experience

Obtained useful technology

unit: number of respondent

	St. Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiquet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	
Seed selection	0	10	3	0	8	8	17	3	5	8	7	69
Fertilizer utilization	8	20	14	1	17	0	18	1	15	7	20	121
Disease control	0	4	1	0	0	0	0	2	12	5	17	41
Water management	9	13	2	0	1	2	0	0	11	1	19	58
Harvesting time	0	7	0	0	0	0	1	0	10	4	17	39
Paddy moisture	0	0	0	0	0	0	4	0	3	0	2	9
Others	5	0	0	7	1	4	0	0	4	3	1	25
<b>Total</b>	<b>22</b>	<b>54</b>	<b>20</b>	<b>8</b>	<b>27</b>	<b>14</b>	<b>40</b>	<b>6</b>	<b>60</b>	<b>28</b>	<b>83</b>	<b>362</b>

Others:	Lampsar:	countermeasure against weeds partial transplanting pre-germination of seeds respect cropping calendar	Aere lao:	extension
	Mboundoun barrage:	7 cultivation technique	Bow:	all cultivation aspects
	Pont gerndarme:	method and date of sowing	Ganguel soule:	3 respect cropping calendar

Technologies need to be obtained

unit: number of respondent

	St. Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiquet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	
Land levelling	0	2	3	0	2	0	8	0	4	1	20	40
Fertilizer application	1	1	4	1	3	0	19	0	7	9	1	46
Irrigation	2	14	2	0	2	1	2	10	10	5	19	67
Disease/pest control	0	12	5	1	0	1	2	19	14	10	2	66
Post harvest	0	0	0	6	0	0	0	0	0	0	13	19
Marketing	0	3	0	20	0	14	9	5	3	3	3	60
Others	18	4	4	1	17	17	0	1	7	4	0	73
<b>Total</b>	<b>21</b>	<b>36</b>	<b>18</b>	<b>29</b>	<b>24</b>	<b>33</b>	<b>40</b>	<b>35</b>	<b>45</b>	<b>32</b>	<b>58</b>	<b>371</b>

Others	Lampsar:	monitor cropping calendar	Aere lao:	14 extension and training 3 processing
	Debi-Tiquet:	cultivation technique combine harvester thresher area expansion	Bow:	2 yield increase 2 production technique 2 cropping calendar 1 harvest 1 marketing
	Gae:	2 training 1 herbicide utilization	Ganguel soule:	2 yield increase 1 good organization 1 area expansion
	Mboundoun barrage:	cultivation technique		
	Pont gendarme:	9 training on new technology 10 field monitoring		

Source: Results of the questionnaire survey conducted by the JICA Study Team



Table 20 Problems from the Farmers' Viewpoint

Problems that farmers are facing

unit: number of respondent

	St. Louis	Dagana				Podor			Matam			Total
	Lampsar	Debi-Tiguet	Gaé	Mboundoun barrage	Pont gendarme	Aéré lao	Guia	Guédé	Bow	Ganguel soulé	N'Douloumadji founébé	
Low profitability	0	1	1				5	3		1	15	26
Marketing problem	6	17		8	8	1	14	1	1	2	2	60
Low yield	1	3	2	1		7	1	9	4	3	16	47
High production cost	14	8	6	16	1	15	3	14	8	10	18	113
Diseases/insects/birds	3	16	9	3	20	8		6	6	9	13	93
Lack of tractors	9	1	1	8	2	12		2	4	0	16	55
Low quality of rice	0	1								0	3	4
Unavailable credit	7		6	10	3	2	14	8	2	0	3	55
Soil salinization	0				1	1	2	3		0		7
Water availability	3	2	4					2	5	9	9	34
Lack of certified seeds	1	1	9				16	1	3	3	6	40
Hard to obtain fertilizer	1	9	5		1			6	11	6	1	40
Others	14	6	9	14		15	5	3	11	12	5	94
Average	59	65	52	60	36	61	60	58	55	55	107	668

Others:	Lampsar:	8 bad system 4 transport products 1 weed 1 equipment	Aere lao:	7 processing 7 training and extension 1 marketing
	Debi-Tiguet:	4 road condition 1 expensive seed 1 remoteness of field	Guia:	5 soil degradation
	Gae	3 lack of labor 2 delayed cultivation 2 bad development 1 weak transport 1 lack of combine 1 bad weeds	Guédé:	3 training and advice
	Mboundoun barrage:	11 delay in following cropping calendar 1 enclavement 1 delay in credit obtenance 1 marketing	Bow	4 no machinery 3 small area 3 low quality of development
			Ganguel soule:	8 small farm land 3 delayed cultivation 1 fertilizer 1 land levelling 1 low price of rice
			N'douloumadji founébé:	5 inadequate group activities

Source: Questionnaire survey conducted by the JICA Study Team, 2005

**Enquête sur les pratiques culturales sur le riz**

Nom de l'enquêteur: \_\_\_\_\_ ; Date: \_\_\_\_\_ (jj/mm/année)  
 Nom de l'enquêté: \_\_\_\_\_ ; Nom du village: \_\_\_\_\_ ;  
 Arrondissement \_\_\_\_\_ ; Département: \_\_\_\_\_ ; Région: \_\_\_\_\_

**Questions concernant la famille**

1.	Combien y a-t-il de membres dans la famille (y compris vous) ?	(_____)
2.	Combien d'entre eux sont engagés dans l'activité agricole dans la famille?	(_____)

**Activités agricoles (2003/2004)**

3.	Végétales	1	2	3	4	5	6	7	8
	Superficie (ha)								
	Espèces végétales: 1.riz (seche); 2.riz (hivernage); 3.mil; 4.sorgho; 5.maïs; 6.niébé; 7.arachide; 8.autre _____								
4.	Elevage	1	2	3	4	5	6	7	8
	Nombre de tête								
	Animaux élevés: 1.vache; 2.cheval; 3.âne/mulet; 5.chameaux; 6.mouton/chevre; 7.poulets; 8.autre _____								

**Matériel agricole** (Quels sont les équipements dont vous disposez dans l'exploitation pour la culture de riz ?)

5.	Equipement	1	2	3	4	5	6	7	8	
	Nombre									
	Nb (Fonctionnel)									
	Equipement: 1.houe; 2.charrue; 3.pulvérisateur; 4.batteuse; 5.GMP; 6.charrette; 7.décortiqueuse; 8.autre _____									

**Foncier**

6.	Superficies cultivées selon le type d'aménagement (mettre le nombre de parcelles en location entre ( ))	Type d'aménagement	Nb de parcelles	Taille (ha)	Coût en location (F/ha)
		Grand/intermédiaire	____( )	____( )	
		PIV	_____	_____	
		PIP	_____	_____	

**Culture du riz (pour saison hivernale)****Semences**

7.	Combien de fois cultivez- vous le riz par an ?	(1. une fois; 2. deux fois)							
8.	Où trouvez-vous les semences?	(1.dernière récolte ; 2.UNIS; 3.marchés; 4.autre source _____)							
9.	Quelles sont les variétés cultivées et quelles sont les raisons de ces choix?								
	Variété	1	2	3	4	5	6	7	7
	Superficie (ha)								
	Critère								
	Variété: 1.IR15-29; 2.Sahel 201; 3.Sahel 202; 4.Sahel 108; 5.Jaya; 6.TCS-10; 7.autre _____ Critère: 1.goût; 2.plus facile à commercialiser ; 3.haut rendement; 4.durée de maturation courte; 5.semences disponibles; 6.autre _____								

**Préparation du sol**

10.	Méthode de préparation du sol (mettre la croix dans la colonne appropriée et le prix par ha si nécessaire)					
	Practice	Labour	Offsetage	Diguette	Boue	Planage
	Méthode					
	Especies (F/ha)					
Méthode: 1. Tracteur loué; 2. Animal loué; 3. Animal personnel; 4. Main d'oeuvre externe; 5. Main d'oeuvre familiale; 6. Autre _____						
11.	Etes-vous satisfait du tracteur ou de l'animal pris en location?	(1.Oui 2.Non) si non, pourquoi? (1.le nivellement n'est pas bien fait; 2.les blocs de terre sont trop larges; 3.labour trop profond; 4. autre _____)				

<u>Semis</u>				
12.	Quel type de semis faites-vous?	(1. semis direct, 2. repiquage) Si 1, allez aux questions 13 à 16, si 2, allez à 17		
13.	Dans quel état du sol faites-vous les semis?	(1.à sec; 2.sur sol mouillé; 3.avec une lame d'eau)		
14.	Comment semez-vous?	(1.à la volée; 2.semoir manuel; 3.semoir motorisé)		
15.	Utilisez-vous de la main d'oeuvre externe pour faire les semis?	(1.Oui, 2.Non) Si oui, combien leur payez-vous? (1.espèces; 2.repas; 3.espèces et repas) Nombre _____; Jours _____; Superficie _____ ha; Espece:F. _____/personne		
16.	Quelle quantité de semences utilisez-vous?	_____ kg/ha		
17.	Quelle est la superficie de la pépinière?	_____ m <sup>2</sup> pour _____ ha		
18.	Quelle quantité utilisez-vous en pépinière?	_____ kg par pépinière		
19.	Pendant combien de temps faites vous la pépinière?	_____ jours du semis au repiquage		
20.	Est-ce que vous mettez des engrais pour la pépinière?	(1.Oui, 2.Non) Si oui, allez à 21, si non à 23.		
21.	Quel type d'engrais et quelle quantité utilisez-vous pour la pépinière?	1.Urea	2.DAP	3.fumier
		_____ kg	_____ kg	_____ kg
22.	Est-ce que vous utilisez de la main d'oeuvre externe pour le repiquage?	(1.Oui, 2.Non) Si oui, combien payez-vous? (1.espèces; 2.repas; 3.espèces et repas) Nombre _____; Jours _____; Superficie _____ ha; Espece:F. _____/personne		
<u>Fertilisation</u>				
23.	Est-ce que vous utilisez des engrais chimiques?	(1.Oui, 2. Non) si oui, répondez aux questions suivantes?		
		Engrais	Dosage (kg/ha)	Date d'application (les jours après les semis ou repiquage)
		DAP		
		Urée		
24.	Où trouvez vous les engrais?	(1.commerçant; 2. distributeur; 3. autre _____)		
25.	Trouvez-vous toujours de l'engrais en temps opportun?	(1.Oui, 2.Non) Si non, pourquoi ? (1.credit non disponible; 2.engrais non disponible à temps; 3.autre raison _____)		
26.	Utilisez-vous du fumier pour la culture de riz?	(1.Oui, 2.Non) si oui, quel type de fumier utilisez-vous? (1.excréments d'animaux; 2.résidus de culture; 3.azolla; 4.autre _____)		
27.	Où trouvez-vous ce fumier?	(1.à partir de votre champ; 2. à partir des voisins; 3. en l'achetant (si c'est le cas FCFA _____); 4.autre _____)		
28.	Quand appliquez-vous le fumier?	(1.avant la préparation du sol; 2. après la récolte; 3.autre _____)		
29.	Quelle quantité de fumier appliquez vous?	_____ kg par _____ ha		
<u>Protection des cultures</u>				
30.	Avez-vous des problèmes avec les insectes ou les maladies?	(1.Oui, 2.Non) Si oui, allez de 31 à 34, si non, allez à 35		
31.	Quels sont ces problèmes?	(1.domages causés par les insectes; 2.maladies fongiques/bactérioses; 3.les 2; 4. autre _____)		
32.	Quelles sont les mesures que vous avez prises? (cherchez la colonne appropriée et mettez le prix)			
	Insectes/maladies	Sauteriaux	Diptères lépidoptères	Foreur de tiges
	Méthode			
	Quantité (kg/ha)			
	Espèce (F/ha)			
	Méthode: 1.produits chimiques; 2.lutte biologique; 3.enlèvement de plantes; 4.rien n'est fait; 5.autre _____			
33.	Où trouvez-vous les produits chimiques?	(1.commerçant; 2.distributeur; 3.autre _____)		
34.	Est-ce que vous utilisez de la main d'oeuvre extérieure pour faire les traitements chimiques?	(1.Oui, 2.Non) Si oui, combien payez-vous? (1.espèces; 2.repas; 3.espèces et repas) Nombre _____; Jours _____; Superficie _____ ha; Espece:F. _____/personne		

35.	Comment traitez-vous les mauvaises herbes?	(1.herbicides; 2.désherbage; 3.rien n'est fait; 4. autre _____) Si 1, allez à 36, si 2, à 38, si non à 40				
36.	Quels sont les herbicides que vous utilisez et comment utilisez-vous ces herbicides?	Herbicides	propanyl	weedone	rondox	autre
		Total quantité	_____l/ha	_____l/ha	_____kg/ha	
		Espece (F/ha)				
37.	Combien de fois désherbez-vous par saison de culture?	(1.une fois; 2.2 fois; 3.3 fois; 4.plus de 3 fois)				
38.	Utilisez-vous de la main d'oeuvre non familiale pour désherber?	(1.Oui, 2.Non) Si oui, combien payez-vous? (1.en espèces; 2.repas; 3.espèces et repas) Nombre _____; Jours _____; Superficie _____ha; Espece:F. _____/personne				
39.	Comment luttez-vous contre les oiseaux?	(1.manoevre; 2.épouvantails; 3. filet; 4. utilisation de certaines variétés ; 5. autre _____)				
40.	Utilisez-vous de la main d'oeuvre non familiale pour chasser les oiseaux?	(1.Oui, 2.Non) Si oui, combien payez-vous par saison? (1.en espèces; 2.repas; 3.espèces et repas) Nombre _____; Jours _____; Superficie _____ha; Espece:F. _____/personne				
<u>Gestion de l'eau</u>						
41.	Avez-vous le contrôle de l'eau que vous utilisez?	(1.Oui, 2.Non) Si oui, comment vous la gérez, ? (1.tous les jours par vous même; 2.selons le calendrier de distribution déterminé par le projet ou l'union 3. autre _____)				
42.	Est-ce que vous payez des frais pour le coût hydraulique?	(1.Oui, 2.Non) Si oui, combien payez-vous? FCFA _____/ha/saison hivernale				
43.	Etes-vous satisfaits de la distribution de l'eau?	(1.Oui, 2.Non) si non , quels sont les problèmes? (1.Quantité; 2.qualité; 3.disponibilité; 4.frais élevés; 5.autre _____)				
44.	Votre champ draine-t-il facilement l'eau?	(1.Oui, 2.Non) si non, quel problème rencontrez-vous avec le drainage ? (1.le sol est trop difficile à travailler; 2.provoque un problème de salinisation du sol; 3.provoque l'enherbement; 4.autre _____)				
<u>Récolte et battage</u>						
45.	Comment récoltez-vous le riz?	(1.location de moissonneuse; 2.main d'oeuvre non familiale; 3.main d'oeuvre familiale; 4.autre _____) Si 1 ou 2; combien payez-vous?(1.en espèces FCFA _____; 2.repas; 3.espèces et repas 4.paddy _____; 5.autre _____)				
46.	Avez-vous récolté le riz à temps l'année dernière?	(1.Oui, 2.Non) si non , pourquoi? (1.la moissonneuse n'est pas arrivée à temps; 2. difficile de trouver une moissonneuse à louer; 3.difficile de drainer l'eau; 4.difficulté à trouver de la main d'oeuvre à employer; 5.autre _____)				
47.	Etes-vous satisfait de la moissonneuse?	(1.Oui, 2.Non) Si non, Quel est le problème? (1.trop de pertes; 2 arrive toujours en retard; 3.autre _____)				
48.	Comment faites-vous le battage du riz?	1.batteuse (location); 2.batteuse (propre); 3.manuellement; 4.autre _____) Comment payez-vous? (1.FCFA _____/ha; 2.paddy _____% de recolte)				
49.	Est-ce que vous utilisez de la main d'oeuvre non familiale pour le battage et mettre le riz en sacs?	(1.Oui, 2.Non) si oui, comment payez-vous? (1.en espèces; 2.repas; 3. espèces et repas 4.paddy _____kg; 5.autre _____) Nombre _____; Jours _____; Superficie _____ha; Espece:F. _____/personne				
50.	Combien de sacs neufs avez-vous acheté l'année dernière ?	(_____sacs) Combien payez-vous? (F. _____/sac) Combien de fois achetez-vous de nouveaux sacs? (chaque _____ année(s))				
51.	Quelle quantité de paddy avez-vous récolté l'année dernière ?	_____sacs pour un champ de _____ha ; poids moyen _____kg/sac (y compris le montant que vous payez en nature)				
52.	Comment a été la récolte de l'année dernière ?	(1.très bonne ; 2.bonne ; 3.moyenne ; 4.mauvaise ; 5.très mauvaise)				
<u>Transport, Consommation et commercialisation</u>						
53.	Comment transportez-vous la récolte du champ au dépôt ?	(1.camion ; 2.charrette ; 3.autre _____) Comment payez-vous ? (1. FCFA _____; 2.paddy _____sacs)				
54.	Quelle est la distance entre le champ et le dépôt ?	_____km				

55.	Comment avez vous consommé la récolte de paddy l'année dernière?								
	Destination	1.autoconsommation	2.vente	3.don	4.paiement en nature	5. remboursement	5.Total		
	sacs								
56.	A qui avez-vous vendu le riz ou le paddy? (1.commerçant; 2.rizier; 3.GIE; 4.UNION; 5.autre_____)								
57.	Où faites- vous l'usinage? (1.rizerie; 2.rizerie de l'Union; 3.décortiqueuse villageoise; 4.autre_____)								
58.	Quel est le coût de l'usinage?		FCFA_____/kg riz blanc						
59.	Combien avez-vous gagné en vendant le riz et les sous-produits l'année dernière (2003)?								
	Type de riz	Riz blanc		Paddy		Son		Paille	
	Quantité vendue (sacs ou kg)	sacs		sacs		sacs		kg	
	Prix unitaire (FCFA/sac ou kg)								
	Total des ventes (FCFA)								
60.	Est-ce que vous consommez du riz tous les jours pendant toute l'année?		(1.Oui, 2.Non) Si oui, combien de fois par jour vous mangez du riz ? (___ fois) Si non, combien de fois vous mangez du riz dans la semaine ? (___ fois)						
61.	Quel est votre aliment de base, le plus important le mil ou le riz?		(1.mil ; 2.riz ; 3. les deux ; 4. autre spéculation_____)						
62.	Pourquoi avez-vous fait le choix ci-dessus ?		(1.bon goût; 2.plus disponible; 3.facile à préparer (choix de femmes); 4. économie d' énergie; 5.autre_____)						
<b>Encadrement</b>									
63.	Comment obtenez-vous le savoir-faire technique pour la culture du riz?		(1.conseiller agricole de l'ANCAR; 2.producteurs voisins; 3.conseiller agricole de la SAED; 4.Relais; 5.documents de vulgarisation; 6.autre_____)						
64.	Les agents d'encadrement vous aident-ils à augmenter substantiellement vos productions de riz ?		(1.Oui, 2.Non) Si oui, quelle est la nature de l'assistance? (1.sélection de semences; 2.utilisation d'engrais; 3.contrôle des maladies; 4.maîtrise de l'eau; 5.en période de récolte; 6.contrôle de l'humidité du paddy; 7.autre_____)						
65.	Quel genre de services attendez-vous du conseil agricole et rural?		(1.nivellement; 2.fertilisation; 3.irrigation; 4.contrôle des maladies; 5.après-récolte; 6.commercialisation; 7.autre_____)						
<b>Financement</b>									
66.	Avez-vous déjà contracté des dettes pour la culture du riz?		(1.Oui, 2.Non) si oui, allez de 67 à 69, si non à 70.						
67.	Où avez-vous emprunté de l'argent l'année dernière ?								
		1.CNCAS	2.CMS	3.PAMECAS	4.commerçant	5.parents	6.connaissances	7.auto-finance	8.autre
	Montant du crédit (F)								
	Taux de intérêt (%)								
	Remboursement (mois)								
	Objet (voir en dessous)								
	Objet: 1.achat d'intrants; 2.location de tracteur/d'équipement; 3.frais d'irrigation ; 4.autre_____								
68.	Avez-vous eu des problèmes pour emprunter de l'argent?		(1.Oui, 2.Non) si oui, quelles ont été les difficultés? (1.taux d'intérêt élevé; 2.procédure compliquée; 3.non disponibilité de structure de crédit dans la zone; 4.obligation de garantie; 5.délais de remboursement; 6.arriérés; 7.autre_____)						
69.	Avez-vous actuellement des arriérés pour la culture du riz?		(1.Oui, 2.Non) si oui, pour quel montant? (FCFA_____ ; par quelle structure __) (cf. 67 pour le nombre)						
<b>Problèmes rencontrés</b>									
70.	Quels sont les trois problèmes majeurs auxquels vous êtes confrontés dans la culture du riz? (1.bénéfice faible; 2.pas de débouchés du riz; 3.rendement faible; 4.coût de production élevé; 5.dommages causés par les insectes, les maladies ou les oiseaux; 6.manque de tracteurs; 7.faible qualité du riz; 8.non disponibilité du crédit; 9.salinisation des terres; 10.problème de disponibilité en eau; 11.manque de semences certifiées; 12.disponibilité des engrais; 13.autres_____)								

Merci beaucoup!

添付資料7

カザマンス地方農業調査結果

## Agricultural survey in the Casamance Area

### 1. Methodology

The Casamance area consists of the two administrative regions of Kolda and Ziguinchor. Ethnically Diolas are dominant in lower Casamance (Ziguinchor), whereas Mandings and Peuls mainly live in Middle and Upper Casamance (Kolda), respectively.

Soils in the lower Casamance are dominantly of ferralitic halomorphic, while in the middle and upper Casamance they are mainly of leached hydro-morphic. Endowed with the relatively abundant rainfall, the Casamance area is most suitable for various agricultural activities. Rice cultivation has traditionally been practiced, especially in the lowland area.

A socio-economic and agricultural survey was conducted in the Casamance area in February 2005, to grasp the present conditions of the rice sector in the area. In the 20 villages selected, 20 village heads, 200 farmers, and 17 farmers' organizations were interviewed using questionnaires. The table below shows the surveyed village and their demographic and ethnic profile.

**List of Surveyed Villages in the Socio Economic Survey for Casamance Area**

	Villages	Department	Population	household	Ethnical distribution
<b>Kolda Region</b>					
1	Dialakégni*	Vélingara	564	49	Peul (100%)
2	Soutouré*	Vélingara	773	100	Peul(70%),Diola(20%),Mandingues(10%)
3	Mbalocounda*	Vélingara	342	25	Peul(100%)
4	Fass Pathé*	Vélingara	133	12	Peul(100%)
5	Anambé*	Kolda	?	?	No data
6	Saré Keita	Kolda	149	17	Manding, Peul
7	Saré Kareba*	Kolda	102	30	Peul(60%), Bajaranke(30%), Sose(10%)
8	Simbandi Brasso	Sediou	4,201	183	Barant(60%), Mandingues(30%), Manjack, etc.
9	Diereng	Sediou	338	?	Manding (100%)
10	Coudomp (Hamdallay?)	Sediou	?	?	?
Remarks: * villages where irrigated rice cultivation is practiced					
<b>Ziguinchor Region</b>					
1	Sindian	Bignona	3,176	565	Diola (100%)
2	Tenghory	Bignona	2,000	200	Diola (100%)
3	Diouloulou	Bignona	2,717	?	Diola (30%), Peul (30%), Mandingues (20%), etc.
4	Tendouck	Bignona	3,890	185	Diola (90%), Peul (10%)
5	Mlomp	Bignona	?	130	Diola (100%)
6	Coubalan	Bignona	2,000	300	Diola (100%)
7	Niaguis	Ziguinchor	2,798	?	Diola (50%), Bainouk (30%), Balante (10%), Mandingue (10%)
8	Nyassia	Ziguinchor	452	49	Diola (100%)
9	Loudia Oulof	Ziguinchor	474	51	Peul (60%), Diola (20%), Oulof (10%), Bambara (10%)
10	Cabrousse Nialou	Oussouye	5,000	1,000	Diola (100%)

Source: Etude socioeconomique sur la production du riz dans les regions de Kolda et de Ziguinchor, GERAD, fevrier 2005

## 2. Results

### (1) Kolda Region<sup>1</sup>

Rice cultivation in the Kolda Region can be classified into two categories. One is rainfed rice farming for the sake of self-consumption, practiced by women using traditional technology. The rainfed rice farming is seen in lowland, locally called “Faro” and along the river. The other one is irrigated rice farming as economic activity, which is practiced in the Anambé basin where SODAGRI has developed irrigated farm. The rice cultivation here is done mainly by men adopting modern technology under mechanization condition. The features of the both categories of rice production activities are described in the following based on the results of the interview survey for 100 farmers.

#### Rainfed rice cultivation (Outside Anambé)

Average family size of the 40 interviewed farmers who practice rainfed farming is some 15, of which economically active members (those whose age are between 15 and 64) are 7.5. Of the 40 farmers interviewed, some 90% or 35 actually cultivate rice with a scale of 1.6 ha on average. Also 35% to 40% of the interviewed farmers cultivate millet, maize and groundnuts, respectively, with a scale of 1 to 1.3 ha on average in each crop.

As for animal husbandry, some 70% of the farmers interviewed raise 15 chicken, 60% raise 12 goats/sheep, and 40% raise 3 cattle, on average.

Most of the rice varieties the farmers use are local ones. Only four farmers out of 35 use modern varieties of Sahel 108 together with local varieties. The interview results revealed that there are at least 19 local varieties which are named. Eight local varieties that more than farmers use are as follows:

Ablaye mano; (m)bolo diossy; nabaring (nabarioun); madina; barafita; wankarang; bantacountou; and saymbande.

Land preparation before sowing is mainly done by man power, and partly by animal power. When animal is rented, it usually costs FCFA4,000 to FCFA5,000 per one hectare.

Direct sowing seems a common practice, but all the interviewed farmers in one village (Sare Keita) practice transplanting. Those who do direct sowing use some 60kg of seeds per one hectare. The farmers in Sare Keita do not use chemical fertilizer. 70% of the other farmers apply compound (NPK) fertilizer and urea with the amount of 77 kg each per hectare. The time of fertilizer application varies from at land preparation to 40 days after sowing for compound, and from at land preparation to 45 days after sowing for urea.

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<sup>1</sup> The description of the Kolda Region is made referring to the Tables 1 -21, attached to this annex.



Although the farmers recognized the damage of rice by pest and diseases, very few use agro-chemicals. Weeding is done manually.

Harvest is done basically by family labors (women), but in some cases group work (mutual help) is practiced. Products are basically consumed at home.

The position of rice as staple food is not so strong. Of the 20 farmers answered, 15 eat rice everyday, but only four farmers regard rice as most important staple. Even if those of seven farmers who put equal importance on millet and rice as staple are added, less than 50% of responded farmers regard rice as most important staple.

Problems on rice farming the farmers identify include soil salinity, low yield, damages by insect/diseases and birds, lack of machinery, insufficient water and lack of seed. It is interesting to note that despite the prime objective of rice cultivation is home consumption, some 20% of the farmers find difficulty in finding market of rice.

#### Irrigated rice cultivation (Anambé Basin)

Average family size of the 60 interviewed farmers who cultivate rice under irrigated condition is some 15, same as that of rainfed rice farmers. On the other hand, the economically active family members are five on average, less than that of rainfed rice farmers.

Some 95% of the interviewed farmers who cultivate rice under irrigation cultivate maize with a scale of 1.4ha on average, 80% cultivate groundnut with 1.1 ha, 70% grow dry season paddy with 2.2ha, 48% cultivate wet season paddy with 4.1ha, 41% plant sorghum with 1.3ha, and 85% grow other crops including cotton with 1.9ha on average. These farmers have larger cultivated land and diversify crops.

As for animal husbandry, 90% of the irrigated farmers interviewed raise goat/sheep with 11 heads, 85% have chicken/fowl with 15, 65% raise cattle with 26 heads, etc. Some 75% of the farmers have horse or donkey/mule as transportation means.

Rice varieties used are mostly improved varieties, in particular Sahel 108 is dominantly used. Some 75% of the answered or 32 farmers use Sahel 108, followed by TCS-10 (11 farmers), IR1529 (4 farmers), etc. There are only three farmers who cultivate local variety. Short growth duration is the major criteria for variety selection.

Land preparation depend mainly on machinery services. The machinery service cost between 20,000 and 30,000 FCFA per hectare.

Direct sowing is practiced, and the seed rate is as high as 200 kg per hectare. Fertilizer application is the common practice, and compound fertilizer (NPK) and urea are used. Application dosage is 200kg/ha for compound fertilizer and 180kg/ha for urea, on average respectively. Time of

application is 18 days after sowing for compound and 35 days after sowing for urea on average, respectively. Split application of urea is not common.

The majority of farmers pay irrigation fee at FCFA34,000 per hectare, while some pay FCFA60,000. Some 73% of the farmers are satisfied with irrigation water. The reasons for dissatisfaction in irrigation include high cost, insufficient irrigation water, inadequate levelling, etc. Nearly same number of the farmers are satisfied with drainage. The dissatisfied farmers complain about inadequate levelling, siltation of drainage, stagnant water, etc.

Some 60% of the farmers responded to the question use combine harvester for harvesting, while the rest do manual harvesting using family or hired labors. The combine harvester service including harvesting and threshing costs between FCFA50,000 and FCFA54,000 per hectare, while manual harvest using hired labor cost FCFA25,000 per hectare on average. Manual threshing is common practice for those who harvest manually. Some farmers hire power thresher from Gambia, for which the cost is about FCFA20,000 per hectare.

On average, some 62% of the harvested rice is consumed for home consumption, 24% for selling, 9% for donation, 2 to 3% for pay in kind.

About half of the farmers interviewed eat rice everyday, but most of them regard millet and maize as the most important staple. Those who regard rice as the most important staple are only three out of 39 answered.

The most serious problem on rice production identified by those who practice irrigated farming is the difficult marketing, followed by lack of agro-machinery, no access to credit, high production cost, damages by insect/diseases and birds, etc.

## **(2) Ziguinchor Region<sup>2</sup>**

In Ziguinchor, rice cultivation has been practiced traditionally. In particular for Diola, the dominant ethnic in the area, rice and their land are closely related to their life and religion. In general, rice is regarded as holy good and symbol of social status and/or wealth, so rice is seldom marketed. Also use of chemicals and machinery on their paddy field is often considered undesirable. According to the interview survey at the Oussouye department, a farmer still keeps the rice harvested in 1984, preparing for the urgent needs.

In the following, features of the rice cultivation in Ziguinchor are summarized based on the questionnaire survey.

Most of the farmers (96% of interviewed) cultivate rice in the wet season. Some farmers also cultivate rice in dry season (16%). Other crops cultivated include millet (40%), maize (28%),

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<sup>2</sup> The description of the Ziguinchor Region is made referring to the Tables 22 -68, attached to this annex.

groundnut (21%), cowpea (13%), etc. Division of labor is basically practiced between the sexes for each of the farming work. Land preparation of paddy field and upland farming as a whole are done by men, while rice farming from transplanting to harvest is done by women.

Most farmers (84% of 77 responded) cultivate crops at a scale of between 1 and 5 ha, 14% between 6 and 9 ha, and 1% more than 10 ha.

Land preparation is done manually or using animal, but manual work using “kajandou”, a traditional farm tool with long stick, is still common. Bund making is also done manually.

Local rice varieties such as Diamissé are commonly used, but some farmers use improved variety like Sahel 108. The most common criterion for variety selection is the taste, followed by the short growth duration, high yielding potential, availability of seeds. In most cases, seeds are taken from the previous harvest.

Some 70% of the responded farmers practice transplanting. Fertilizer is seldom applied, but manure is usually supplemented to soil as many livestock enter into paddy field to eat remained rice straw after harvest.

Weeding is done manually. Control of pest and diseases is not practiced except when the serious damage is expected. Harvest is done by cutting spikelets using knives. The products are consumed at home.

Problems on rice cultivation among farmers include difficulty in controlling water (lack of water control structure), obsolete and shortage of agricultural tools and equipment, shortage of improved variety of seeds, saline hazard and acid toxicity of soils, low level of inputs, etc.

**Tables summarizing the results of the agricultural survey in the Kolda Region (Tables 1-21)**

**Table 1 Size of the Family**

Anambé Basin							Total	unit: number				Total
	Dialakegni	Soutoure	Mbalocounda	Fass Pathe	Anambe	S. Kareba		Outside Anambé				
	S. Keita	S. Brasso	Diereng	Goudomp								
Total	210	158	137	155	120	106	886	95	250	54	148	547
number	10	10	10	10	10	10	60	9	10	8	10	37
Average	21	16	14	16	12	11	14.8	11	25	7	15	14.8
maximum	30	30	19	35	23	23	35	18	44	20	22	44
minimum	8	10	10	6	5	5	5	5	10	1	8	1

**Table 2 Number of Economic Active Family Member**

Basin Anambé							Total	unit: number				Total
	Dialakegni	Soutoure	Mbalocounda	Fass Pathe	Anambe	S. Kareba		hors de Anambé				
	S. Keita	S. Brasso	Diereng	Goudomp								
Total	64	52	46	51	40	54	307	50	136	41	51	278
number	10	10	10	10	10	10	60	9	10	8	10	37
Average	6	5	5	5	4	5	5.1	6	14	5	5	7.5
maximum	20	10	11	11	8	18	20	8	34	10	18	34
minimum	1	2	1	2	1	1	1	3	4	2	1	1

Source: The JICA Study Team based on the GERAD survey results, February 2005

Table 3 Cultivated Area by Crops

	Anambé Basin						Total	unit: ha				Total
	Dialakegni	Soutoure	Mbalocounda	Fass Pathe	Anambe	S. Kareba		S. Keita	S. Brasso	Diereng	Goudomp	
<b>Paddy(dry season)</b>												
Total	13.4	26.7	12.5	2	20.85	15	90.45	0	0	0	0	0
number	7	10	6	1	10	8	42	0	0	0	0	0
Average	1.9	2.7	2.1	2.0	2.1	1.9	2.2					
maximum	4.1	8.0	3.0	2.0	5.0	3.0	8.0	0	0	0	0	0
minimum	1.0	1.0	1.0	2.0	1.0	1.0	1.0	0	0	0	0	0
<b>Paddy(rainy season)</b>												
Total	0.5	35.5	11	0	27.75	45	119.75	10.75	10.31	23.5	11.755	56.315
number	1	6	4	0	8	10	29	9	9	8	9	35
Average	1	6	3		3	5	4.1	1	1	3	1	1.6
maximum	0.5	25	3	0	10	15	25.0	3	4	5	2	5
minimum	0.5	1	2	0	1.3	1	0.0	0.25	0.01	0.5	0.005	0.005
<b>Millet</b>												
Total	5	1	2.75	0.5	1.5	2.5	13.25	2.25	3.15	9.5	2.25	17.15
number	3	1	2	1	2	3	12	2	6	6	3	17
Average	2	1	1	1	1	1	1.1	1	1	2	1	1.0
maximum	2	1	1.5	0.5	1	1	2.0	2	1	3	1.5	3
minimum	1	1	1.25	0.5	0.5	0.5	0.5	0.25	0.2	0.5	0.25	0.2
<b>Sorghum</b>												
Total	9.75	4.25	9.75	0.5	3	4.75	32	1	2.7	2.5	0	6.2
number	7	4	7	1	2	4	25	1	5	3	0	9
Average	1	1	1	1	2	1	1.3	1	1	1		0.7
maximum	2	2	3	0.5	2	3	3.0	1	1	1	0	1
minimum	0.75	0.25	0.75	0.5	1	0.25	0.3	1	0.2	0.5	0	0
<b>Maize</b>												
Total	15.25	12.5	14.75	16.5	13.2	10.25	82.45	4.5	2.75	9	1.5	17.75
number	9	10	10	10	10	8	57	5	3	5	2	15
Average	2	1	1	2	1	1	1.4	1	1	2	1	1.2
maximum	4	4	2	3	3	4	4.0	2	2.25	3	1	3
minimum	0.75	0.5	1	1	0.25	0.5	0.3	0.25	0.25	0.5	0.5	0.25
<b>Cowpea</b>												
Total	2	0	0	0	0	0	2	0.25	0	0	0	0.25
number	3	0	0	0	0	0	3	1	0	0	0	1
Average	1						0.7	0				0.3
maximum	1	0	0	0	0	0	1.0	0.25	0	0	0	0
minimum	0.5	0	0	0	0	0	0.0	0.25	0	0	0	0
<b>Groundnut</b>												
Total	14.5	5.25	11.25	6.75	6.75	6	50.5	1.5	6.25	10.5	0	18.25
number	10	7	10	8	6	7	48	3	5	6	0	14
Average	1	1	1	1	1	1	1.1	1	1	2		1.3
maximum	3	1	2.5	2	3	1.5	3.0	1	4	3	0	4
minimum	0.25	0.25	0.5	0.25	0.25	0.25	0.3	0.25	0.25	0.5	0	0
<b>Others</b>												
Total	25.75	11.25	18.75	23.7	11.25	6.5	97.2	0	0.75	0	0.25	1
number	10	10	10	9	7	5	51	0	2	0	1	3
Average	3	1	2	3	2	1	1.9		0		0	0.3
maximum	7.5	2	3	5	5	3	7.5	0	0.5	0	0.25	1
minimum	0.75	0.25	1	1	0.25	0.5	0.3	0	0.25	0	0.25	0

Source: The JICA Study Team based on the GERAD survey results, February 2005

Table 4 Raised Animal

	Anambé Basin						Total	unit: head Outside Anambé				Total
	Dialakegni	Soutoure	Mbalocounda	Fass Pathe	Anambe	S. Kareba		S. Keita	S. Brasso	Diereng	Goudomp	
<b>Bovins</b>												
Total	349	125	233	197	46	60	1,010	10	195	19	4	228
number	7	8	9	8	6	1	39	4	3	6	2	15
Average	50	16	26	25	8	60	26	3	65	3	2	15
maximum	115	60	60	60	15	60	115	5	185	5	2	185
minimum	5	1	4	7	4	60	1	1	4	2	2	1
<b>Cheval</b>												
Total	10	5	7	2	2	0	26	0	0	0	0	0
number	5	3	5	1	2	0	16	0	0	0	0	0
Average	2	2	1	2	1		2					
maximum	4	2	2	2	1	0	4	0	0	0	0	0
minimum	1	1	1	2	1	0	0	0	0	0	0	0
<b>Ane/mule</b>												
Total	16	21	11	6	11	7	72	10	8	6	0	24
number	8	9	7	5	7	5	41	5	2	4	0	11
Average	2	2	2	1	2	1	2	2	4	2		2
maximum	3	6	3	2	3	3	6	3	4	2	0	4
minimum	1	1	1	1	1	1	1	1	4	1	0	0
<b>Muton/chèvre</b>												
Total	129	42	133	196	71	39	610	36	171	66	10	283
number	9	8	10	10	10	8	55	7	5	8	3	23
Average	14	5	13	20	7	5	11	5	34	8	3	12
maximum	30	20	34	40	29	8	40	12	118	15	5	118
minimum	3	1	3	5	1	1	1	2	1	2	1	1
<b>Poules</b>												
Total	139	136	154	66	125	120	740	98	97	117	137	449
number	8	9	9	8	9	8	51	7	6	8	8	29
Average	17	15	17	8	14	15	15	14	16	15	17	15
maximum	50	50	30	20	30	30	50	30	31	30	40	40
minimum	2	2	7	1	4	5	1	1	7	2	4	1
<b>Autres</b>												
Total	0	20	0	0	0	0	20	0	20	0	75	95
number	0	1	0	0	0	0	1	0	1	0	4	5
Average		20					20		20		19	19
maximum	0	20	0	0	0	0	20	0	20	0	26	26
minimum	0	20	0	0	0	0	0	0	20	0	12	0

Source: The JICA Study Team based on the GERAD survey results, February 2005

Table 5 Variety of Rice Cultivated

	Anambé Basin						Total	unit: ha Outside Anambé				Total	
	Dialakegni	Soutoure	Mbalocounda	Fass Pathe	Anambe	S. Kareba		S. Keita	S. Brasso	Diereng	Goudomp		
<b>IR1529</b>													
Total	0	0	0	0	0	9	9	0	0	0	0	0	0
number	0	0	0	0	0	4	4	0	0	0	0	0	0
Average						2	2.3						
maximum						3	3						
minimum						2	2						
<b>Sahel 202</b>													
Total	0	0	0	0	0	3	3	0	0	0	0	0	0
number	0	0	0	0	0	1	1	0	0	0	0	0	0
Average						3	3.0						
maximum						3	3						
minimum						3	3						
<b>Sahel 108</b>													
Total	7.7	42.2	2.5	1.3	17.4	9	80.1	0	1.25	0	1	2.25	
number	5	9	2	1	9	6	32	0	2	0	1	3	
Average	2	5	1	1	2	2	2.5		1		1	0.8	
maximum	3	25	1.5	1.3	5	2	25		0.75		1	1	
minimum	1	1	1	1.3	1	1	1		0.5		1	0.5	
<b>Jaya</b>													
Total	0	0	0	0	0	1	1	0	0	0	0	0	0
number	0	0	0	0	0	1	1	0	0	0	0	0	0
Average						1	1.0						
maximum						1	1						
minimum						1	1						
<b>TCS-10</b>													
Total	7.35	4	0	0	14.8	3	29.15	0	0	0	0	0	0
number	3	2	0	0	4	2	11	0	0	0	0	0	0
Average	2	2			4	2	2.7						
maximum	4	3			10	2	10						
minimum	1.35	1			1	1	1						
<b>Others</b>													
Total	0.5	0	0	0	0	4	4.5	14	8.6	18	8.7505	49.3505	
number	1	0	0	0	0	2	3	10	8	6	7	31	
Average	1					2	1.5	1.3	1.1	3.0	1.3	1.6	
maximum	0.5					3	3	3	4	5	2	5	
minimum	0.5					1	0.5	0.25	0.1	1	0.0005	0.0005	

Variétés Traditionales Nombre de ménage cultivé

Semare	1
(m)bolo diossy	6
nabaring(nabarioun)	6
ayin deoundi	1
ablaye mano	9
traditional	6
madina	5
barafita	4
riz rouge	1
wankarang	4
colsar bepa	1
saymbande	3
code foleri	1
Kola mano	1
Kouba woni	1
bantacountou	4
CFA	1
Jambarang	1
Hako bla	1
Koubaly	1

Source: The JICA Study Team based on the GERAD survey results, February 2005

Table 6 Selection Criteria of Varieties

	Anambé Basin						Total	unit: number of respondents Outside Anambé				Total	
	Dialakegni	Soutoure	Mbalocounda	Fass Pathe	Anambe	S. Kareba		S. Keita	S. Brasso	Diereng	Goudomp		
<b>IR1529</b>													
Number	0	0	0	0	0	3	3	0	0	0	0	0	0
Good taste							0						0
Easy to sell							1						0
High yielding							2						0
Short growth duration							0						0
Availability of seeds							0						0
<b>Sahel 202</b>													
Number	0	0	0	0	0	1	1	0	0	0	0	0	0
Good taste							1						0
Easy to sell							1						0
High yielding							1						0
Short growth duration							1						0
Availability of seeds							1						0
<b>Sahel 108</b>													
Number	5	9	2	1	9	5	31	0	2	2	0	4	4
Good taste							4						3
Easy to sell							1						0
High yielding	2	2			2		6		1				2
Short growth duration	4	6	2	1	5	3	21		2	2			4
Availability of seeds	4	2			1	1	8		1	1			2
<b>Jaya</b>													
Number	0	0	0	0	0	1	1	0	0	0	0	0	0
Good taste							0						0
Easy to sell							0						0
High yielding							0						0
Short growth duration							0						0
Availability of seeds							0						0
<b>TCS-10</b>													
Number	3	2	0	0	4	2	11	0	0	0	0	0	0
Good taste							1						0
Easy to sell							2						0
High yielding	1	1			2	1	5						0
Short growth duration	1				2	1	4						0
Availability of seeds	2	1					3						0
<b>Others</b>													
Number	0	0	0	0	0	1	1	9	5	1	5	20	20
Good taste							0	1	1		2	4	4
Easy to sell							0					0	0
High yielding							0	3	1	1	1	6	6
Short growth duration							0	5	4	1	4	14	14
Availability of seeds							0	2	4		4	10	10

Source: The JICA Study Team based on the GERAD survey results, February 2005



Table 7 Land Preparation Method

	Anambé Basin						Total	unit: number of respondents				Total
	Dialakegni	Soutoure	Mbalocounda	Fass Pathe	Anambe	S. Kareba		S. Keita	S. Brasso	Diereng	Goudomp	
<b>Labour</b>												
Number	4	2	1	0	2	8	17	9	10	9	10	38
Tractor	4	2	1		2	8	17					0
Animal rent							0	2	4			6
Own Animal							0	4	1	2	1	8
Hired labor							0		2			2
Family labor						1	1	5	9	9	10	33
<b>Offsetage</b>												
Number	6	8	1	0	8	2	25	2	7	8	8	25
Tractor	5	8	1		8	2	24					0
Animal rent							0	1	2			3
Own Animal	1						1			2	1	3
Hired labor							0		4			4
Family labor							0	1	7	8	8	24
<b>Boue</b>												
Number	0	0	0	0	0	0	0	0	8	4	5	17
Tractor							0					0
Animal rent							0		1			1
Own Animal							0			1		1
Hired labor							0		1			1
Family labor							0		8	4	5	17
<b>Planage</b>												
Number	0	0	0	0	0	0	0	0	1	0	0	1
Tractor							0					0
Animal rent							0					0
Own Animal							0					0
Hired labor							0					0
Family labor							0		1			1

Source: The JICA Study Team based on the GERAD survey results, February 2005

Table 8 Cost of Services per Hectare by Type of Services

	Anambé Basin						Total	unit: FCFA/ha Outside Anambé				Total
	Dialakegni	Soutoure	Mbalocounda	Fass Pathe	Anambe	S. Kareba		S. Keita	S. Brasso	Diereng	Goudomp	
<b>Labour</b>												
Total	81,000	50,000	25,000	0	45,000	225,000	426,000	5,000	13,000	0	0	18,000
number	3	2	1	0	2	8	16	2	3	0	0	5
Average	27,000	25,000	25,000		22,500	28,125	26,625	2,500	4,333			3,600
maximum	27,000	25,000	25,000		25,000	45,000	45,000	3,000	5,000			5,000
minimum	27,000	25,000	25,000		20,000	15,000	15,000	2,000	3,000			3,000
<b>Offsetage</b>												
Total	106,200	190,000	25,000	0	195,000	40,000		0	13,500	0	0	13,500
number	5	8	1	0	8	2		0	3	0	0	3
Average	21,240	23,750	25,000		24,375	20,000			4,500			4,500
maximum	27,000	25,000	25,000		25,000	25,000			5,000			5,000
minimum	0	20,000	25,000		20,000	15,000			4,000			4,000
<b>Boue</b>												
Total	0	0	0	0	0	0		0	4,000	0	0	4,000
number	0	0	0	0	0	0		0	1	0	0	1
Average									4,000			4,000
maximum									4,000			4,000
minimum									4,000			4,000
<b>Planage</b>												
Total	0	0	0	0	0	0		0	0	0	0	0
number	0	0	0	0	0	0		0	0	0	0	0
Average												
maximum												
minimum												

Source: The JICA Study Team based on the GERAD survey results, February 2005

Table 9 Seed Dosage

Anambé Basin							Total	Outside Anambé				Total
	Dialakegni	Soutoure	Mbalocounda	Fass Pathe	Anambe	S. Kareba		S. Keita	S. Brasso	Diereng	Goudomp	
Total (kg)	1700	1620	0	0	2155	1800	7275	198	635	105	25	963
number	9	10	0	0	10	8	37	4	8	3	1	16
Average	189	162			216	225	197	50	79	35	25	60
maximum	250	250			250	250	250	100	150	50		150
minimum	50	60			175	150	50	3	10	20		3

unit: kg/ha

Table 10 Irrigation Cost

Anambé Basin							Total	Outside Anambé				Total
	Dialakegni	Soutoure	Mbalocounda	Fass Pathe	Anambe	S. Kareba		S. Keita	S. Brasso	Diereng	Goudomp	
Total	354000	421320			414830	172290	1362440	0	0	0	0	
number	8	10			10	7	35	0	0	0	0	
Average	44,250	42,132			41,483	24,613	38,927					
maximum	75,000	60,000			60,000	34,165	75,000					
minimum	35,000	34,000			34,100	5,000	5,000					

unit: FCFA/ha

Table 11 Fertilizer Dosage

Anambé Basin							Total	Outside Anambé				Total
	Dialakegni	Soutoure	Mbalocounda	Fass Pathe	Anambe	S. Kareba		S. Keita	S. Brasso	Diereng	Goudomp	
NPK												
Total	1550	2200	200	0	2000	1750	7700	0	650	560	490	1700
Nombre	8	10	1	0	10	9	38	0	7	9	6	22
Moyenne	194	220	200		200	194	203		93	62	82	77
maximum	250	250	200		200	250	250		150	100	100	150
minimum	150	200	200		200	125	125		50	50	40	40
Urée												
Total	1350	2100	100	0	1900	1300	6750	0	400	660	550	1610
Nombre	8	10	1	0	10	8	37	0	6	9	6	21
Moyenne	169	210	100		190	163	182		67	73	92	77
maximum	200	250	100	0	200	250	250		150	100	100	150
minimum	100	150	100	0	150	50	0		50	50	50	50

unit: kg/ha

Table 12 Time of Fertilizer Application

Anambé Basin							Total	Outside Anambé				Total
	Dialakegni	Soutoure	Mbalocounda	Fass Pathe	Anambe	S. Kareba		S. Keita	S. Brasso	Diereng	Goudomp	
NPK												
Total	133	140	7	0	168	224	672	0	82	80	124	286
Nombre	8	10	1		10	9	38	0	6	4	5	15
Moyenne	17	14	7		17	25	18		14	20	25	19
maximum	25	25	7		25	40	40		40	40	40	40
minimum	7	0	7		10	14	0		0	0	21	0
Urea												
Total	217	339	7	0	400	318	1281	0	42	153	42	237
Nombre	8	10	1		10	8	37	0	5	5	6	16
Moyenne	27	34	7		40	40	35		8	31	7	15
maximum	30	45	7		50	56	56		21	45	21	45
minimum	15	25	7		15	25	7		0	21	0	0

unit: days after sowing

Source: The JICA Study Team based on the GERAD survey results, February 2005

Table 13 Satisfaction on Irrigation

unit: number of respondents

	Anambé Basin						Total
	Dialakegni	Soutoure	Mbalocounda	Fass Pathe	Anambe	S. Kareba	
Number	8	10	1		10	8	37
Satisfied	5	6	1		8	7	27
Not satisfied	3	4	0		2	1	10

reason of being unsatisfied: high cost, 1 water quantity, 2 water quantity, levelling, 3 high cost, Lack of water management

Table 14 Satisfaction on Drainage

unit: number of respondents

	Anambé Basin						Total
	Dialakegni	Soutoure	Mbalocounda	Fass Pathe	Anambe	S. Kareba	
Number	8	10	1		10	8	37
Satisfied	5	10	0		6	7	28
Not satisfied	3	0	1		4	1	9

reason of being unsatisfied: 3 levelling, siltation, water stagnation, 3 levelling

Table 15 Method of Harvest

unit: number of respondents

	Anambé Basin						Total
	Dialakegni	Soutoure	Mbalocounda	Fass Pathe	Anambe	S. Kareba	
Number	9	10			9	10	38
Combine harvester	2	9			7	6	24
Hired labor	3				1	5	9
Family labor	4	1			1	3	9

Table 16 Method of Threshing

unit: number of respondents

	Anambé Basin						Total
	Dialakegni	Soutoure	Mbalocounda	Fass Pathe	Anambe	S. Kareba	
Nombre	7	8			10	10	35
Combine harvester	3	7			8	10	28
Hired labor							0
Family labor	4	1			2	4	11

Table 17 Destination of Harvested Paddy

unite: %

	Anambé Basin						Average
	Dialakegni	Soutoure	Mbalocounda	Fass Pathe	Anambe	S. Kareba	
Self-consumption	75.0%	67.8%			51.0%	61.9%	61.7%
Sale	10.6%	20.6%			33.4%	23.6%	23.9%
Gift	4.0%	8.1%			10.3%	13.5%	9.4%
Pay in kind	3.5%	0.0%			4.7%	1.0%	2.7%
Repaying credit	6.8%	3.5%			0.5%	0.0%	2.3%
Total	100.0%	100.0%			100.0%	100.0%	100.0%

Remarks: \* arithmetic average

Source: The JICA Study Team based on the GERAD survey results, February 2005

Table 18 Daily Rice Consumption

	Anambé Basin						Total	Outside Anambé				Total
	Dialakegni	Soutoure	Mbalocounda	Fass Pathe	Anambe	S. Kareba		S. Keita	S. Brasso	Diereng	Goudomp	
manger riz tous les jours?												
Nombre	9	9		4	9	10	41	8	8	4		20
Oui	3	4		1	9	5	22	4	8	3		15
Non	6	5		3	0	5	19	4	0	1		5

unit: number of respondents

Table 19 Frequency of Rice Eating

	Anambé Basin						Total	Outside Anambé				Total
	Dialakegni	Soutoure	Mbalocounda	Fass Pathe	Anambe	S. Kareba		S. Keita	S. Brasso	Diereng	Goudomp	
1		2				1		1		2		
2		4			2	2		1				
3	3	4		5	3	3		7-16				
4	3	4			2	2		7	2			
5	3	7		1		1			1			
6	4	1			1			1-2	1			
7		7			1			1-2	1-2			
8	2	2			2			1-2	1-2			
9	2				4			2	2-3	2		
10	3	2			2							

unit: frequency per day or week

Remarks: number with bolded letter shows the frequency per week, otherwise per day

Table 20 Most Important Food

	Anambé Basin						Total	Outside Anambé				Total
	Dialakegni	Soutoure	Mbalocounda	Fass Pathe	Anambe	S. Kareba		S. Keita	S. Brasso	Diereng	Goudomp	
Number	6	10		4	9	10	39	10	10	4		
Millet	2	8		3	9	10	32	8	3			
Rice	3						3	1	2	1		
Both									4	3		
Other	1	2		1		3	7	2	3			

unit: number of respondents

Table 21 Problems on Agriculture

Problem	Anambé Basin						Total	Outside Anambé				Total		
	Dialakegni	Soutoure	Mbalocounda	Fass Pathe	Anambe	S. Kareba		S. Keita	S. Brasso	Diereng	Goudomp			
Low profitability						1	1					0		
Difficulty in marketing		7	9		4	5	5	31			3	1	5	9
Low yield				1			1		3	4	6	1	14	
High production cost		4	2	2	3	4	15			2	1	1	4	
Diseases/insects/birds		2	3	1	1	4	3	14	5	1	6	1	13	
Lack of tractors		4	5	2		4	4	19	6	1	1	3	11	
Low quality of rice							0		1			1		
Credit unavailability		3	3	1		3	6	16		3	2	2	7	
Soil salinization							0		6	7	8	21		
Water availability		1	1	2	1		1	6	5	3	1	2	11	
Lack of certified seeds		1			1	2	2	6	1	3	2	4	10	
Difficulty in obtaining seeds						3	3	1	2		1	4		
Others		3	2	1	5		1	12	2				2	
Total		25	25	11	15	25	23	124	23	29	27	28	107	

unit: number of respondents

Source: The JICA Study Team based on the GERAD survey results, February 2005

**Tables summarizing the results of the agricultural survey in the Ziguinchor Region (Tables 22-68)**

**Table 22 Number of Family Members**

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaquis	Niassia	Sindian	Tenghory	Total
Total	131	108	68	67	66	142	98	33	205	165	1083
number	10	10	10	10	10	10	10	10	10	10	100
average	13	11	7	7	7	14	10	3	21	17	10.8
maximum	20	20	11	16	11	23	20	5	26	23	26
minimum	4	5	2	2	5	5	3	2	14	10	2

**Table 23 Number of economically active family members**

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaquis	Niassia	Sindian	Tenghory	Total
Total	76	68	67	77	40	98	33	46	165	75	745
number	10	10	10	9	10	10	10	10	10	10	99
average	8	7	7	9	4	10	3	5	17	8	7.5
maximum	14	11	16	15	7	20	5	8	23	10	23
minimum	3	2	2	4	2	3	2	2	10	2	2

Source: The JICA Study Team based on the GERAD survey results, February 2005

Table 24 Cultivated area by crop species

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaquis	Niassia	Sindian	Tenghory	Total
<b>Riz(wet season)</b>											
Total	24.7	14.25	23.5	15.75	58	13.5	0	8.5	1	12	171.2
number	10	10	10	9	9	10	0	9	2	10	79
average	2	1	2	2	6	1		1	1	1	2.2
maximum	6	4.5	6	6.75	10	4		1	0.5	2	10
minimum	1	0.25	0.5	1	3	0.5		0.5	0.5	0.5	0.25
<b>Millet</b>											
Total	8.7	0	14	3.5	0	1	0	0	2	8.5	37.7
number	8	0	10	5	0	1	0	0	1	9	34
average	1		1	1		1			2	1	1.1
maximum	2		2.5	1		1			2	2	3
minimum	0.5		0.5	0.5		1			2	0.5	0.5
<b>Sorghum</b>											
Total	0	0	0	1	0	0	0	0	1	1	3
number	0	0	0	2	0	0	0	0	1	2	5
average				1					1	1	0.6
maximum	0		0	0.5					1	0.5	1
minimum	0		0	0.5					1	0.5	0
<b>Maize</b>											
Total	4.5	0	2	1.75	0	8	0	0	0.5	4	20.75
number	5	0	3	3	0	10	0	0	1	6	28
average	1		1	1		1			1	1	0.7
maximum	1		1	0.75		1			0.5	1	1
minimum	0.5		0.5	0.5		0.5			0.5	0.5	0.5
<b>Cowpea</b>											
Total	0	0	1.5	0.5	0	8	0	0	0	0.5	10.5
number	0	0	3	1	0	10	0	0	0	1	15
average			1	1		1				1	0.7
maximum			0.5	0.5		1.5				0.5	2
minimum			0.5	0.5		0.5				0.5	0.5
<b>G. nuts</b>											
Total	1.5	0	0.5	2.1	0	14.5	0	0	0	7	25.6
number	2	0	1	4	0	10	0	0	0	4	21
average	1		1	1		1				2	1.2
maximum	1		0.5	0.75		2.5				2	3
minimum	0.5		0.5	0.1		1				1	0.1
<b>Others</b>											
Total	0	1	7	1.85	0	0.5	0	0	0	0.5	10.85
number	0	1	5	3	0	1	0	0	0	1	11
average		1	1	1		1				1	1.0
maximum		1	3	1	0	0.5				0.5	3
minimum		1	1	0.25	0	0.5				0.5	0
<b>Total</b>											
Total	39.4	15.25	48.5	26.45	58	45.5	0	8.5	4.5	33.5	279.6
number	10	10	10	10	9	10		9	2	10	80
average	4	2	5	3	6	5		1	2	3	3.5
maximum	9	5	8	7	10	8		1	4	7	10
minimum	2	0.3	2	1	3	3		1	1	1	0.3

Source: The JICA Study Team based on the GERAD survey results, February 2005

Table 25 Raised Animal by Species

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaquis	Niassia	Sindian	Tenghory	Total
<b>Cattle</b>											
Total	35	26	16	31	14	47	0	0	23	28	220
number	6	8	3	5	2	7	0	0	9	7	47
average	6	3	5	6	7	7			3	4	5
maximum	10	5	8	14	8	12			5	15	15
minimum	2	1	3	2	6	2			1	2	1
<b>Horse</b>											
Total	0	0	0	0	0	0	0	0	6	0	6
number	0	0	0	0	0	0	0	0	2	0	2
average									3		3
maximum									3		3
minimum									3		3
<b>Donkey/mule</b>											
Total	1	0	0	0	0	0	0	0	0	4	5
number	1	0	0	0	0	0	0	0	0	2	3
average	1									2	2
maximum	1									3	3
minimum	1									1	1
<b>Sheep/goat</b>											
Total	40	23	57	60	29	78	14	2	13	44	360
number	7	7	8	9	3	10	4	1	3	10	62
average	6	3	7	7	10	8	4	2	4	4	6
maximum	10	10	24	11	12	17	4	2	6	10	24
minimum	1	1	1	2	7	3	2	2	3	1	1
<b>Poultry</b>											
Total	15	43	154	121	110	181	104	101	55	35	919
number	1	8	9	10	10	9	9	10	9	5	80
average	15	5	17	12	11	20	12	10	6	7	11
maximum	15	12	40	16	21	36	20	16	12	10	40
minimum	15	1	3	7	5	10	4	2	2	4	1

Table 26 Varieties Used

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaquis	Niassia	Sindian	Tenghory	Total
Total	9	10	10	9	10	10	10	10	7	9	94
IR1529				2							2
Sahel 201			1	1							2
Sahel 202											0
Sahel 108										1	1
Jaya											0
TCS-10	1										1
Others	8	10	9	6	10	10	10	10	7	8	88

Table 27 Selection Criteria of Varieties

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaquis	Niassia	Sindian	Tenghory	Total
Total	9	10	10	8	0	6	9	10	7	10	79
Taste	6	10	4	6			8	10	5	8	57
Marketable				3						1	4
High yield	3	10	8	4			3		4	8	40
Short matu	4	8	9	3		3	7		5	6	45
Availability	5	1	5	3		6	4	10	3		37
Others		1		2							3

Source: The JICA Study Team based on the GERAD survey results, February 2005



Table 28 Means of Land Preparation

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaguis	Niassia	Sindian	Tenghory	Total
<b>Plough</b>											
Number	9	2	10	5	3	4	1	0	8	4	46
Tractor hire							1			1	2
Animal hire											0
Own animal				2						1	3
Hire labor	9	2	6	1		4	1		2	2	27
Family labor			4	2	3				6		15
Other											0
<b>Harrow</b>											
Number	9	2	6	3	0	4	1	0	2	3	30
Tractor hire											0
Animal hire											0
Own animal											0
Hire labor											0
Family labor	9	2	6	3		4	1		2	3	30
Other											0
<b>Bunding</b>											
Number	6	4	3	9	9	9	0	10	6	0	56
Tractor hire											0
Animal hire				1							1
Own animal				1		1					2
Hire labor	6	4		2	2	8					22
Family labor			3	5	7			10	4		29
Other									2		2
<b>Levelling</b>											
Number	5	0	0	2	0	0	0	0	6	5	18
Tractor hire											0
Animal hire											0
Own animal				2							2
Hire labor	5									2	7
Family labor									6	3	9
Other											0

Source: The JICA Study Team based on the GERAD survey results, February 2005

Table 29 Cost of Land Preparation by Type of Service

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaguis	Niassia	Sindian	Tenghory	Total
<b>Plough</b>											
Total	51,000	0	0	0	0	0	0	0	8,000	44,500	103,500
number	5	0	0	0	0	0	0	0	2	4	11
average	10,200								4,000	11,125	9,409
maximum	30,000								4,000	12,500	30,000
minimum	3,000								4,000	10,000	3,000
											0
<b>Harrow</b>											
Total	0	0	0	0	0	0	0	0	0	0	0
number	0	0	0	0	0	0	0	0	0	0	0
average											
maximum											
minimum											
<b>Bunding</b>											
Total	41000	275000	0	10000	0	29500	0	0	0	0	355,500
number	3	9	0	2	0	3	0	0	0	0	17
average	13,667	30,556		5,000		9,833					20,912
maximum	30000	150000		5000		12000					150,000
minimum	1000	10000		5000		7500					1,000
											0
<b>Levelling</b>											
Total	25000	0	0	0	0	0	0	0	0	23000	48,000
number	2	0	0	0	0	0	0	0	0	2	4
average	12,500									11,500	12,000
maximum	15000									12000	15,000
minimum	10000									11000	10,000
											0

Source: The JICA Study Team based on the GERAD survey results, February 2005

Table 30 Type of Cultivation

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaguis	Niassia	Sindian	Tenghory	Total
Total	9	10	20	14	18	20	16	17	8	16	
number	8	10	10	10	9	10	8	10	8	9	92
Direct seedin	7	10		6				3	8	2	36
Transplanting	1		10	4	9	10	10	7		7	58

Table 31 Condition of soils at sowing/transplanting

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaguis	Niassia	Sindian	Tenghory	Total
Number	7	10	10	6	0	0	0	6	8	6	53
Dry condition		10		1						1	12
moist	7		10	2				6	8	5	38
submerged				3							3
Other											0

Table 32 Seed amount (kg/ha)

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaguis	Niassia	Sindian	Tenghory	Total
number	10	10	4	4	10	8	5	10	1	1	63
average	96	21	21	80	30	20	21	18	6	50	38
maximum	200	50	30	100	91	35	30	25	6	50	200
minimum	30	0.5	15	50	16	10	5	10	6	50	0.5

Table 33 Nursery period (days)

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaguis	Niassia	Sindian	Tenghory	Total
Total	36	23	234	19.5	90	150	142	79	5	200	979
number	10	10	9	9	5	8	10	10	1	7	79
average	4	2	26	2	18	19	14	8	5	29	12
maximum	10	3	30	4	20	20	20	9	5	30	30
minimum	1	1	21	0.5	15	15	7	7	5	20	0.5

Note: The villages with bolded letter are those where transplanting is widely practiced.

Table 34 Procurement of Fertilizer

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaguis	Niassia	Sindian	Tenghory	Total
number	1	0	3	4	0	7	1	0	6	1	23
Store				3			1		2		6
Distributor	1		3			7			2	1	14
Other				1					2		3

Table 35 Availability of Fertilizer

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaguis	Niassia	Sindian	Tenghory	Total
number	4	10	9	9	10	10	8	8	6	5	79
Available	4	10	4	8	10	8	6	8	6	2	66
Not available			5	1		2	2			3	13

Table 36 Material of Manure

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaguis	Niassia	Sindian	Tenghory	Total
number	4	10	4	9	10	8	3	10	8	2	68
Animal dunc	2	10	4	8	10	8	1	1	4	2	50
crop residue	1								4		5
azolla											0
others	1			1			2	9			13

Source: The JICA Study Team based on the GERAD survey results, February 2005

Table 37 Problem with insect/diseases

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaquis	Niassia	Sindian	Tenghory	Total
number	10	10	10	10	10	10	10	10	10	10	100
Yes	6	4	7	4	7	3	6	0	2	7	46
No	4	6	3	6	3	7	4	10	8	3	54

Table 38 Cause of Problems

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaquis	Niassia	Sindian	Tenghory	Total
number	6	2	9	5	8	7	8	0	3	7	55
insect		2		1	6	7	1				17
diseases			1		1					1	3
both	6		8	4			6		3	6	33
others					1		1				2

Table 39 Countermeasures to Sauteriaux

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaquis	Niassia	Sindian	Tenghory	Total
number	4	1	9	7	6	1	2	0	3	8	41
chemicals	2	1	6								9
Biological	1										1
Remove plants			3				1		1		5
Do nothing	1			7	6				3	8	25
Others						1	1				2

Table 40 Weeding method

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaquis	Niassia	Sindian	Tenghory	Total
number	8	6	10	5	4	0	0	9	5	5	52
herbicide											0
manual we	8	6	8	5				9	5	1	42
Do nothing			2		4					4	10

Table 41 Weeding Frequency

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaquis	Niassia	Sindian	Tenghory	Total
number	7	9	8	7	0	0	1	10	5	1	48
1 time	3		8	6			1	10	5		33
2 times	4	7		1						1	13
3 times		2									2

Table 42 Condition of labor hiring

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaquis	Niassia	Sindian	Tenghory	Total
number	7	7	0	2	0	0	0	0	2	1	19
money				2					1		3
lunch	1										1
Both	6	7							1	1	15

Table 43 Countermeasure on bird

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaquis	Niassia	Sindian	Tenghory	Total
number	3	7	9	9	7	1	0	10	5	7	58
watchmen	2			6	7	1		3	5	6	30
scarecrow		7		3						7	17
nets				1							1
variety				3							3
other	1		9	1				10			21

Source: The JICA Study Team based on the GERAD survey results, February 2005

Table 44 Harvest Method

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaquis	Niassia	Sindian	Tenghory	Total
Number	9	10	10	6	9	9	7	10	2	7	79
Combine		3									3
Hired labor	6	4	8		2	6	5			4	35
Family labor	9	9	8	6	9	9	7	10	2	3	72

Table 45 Condition of labour employment

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaquis	Niassia	Sindian	Tenghory	Total
number	6	6	9	2	2	6	6	0	0	5	42
Money			6	2	2	6	6				22
Lunch			1								1
Both	6	6	2							5	19

Table 46 Timing of harvest

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaquis	Niassia	Sindian	Tenghory	Total
number	8	8	10	7	8	8	4	10	1	6	70
Timely	3	7	5	5	6	6	4	10		6	52
Not timely	5	1	5	2	2	2			1		18

Table 47 Reason for untimely harvest

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaquis	Niassia	Sindian	Tenghory	Total
number	5	9	6	3	2	1	0	0	0	0	26
Arrival of combine		4		2							6
Availability of combine		7		1							8
Poor drainage		1		2							3
Finding labor	5	3	6	1	1	1					17
Other reasons	1				1						2

Table 48 Threshing method

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaquis	Niassia	Sindian	Tenghory	Total
number	5	1	9	8	10	9	0	8	0	9	59
Hired thresher											0
Own thresher		1									1
Manual	2		9	2	10	9		8		9	49
Others	3			7							10

Table 49 Transport

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaquis	Niassia	Sindian	Tenghory	Total
number	7	4	10	7	10	6	9	9	0	8	70
Vehicle					1		1			1	3
Cart	4		9	7		1	1			2	24
Others	3	4	1		9	5	7	9		5	43

Table 50 Transportation cost (FCFA)

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaquis	Niassia	Sindian	Tenghory	Total
Total	2100	0	13500	0	0	0	0	0	0	0	15600
number	3	0	6	0	0	0	0	0	0	0	9
average	700		2,250								1,733
maximum	1000		3000								3000
minimum	100		2000								100

Source: The JICA Study Team based on the GERAD survey results, February 2005

Table 51 Destination of Harvested Rice

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaquis	Niassia	Sindian	Tenghory	Total
<b>self-consumption</b>											
Total	760	59	13	1088	0	0	820	1190	0	2	3,932
number	3	9	2	9	0	0	3	9	0	1	36
average	253	7	7	121			273	132		2	109
maximum	600	10	8	300			500	200		2	600
minimum	10	2	5	9			150	100		2	2
<b>Sale</b>											
Total	0	0	0	28	0	0	0	0	0	0	28
number	0	0	0	2	0	0	0	0	0	0	2
average				14							14
maximum				20							20
minimum				8							8
<b>Gift</b>											
Total	70	0	0	471	0	0	60	0	0	0	601
number	2	0	0	7	0	0	1	0	0	0	10
average	35			67			60				60
maximum	50			400			60				400
minimum	20			1			60				1

Table 52 Rice daily intake

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaquis	Niassia	Sindian	Tenghory	Total
Total	6	6	9	9	9	0	8	10	1	7	65
Everyday	5	5	4	9	9		8	10	1	6	57
Not everyd	1	1	5	0	0		0	0	0	1	8

Table 53 Frequency of rice intake per day

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaquis	Niassia	Sindian	Tenghory	Total
Number	6	4	4	8	9	0	10	10	0	7	58
1 time	0	0	0	0	0		0	0		2	2
2 times	5	0	0	1	0		0	0		5	11
3 times	1	4	4	7	9		10	10		0	45

Table 54 Frequency of rice intake per week

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaquis	Niassia	Sindian	Tenghory	Total
Number	0	0	5	0	0	0	0	0	0	1	6
1										1	1
2											0
3			2								2
4											0
5			1								1
6			2								2
7											0

Table 55 Monthly rice consumption (kg/month)

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaquis	Niassia	Sindian	Tenghory	Total
Total	940	1300	869	1065	620	1210	1095	710	1136	1470	10,415
number	10	10	8	10	10	10	10	10	9	9	96
average	94	130	109	107	62	121	110	71	126	163	108
maximum	160	200	200	150	100	225	210	100	350	300	350
minimum	50	100	4	50	50	50	25	50	60	100	4

Table 56 Self-sufficient in months a year

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaquis	Niassia	Sindian	Tenghory	Total
Total	85	50	115	28	43	22	69	49	0	22	483
Number	10	10	9	9	10	10	9	5	0	10	82
average	9	5	13	3	4	2	8	10		2	6
maximum	12	6	70	6	6	4	10	12		6	70
minimum	6	2	2	1	2	1	6	1		1	1

Table 57 Most important staple

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaquis	Niassia	Sindian	Tenghory	Total
Number	7	8	6	8	9	0	8	7	5	7	65
Rice	6	8	4	8	9		8	7	5	6	61
Millet	0	0	2	0	0		0	0	0	0	2
Both	1	0		0	0		0	0	0	1	2

Table 58 Criteria for being staple

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaquis	Niassia	Sindian	Tenghory	Total
Number	7	9	9	9	8	0	9	10	4	8	73
Taste	6	9	7	9	5	0	9	0	4	8	57
Availability	7	0	6	3	7	0	9	0	0	2	34
Easy cook	0	2	3	5	0	0	0	0	3	6	19
Energy sav	0	0	0	0	0	0	0	0	0	0	0
Others	0	0	1	0	0	0	0	10	0	0	11

Source: The JICA Study Team based on the GERAD survey results, February 2005

Table 61 Technologies extended

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaquis	Niassia	Sindian	Tenghory	Total
Number	0	9	1	1	0	2	0	0	6	1	20
Seed selection		8		1							9
fertilizer utilization									6		6
pest control		1	1							1	3
water management										1	1
harvest time		4				1					5
paddy moisture control		1		1							2
Others						1					1

Table 62 Technologies farmers want to acquire

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaquis	Niassia	Sindian	Tenghory	Total
Number	2	3	10	8	3	5	9	10	8	8	66
Levelling			2	1					8	7	18
Fertilizer	1	1	6	6	3	5	9	8	4	2	45
Irrigation		3		4				10	4	6	27
Pest contro	2		4	4		1	9			1	21
post-harvest								1			1
Marketing											0
Others			5			3		1			9

Table 63 Experience of obtaining loan

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaquis	Niassia	Sindian	Tenghory	Total
number	4	6	10	9	0	0	8	10	7	9	63
Yes (1)			3				2			3	8
No (2)	4	6	7	9			6	10	7	6	55

Table 64 Source of loan

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaquis	Niassia	Sindian	Tenghory	Total
number	0	0	3	0	0	0	2	0	0	2	7
CNCAS										1	1
Parents			3				2				5
Connaissance										1	1

Table 65 Amount of loan

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaquis	Niassia	Sindian	Tenghory	Total
Total	0	0	14,500	0	0	0	88,000	0	0	620,000	722,500
number	0	0	3	0	0	0	2	0	0	2	7
average			4,833				44,000			310,000	103,214
maximum			10,000				50,000			600,000	600,000
minimum			2,000				38,000			20,000	2,000

Table 66 Object of loan

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaquis	Niassia	Sindian	Tenghory	Total
Total											
number	0	1	3	0	0	0	1	0	0	1	6
Input purchase			2								2
Irrigation cost		1									1
Others			1				1			1	3

Table 67 Difficulty in obtaining loan

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaquis	Niassia	Sindian	Tenghory	Total
number	0	5	10	9	0	0	4	0	3	2	33
High interest rate		4		9			1		1		15
Complicated procedur		4	9	6			1		2	2	24
Unavailable credit							2		1	1	4
Obligation of credit		1	9	1							11
Delay in reimbursement				2						1	3
Debt											0
Others							3				3

Source: The JICA Study Team based on the GERAD survey results, February 2005



Table 68 Problems that farmers are facing

	Coubalan	Cabrousse	Diouloulou	Tendouck	Mlomp	Loudia wolof	Niaguis	Niassia	Sindian	Tenghory	Total
Low profit	1	7		1					1		10
No market											0
Low yield	6	5	10	9	10	9	9	10	8	9	85
High production cost		2							1		3
Damage by insect/diseases/birds	6	4	5	7		4	5	1	6	9	47
Tractor shortage	1		5	2			8		2	4	22
Low rice quality	2	3		3					3		11
Unavailable credit							1		1	2	4
Soil salinity	3		6	3	10	10	6	9		3	50
Water availability		3	2	2	3	1	1	9	1	2	24
Lack of certified seeds	1	2			2				1		6
Fertilizer availability	3										3
Others	2		2		5	6					15
Total	25	26	30	27	30	30	30	29	24	29	280

Source: The JICA Study Team based on the GERAD survey results, February 2005

添付資料8

カザマンス地方の土壤

## **Soils in the Casamance Area**

Based on the experience of staying and working in the rural areas of Ziguinchor, here actual conditions of rice cultivation and paddy soils in the lower Casamance will mainly be described.

### **1. General conditions of agriculture in Casamance Area**

Endowed with the most favorable climate conditions, farmers in the Ziguinchor region enjoy cultivating various kinds of crops. On the red-brown upland soils, groundnut, maize, millet, etc. are cultivated. Food crops including upland rice, sweet potatoes, taros, yams, are grown on light yellow brown to gray soils. Fruits like mangoes, papaya, oranges, etc. and dry season vegetables such as tomatoes, onion, okra, cabbages, etc. are also extensively cultivated on these soils.

On the other hand, on the gently slopes of the valley along the Casamance river and its tributaries, thanks to the abundant annual rainfall with 1,500 mm on average, rainfed rice cultivation has been traditionally practiced in the rainy season utilizing flood water. However, due to the drastic decrease in rainfall amount during the last decades, which has allowed sea water to intrude some 200 km inland from the sea coast, widespread salinity hazard as well as problems on acid sulfate soils under the mangrove marshy land have become obvious. Due to such deteriorated soil conditions, while sites of the abandoned paddy fields are often seen in the mangrove marshy lands, it is also seen that the farmers made tremendous efforts every year to prepare land and transplant in vain on the low land or upper slopes which are apparently unsuitable for cultivation.

### **2. Overview of the soils in the Casamance area**

In the Lower Casamance area, the stratification of sand which had remained by advancement and regression of sea front during geological age is widely observed in the soil profile. In particular, near the sea shore, represented by the Loudia-Ouolof village in Oussouye, gray to white sand with unified particle size is deposited more than 1m deep. Likewise, very wide paddy fields have been established on sandy soils in the area from Mlomp to Pointe-St. George in Oussouye. Another sandy paddy fields with low productivity are seen in the coastal area of Kabrousse. Soils with relatively high sand content are seen even in the paddy field established in a higher altitude of the uppermost parts of the tributaries like Nyassia area.

On the other hand, gray brown lowland soils with high clay content seem dominant in the paddy field in higher altitude of inland area of Bignona. In the lowlands along the Casamance river, heavy clayey gray brown to black brown alluvial soils are seen. Acid sulfate soils are observed everywhere in the lowland of so-called "marigot" or backwater area. The potentially acid sulfate soils extend over 2,500 km<sup>2</sup>, from the river mouth to upstream areas along the main course and its tributaries.

As for upland soils, deep red brown soils are dominant. In the inland area along the national roads, outcrops of ironstone are often seen. Soil profile observation was made at the Kolomba village of Bignona Department located in relatively higher elevation. Top soils with 15 cm deep are reddish dark yellow sandy loam, followed by reddish brown sandy loam up to 40cm. Red brown clayey soils continue from 60cm to 180 cm deep, and beyond that plant root like carbonized fine sections were seen. In the area with better water conditions, light yellow brown to gray soils are observed.

Soils profile survey at the Diourou village of Bignona shows that topsoils are of sandy loam with upper 12 cm being light gray, followed by beige color soil up to 140 cm deep. From 140cm deep, brownish beige loam with a few red brown spots was seen, followed by silt clay loam with red brown spots from 240 cm deep, and between 315 cm and 385 cm deep whitish beige light clay with more red brown spots.

### **3. Toposequence of the rice cultivation area**

As already described, paddy soils in the lower Casamance, particularly in the lowlands along the tributaries near the coast, are in many cases of sandy loam to sandy. Clayey lowland paddy soils are only seen in a confined area of inland along the Casamance and its tributaries.

Toposequence of the rice cultivation area in the Lower Casamance is as follows. Red brown upland soils develop under the forests in the highest land, and palm trees are grown from the edge of the forests down to the edge of upper slopes where red brown to light yellow brown soils develop. On the upper slopes where gray soils develop, upland rice is grown and/or nursery is prepared<sup>1</sup>. Soils of the successive upper slope are relatively of hydro-morphic, and utilized for the rainfed paddy cultivation which depends on groundwater. However, the growth of paddy is unstable due to the decreased groundwater level resulting from the decrease in rainfall. On the middle slopes is the best rice cultivation area where water is usually sufficiently available and no fear of salinity hazard or acid toxicity. Near the water course, saline contents increase rapidly, which often results in standing dead after transplanting, but as soil fertility is high, the highest yield is expected when sufficient rainfall is obtained<sup>2</sup>. Beyond this where marshy land extends, soils are called “tanne”, showing very low pH with high salinity. In particular, bared “tanne” has the highest salt content, which sometimes becomes salt pan in the dry season<sup>3</sup>. On the mangrove area, where pH increases, young alluvium with high organic matter content is deposited. In some area, paddy fields near the water course are adjacent to “marigot”, small stream of the end of tributaries or back water.

### **4. Overview of rice cultivation**

#### **(1) Farming practice**

In the Lower Casamance area, transplanting is a common practice. Nursery is prepared by burning trees near the rainfed paddy field, or utilizing a part of paddy field in case of flat lowland, at the beginning of rainy season, in early to mid-July. Sowing and transplanting is done when rainfall stabilizes, which tends to delay nursery work and prolong nursery period, resulting in weak and poor seedlings when transplanted. Land preparation and weeding is done from early August to early September when the paddy field starts to be submerged.

Land preparation by Diola's male is done using “kajandou”, a spatula-shape traditional agricultural

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<sup>1</sup> Upland rice growing is more common in the coastal area where rice yield is lower. There, rice yield is very low presumably less than 1 ton/ha.

<sup>2</sup> This area includes heavy clay soil area along the Casamance river.

<sup>3</sup> Including light red yellow brown sandy soils along the department road between Nyassia and Oussouye in the Kmobeul river basin.

tool with long stick. They make ridges with 40 to 60 cm in width and 30 cm in height, on which seedlings will be transplanted. Actually they turn the ridges made in the previous year over both sides to make new ridges in between the previous ridges. In this process, weeds are to be buried. Uprooting of seedlings and subsequent transplanting are done by women.

On the other hand, rice cultivation by Mandingues started with land preparation by women at the beginning of submergence of paddy field. They cultivate the land using a traditional hoe ('ebara' or 'daba' in local word) and weed at the same time for transplanting. They do not make ridges. Like Diolas, all the works from transplanting to harvest are done by women. The area of each parcel of paddy fields varies mainly depending on the topographic conditions. In the lowland near the water course, the parcels are larger in general ranging from 380 to 2,600m<sup>2</sup>, while those in the upper slope are smaller between 10 and 200m<sup>2</sup>. However, there can be seen very small and sometimes very irregularly divided parcels even in flat land, maybe due to ownership right and/or custom.

Seedlings have already been grown up at the transplanting time, and are brought from the nursery to the main field in a long distance, which resulted in the damaged planting. Planting density, although varies depending on ethnic and location, is usually between 20 and 35 hills per square meter. In rare case, denser planting with 50 to 70 hills per square meter is observed at broadcasting on ridges and plain land. After the transplanting, special management is not done, except for scaring off birds using stone throwing apparatus during the maturity period. In sandy soil paddy fields where yield level is low, weeding and supplemental planting are done. Panicle initiation stage is from the late September to early October, followed by heading stage one month after. At this stage, the number of effective tillers per hill of local varieties under no fertilizer application with traditional farming methods is two to five, and the number of panicles per square meter is between 70 and 120 for the sandy soils in the coastal area, and between 100 and 160 for the clayey to loamy soil in the inland area, respectively. Maturity stage comes in early to middle November. But the harvest, cutting panicles done by women's collective works, is not necessarily done timely partly due to other engagement, and sometimes lasts until about mid-December. Cut panicles are tied up in a head sized bundle, and put on the drained ridges to dry in the sun for about a week. During the drying period, no protection measures are taken. Dried panicles are stored in the house or storage as bundles, and in each time necessary amount is taken and threshed by stamping them on the mat, pounded with a pestle, and winnowed. Paddy yields obtained through traditional farming practices vary. In the inland of the clayey lowland along the Casamance river, it is between 1.4 ton/ha and 2.8 ton/ha. On the sandy loam soils of the Nyassia department, it ranges from 1.4 ton/ha to 1.9 ton/ha. In the sandy soils of the mangrove swampy area near the coast, it varies from 0.7 ton/ha to 1.6 ton/ha. Broadcasted ridged paddy field sometimes obtains nearly 3 ton/ha.

## (2) Classification by area

Local research institute classifies Ziguinchor into four areas based on the topography, distribution of ethnicity, farm management method, etc. They are: (I) Diouloulou area located near the coast in the north of the Casamance river; (II) Bignona area located in the inner area in the north of the Casamance river, (III) Oussouye area near the coast in the south of the Casamance river, and (IV) Niaguis area in the inner area in the south of the Casamance river. In the former two areas, especially the Bignona area, villages and paddy fields are located in relatively high altitudes, while

in the latter two areas, especially the Oussouye area, they are mainly located in lowland. The Diolas mainly occupy the areas I and III and practice rice cultivation by ridging. While in the inland areas of II and IV, the Mandingues are the majority, cultivating paddy on plain ridges. It is noteworthy that people in the area II are relatively open, have an enterprising spirit to adopt newly introduced technology including power thresher, animal plow, tractors, etc. On the contrary, those in the area III, known for being persisted in tradition, adoption of new technology like animal plow is not easy because of the resistance from the cultural background.

### (3) Varieties

It seems that African rice (*Oryza glaberrima*) has primarily been cultivated before, but now domesticated indica type rice (*Oryza sativa*) which have been brought from South-east Asia in 16 to 17<sup>th</sup> century by European, such as Ebandioulaye, Barafita, Seni cory, etc., are mainly cultivated. Local varieties responded well to applied nitrogen, particularly in vegetative growth, and many varieties decrease their paddy-straw ratio when the nitrogen application exceeds some 50 kgN/ha. Although new varieties like IR series, Chinese high yielding, Low pH tolerant new varieties have been introduced, they have not necessarily been accepted as the farmers are unskilled in fertilizer application technique and less eager to purchase chemical fertilizer, and as those varieties with short culm height are not preferred despite its high yielding due to hard harvest work. As for the growth duration, those with 120 to 130 days were planted in the lowland near the water where submerged period is longer, while 110 days varieties are grown on upper slope area. The following table shows some varieties cited from the list of recommended varieties by the local experimental station.

**Table Recommended Rice Varieties in the Casamance Area**

Varieties	Origin	Growth duration (days)	Plant height (cm)	Potential yield (t/ha)	Remarks
IRAT 10	Cote d'Ivoire	110	100	5.5 (rainfed)	for upland
I Kong Pao	Taiwan	110	85	5.5 (rainfed)	
DJ 346D	ISRA (Senegal)	115	105	6.5 (irrigated)	Low pH tolerant
DJ 684D	ISRA	120	100	6.5 (irrigated)	Low pH tolerant
JAYA	Indonesia	120	80-90	8 (irrigated)	
IR8	IRRI (Philippines)	125	95	7 (irrigated)	
IR422	IRRI	125	115	4.5 (rainfed)	
IR1529	IRRI	130	100	10 (irrigated)	
ROK 5	Sierra Leone	130	Floating rice	5 (irrigated)	

### (4) Fertilizer application to paddy field

Besides the cattle dung is scattered to the paddy field during the grazing period after harvest, manure mixed soils at animal yard are spread over the paddy field before the major rainfall. As for the chemical fertilizer, the local extension agent seemed to have once distributed them at free and given demonstration. So, the farmers knew the effectiveness of their application to certain extent, and some farmers apply urea (called 'salt'), saying that leaf color becomes healthy. However, in the average farmers level, as effective application methods of fertilizer has not been extended, and as

they have not realized the profitability and reliability of fertilizer, they have yet been aggressive enough to invest themselves on fertilizer. From my personal feeling, cost of fertilizer is not too expensive for them, compared to the expense for ceremonies in their tradition. If the farmers could understand the significance of the fertilizer application by demonstrating them the examples of yield increase and profits in figures at their field, and by teaching them the physiology and nutrition of the rice plant as well as fertilizer application technique, they would express strong interest to try it.

Based on the experiments in various locations, optimum nitrogen application rate seems 50kgN/ha in total, which should be split in two times: at initial growth stage and panicle initiation stage, by urea and/or di-ammonium phosphate (DAP). Top dressing at heading stage should be done only on clayey soil. The optimum amount of phosphorus to be applied would be 30 to 50 kgP<sub>2</sub>O<sub>5</sub>/ha. In consideration of the burden of transportation, those fertilizer with high phosphorus content such as triple super-phosphate (TSP) and DAP should be used. Local product of 'Phosphate de Taba' is also reported to be effective. In this connection, the dosage of three major nutrients (N, P and K) to the paddy field recommended by the local experiment station is 103 kg/ha for N, 20 kg/ha for P<sub>2</sub>O<sub>5</sub>, and 40 kg/ha for K<sub>2</sub>O, respectively, by combined use of urea and compound (N: P<sub>2</sub>O<sub>5</sub>: K<sub>2</sub>O =10:10:20)<sup>4</sup>. On the other hand, the recommendation by the extension agent (PIDAC) is, using the same fertilizers, 33kgN/ha, 5kg P<sub>2</sub>O<sub>5</sub>/ha, and 10kg K<sub>2</sub>O/ha, respectively.

It has been reported that the groundwater in this area contain significant level of nitrogen, and its concentration ranges, according to the report by R. Bertrand et al., from 150mg/l up to 600 mg/l which is often measured at the end of rainy season. It was also observed in some places that the growth of rice plant became vigorous at the later growth stage after the long stagnant growth period since transplanting, especially at favorable season in terms of rainfall. It is presumed to be attributed to the supply of nitrogen with groundwater which infiltrated into the phreatic layer through the forest soils at top of the slope.

## 5. Study results on the paddy soil environment

### (1) Chemical properties of the soils on the rainfed paddy

First, the physico-chemical properties of the paddy soils in various places of the Ziguinchor region are presented in the Table below.

**Table Properties of the paddy soils in Ziguinchor**

	Niaguis	Fanda	Nyassia	Diohel	Loudia-Oulof
Location	Inland lowland along the Casamance river	Inland lowland along the Casamance river	Upper slope in the upper stream of tributary of the Casamance river	Middle to upper slope; upper stream of tributary of the Casamance river	Near coast; sandy; Marshy area (Marigot)
Soil texture	Clay	Clay	Sandy loam	Sandy loam	Sandy
Soil depth (cm)	0-16	0-10	0-10	0-10	0-17
CaO (mg/100g)	123.4	170.4	78.5	67.3	67.3
MgO (mg/100g)	48.4	24.2	16.1	8.1	64.5
K <sub>2</sub> O (mg/100g)	30.6	30.6	36.3	24.5	46.2

<sup>4</sup> This dosage may be for modern varieties.

Na <sub>2</sub> O (mg/100g)	40.9	51.1	48.3	34.1	54.5
P <sub>2</sub> O <sub>5</sub> * (mg/100g)	2.7	2.3	2.5	0.9	4.5
CEC (mg/100g)	12.1	13.4	4.9	3.9	5.9
Base saturation rate (%)	44	43	83	77	94
Na saturation rate (%)	10.9	12.3	31.7	28.1	30.0

Remarks: \* Truog method

### (2) Water quality around the paddy field

Water quality of the Casamance river (main river) was measured in summer of 1988. At Niaguis, located some 65km from the rivermouth, the pH value varies between 6.5 and 8. Electric conductivity (EC) was very high at 110mS/cm up to early August, then decreased rapidly to 35mS/cm from the end of August to early September when the rainfall concentrates, and again increased from mid-September when rainfall seemed to stop in the upper catchment, and sustained at 60 to 70 mS/cm until early December. On the other hand, at a marigot located at the Loudia-Ouolof village (some 17km from the river mouth of the Casamance river) of the Oussouye department, pH of the stagnant water varied much between 4.1 and 7.7, showing the increasing tendency towards the dry season. EC also varied a lot during the measurement period. It decreased gradually from 90 mS/cm at early July to 10 mS/cm at the end of August, and kept for several months until the end October when the value again increased to 70 to 90 mS/cm until December. Dilution effect by rainfall is larger in marigot than in river stream and the duration of the low EC period is also longer in marigot.

For comparison, monthly average EC value of the water of a tributary of the Casamance river at Nyassia measure by the local experimental station is shown in the Table below. From the table, it is obvious that the EC value varies much year by year. The station set criterion of possible transplanting time as the EC of soil solution at less than 5 mS/cm. According to the station, in the normal rainfall year, July 15 to 25 will be the time of transplanting when accumulated rainfall reaches 250 mm.

**Table EC value of the river water at Nyassia (July 1967 to Oct. 1968)**

Investigated year	'67					'68										
	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
EC (mS/cm)	35	2	1	1	3	7										
Days with <5 mS/cm			121													30
Days with <8 mS/cm			144													39

### (3) Fluctuation of the groundwater quality of rainfed paddy field

~~Figures III-9 to 12 show the measurement record of~~ The depth of water table and quality of the groundwater were measured in the paddy field on the lower slopes over the paddy growth period. Measurement was done at two sites: one is the paddy field with heavy clay soils located in Niaguis village of the Niaguis department along the main stream of the Casamance river, the other is the paddy field with sandy soil at the mangrove swamp in the Loudia-Ouolof village of the Oussouye department near the coast. In each location, three piezometers have been set up from the water edge



to 200m apart. Groundwater level and water quality have been monitored. Buried depth of the piezometers varies a little depending on the workability of the sites.

At the Loudia-Ouolof site, podzol like light gray sandy soils deposit more than 1 meter, and dark blue grey layer appears at 70 cm depth in mid June at the beginning of wet season. Nearer to the valley bottom, severer the saline hazard is. The area nearest to the mangrove swamp (piezometer No.1) do not allow rice plant to grow, although farmers cultivate the area every year. The pH and EC values of ground water at the depth of around 60 to 70 cm, at the piezometers No.1 and 2 of Loudia-Ouolof fluctuate almost parallel with those of surface water in the rainy season. On the contrary, the groundwater quality at the depth of 117cm from the surface at piezometer No.3 showed very strong acid with the pH value of around 3 throughout the measurement period of five months, and more saline with less fluctuation than surface water and upper layer of groundwater at between 30 and 90 mS/cm. Furthermore, in early October when rainfall finishes, after submerged water in the paddy field is disappeared, groundwater level decreased rapidly, correspondingly the water quality at root zone layer was deteriorated. The paddy in this field died in spots in late to end October every year. It is presumed that strongly acidic and high saline groundwater, which has been suppressed by rain derived freshwater until the rainfall finishes, goes up before the maturity period. Diminished rainy season as well as rainfall amount hastened the disappearance of submerged water, which causes die of paddy plants in later growth stage before maturity. Paddy cultivation is barely realized on the sandbank floating on the water with very hazardous quality.

In the lowland of the Niaguis village along the mainstream of the Casamance river, gray brown to black brown heavy clay surface soils with red brown spots extend. The paddy growth near the water course (piezometer No.1) differs from place to place and year by year, due to the damage by salt. At the adjacent paddy fields (piezometer No.2), there are some parts where acid water stagnates. On the other hand, the point of the piezometer No.3, some 200 m apart from the river course, groundwater quality in terms of pH and EC is kept below the critical level for paddy growth, even at the depth of 98cm to 115cm. Although the decline in groundwater level occurs like the sandy soil paddy, the decline starts some one week late, and correspondingly, the deterioration of water quality (increased EC value) at the paddy fields near the water course and the adjacent acid water area start late and advance slowly. For this reason, duration of paddy growth under safe environment is naturally extended, which, combined with the advantageous soil fertility condition, may partly explain the better yield in this area.

As the pH value of the groundwater at piezometer No.2 increased in the dry season, acidification of stagnant water at piezometer No.2 might have resulted not from groundwater, but from surface water movement. In all cases, the growth of paddy plants in this area is prevented from the hazardous groundwater intrusion by thick clay layer of surface soils.

#### (4) Significance of the high ridged paddy cultivation

Considering the above mentioned difference in the behavior of the groundwater between coastal sandy soil and inland heavy clay soils, and the distribution of various paddy cultivation methods in the area, the following can be explained. High ridged paddy cultivation by Diolas is mainly seen in the coastal sandy paddy fields, where high saline content water always threatens. In such fields,

salinization of soils somewhat occurs in the dry season, but due to sandy in texture, certain amount of rainfall can leach out salts rapidly from surface soils, and strongly acid and highly salty groundwater in the root zone is gradually pushed down. In this method, therefore, transplanting is done at the top of the ridges in which salts are leached out by the rainfall at the early rainy season, and the roots are elongated following the desalinization of sub-soil layer. While avoiding the damage by salt at the initial growth stage, it enables early sowing and transplanting to some extent, resulting in the extension of the growth duration of paddy in the field, which brings about the stable and increased yield. Especially at present when rainfall has decreased, it is considered that this method, by advancing the maturity period, helps to lessen the damage induced by the raise of groundwater at late October. In those days when the submerged water was at the height of the waist, high ridges might have helped to avoid submergence of the seedlings.

On the other hand, flat ridge cultivation is often seen in inland clay soil area where the influence of sea water intrusion is not expected. Longer submergence duration and better soil fertility of this area might not have brought about the fear of saline which reduce the yield and no reason for the introduction of high ridges which needs very hard work.

## **6. Actual situation of the countermeasure on salinity and acid toxicities**

### **(1) Countermeasure by fertilizer application and rainwater storage**

As for the countermeasures to the salinity and acidity problems on the paddy plants in the Casamance area, many researches including the technical assistance by Dutch since 1962, have been conducted, and acceleration of leaching out salts and sulfates by augmentation of drain ditches, construction of small dams, etc. have been proposed. However, despite of various efforts such as new land reclamation, construction of seawall and gate, etc., the fact is that the problem has not been solved because of various reasons such as the failure in salt leaching by strong acidification, lack in labor force by out-migration, inadequate civil engineering technology, financial problem, etc.

So, for the time being, it is considered reasonable to limit the development activities to more suitable area for paddy cultivation and concentrate investment for fertilizer application there. As the yield level is rather low at present, it is relatively easy to increase yield and profit by improving rice growing environment through strict farm management. In the various demonstration plots, the paddy yield increased by 150 – 250%, from 0.6 - 2.0 ton/ha to 2.0 - 3.8 ton/ha, by applying 50 to 70 kgP<sub>2</sub>O<sub>5</sub>/ha as TSP or DAP under the ridges and 40 to 50kgN/ha as urea once or in two split times. This yield increment, if converted into milled rice price, will bring about the net profit by at least 250% to 450% of investment on fertilizer. For extending such fertilizer application technique, it is first to be done that the local technician show farmers the effectiveness of the technique and expected benefit through the field demonstration. In each village, at least a measuring tape and a balance should be equipped so that they could calculate and weigh the necessary amount of fertilizer through the measurement of the field plot area. Each farmer should learn the necessary amount of fertilizer in each parcel using locally available material such as empty cans as measuring unit. For this, training of trainer is necessary to train a leader who could design fertilizer application plan and guide other farmers.

As mentioned above, saline and acid problem on the paddy production in the coastal sandy soils occurs because of the reduction in the period of submergence by fresh water in the root zones due to the decreased amount of rainfall, which allows the intrusion of highly saline and acidic water into the root zones at the end of the rice growing period. To avoid this problem as much as possible, supplemental irrigation after the mid-October when groundwater level decreases, to keep the water quality in the root zone better in the maturity period, would be effective by storing excessive rainwater which falls in August and September. Another option may be early irrigation, if possible, to shift the maturity stage before the deterioration of water quality by advancing the sowing and transplanting. However, it is difficult to obtain better quality water in early cropping season. Moreover, serious attack and damage by “mange-mil” will be expected to the paddy field where growth stage is more advanced than surrounding fields. It is, therefore, more realistic to consider the irrigation at late stage of paddy growing.

## (2) Problem of acid water seepage

In the sandy paddy field on the upper slope near the relatively large tributaries, acid toxicity without saline problem was observed. In the case of the paddy fields adjacent to the palm woods in the Karongue village of the Diouloulou Department, the pH value of the paddy soils up to 50 cm in depth were 3.6 to 4.0. The surface soil was gray sandy loam, and from the 30cm in depth and below was whitish sand. So the cause of the problem was considered not salinity that the farmer complained, but strong acidity seeped horizontally from the lowland near the water course through phreatic layer. When calcium carbonate was applied at a rate of 1.5 to 3.0 ton/ha to the surface soils of 10 to 20 cm depth, paddy growth was improved, and the soil pH was measured at 4.6 to 5.1 after the rainy season in January of the following year. The farmer who had been unable to do was eager to prepare for the application of inputs by burning oyster shell.

添付資料9

SENRIZイベント時に配布したパンフレットと

SENRIZ販売促進用ポスター

## MARKETING PROMOTION

**SENRIZ** is now on sale at

- ✚ SCORE
- ✚ On-the-Run
- ✚ Etablissements Babacar Samb & Fils  
Dakar (8555486), Touba (9740533), Kaolack (9411453)
- ✚ Bonjour
- ✚ Boutique de references

*Fraîchement  
usiné*

*Please check product information on package*

Variété :	SAHEL	<input type="checkbox"/> 108	<input checked="" type="checkbox"/> 201	<input type="checkbox"/> 202
Récolté :	<input type="checkbox"/> Nov 05	<input checked="" type="checkbox"/> Déc 05	<input type="checkbox"/> Jan 06	
Usiné :	<input checked="" type="checkbox"/> Déc 05	<input type="checkbox"/> Jan 06	<input type="checkbox"/> Fév 06	
	<input type="checkbox"/> Mars 06	<input type="checkbox"/> Avril 06	<input type="checkbox"/> Mai 06	
Type :	<input type="checkbox"/> Entier	<input type="checkbox"/> Mixte	<input checked="" type="checkbox"/> Brisé	

Minimum but essential information of products are seen on packages of **SENRIZ**. Consumers may obtain more information, if any, from rice producers.

### *Voice of Producers*

*We, rice farmers of Debit-Tiguette Union, Dagana - St. Loius, have sown Sahel 108, 201 and 202 in July and August 2005. Rainfalls were sufficient enough. Harvest of the year 2005 was successful. Please taste our best rice now. **Bon appétit!***

## AKNOWLEDGEMENT

DAPS and JICA appreciate the collaboration of all the following partners for successful performance of Marketing Promotion of Senegalese Rice.

- ✚ Association pour le Développement de la Riziculture en Afrique de l'Ouest (ADRAO)
- ✚ Agence Nationale de Conseil Agricole et Rural (ANCAR)g
- ✚ Agence de Régulation des Marchés (ARM)
- ✚ Caisse Nationale de Crédit Agricole du Sénégal (CNCAS )
- ✚ Fédération Nationale des Producteurs de Riz au Sénégal (FNPRS)
- ✚ Institut Sénégalais de Recherche Agricole (ISRA)
- ✚ Institut de Technologie Alimentaire (ITA)
- ✚ Observatoire National du Riz au Sénégal (ONRS)
- ✚ Société d'Aménagement et d'Exploitation des Terres du Delta du fleuve Sénégal et des Vallées du fleuve Sénégal et de la Falémé (SAED)
- ✚ Société de Développement Agricole et Industrielle du Sénégal (SODAGRI)

### **SENRIZ**

Our rice and your rice for challenge towards our food security and economic development



## MARKETING PROMOTION OF SENEGALESE RICE



**Produced through  
Technology Transfer Program under  
Master Plan Study on  
Reorganization of Rice Production in  
Senegal**

Department of Analysis, Prediction and Statistics (DAPS), Ministry of Agriculture and Hydraulic, Senegal

Assisted by

Japan International Cooperation Agency (JICA)

Contact : DAPS 8646413 / SAED 9611380

Email : SENRIZ@yahoo.fr

## INTRODUCTION OF SENRIZ

Have you ever heard that one Senegalese consumes about 80 kg of white rice a year? Your answer may be “Yes”. Senegal is one of the largest rice consumers in Africa on per-capita consumption basis. Then, do you know that 80% of rice you consume is imported from other countries?

**SENRIZ** is local rice released for promotion so as to introduce Senegalese consumers how much better local rice is than they have known before.

**SENRIZ** is white rice produced from dry paddy harvested by leading rice farmers in the Senegal river valley and processed by new modern rice mill.

**SENRIZ** is produced from local rice varieties, namely SAHEL series, which have been carefully selected to meet Senegalese taste,

**SENRIZ** is sold with product information including variety, date of harvesting and date of processing and quality grade. Consumers can easily identify freshness and quality of rice.

Please check quality control records on package, when you buy **SENRIZ**!

## QUALITY CONTROL ON FARM

### Quality control by appropriate practices



- + Elimination of weeds and damaged hills
- + Less use of pesticides
- + Timely topdressing and water control

### Quality control by timely harvesting



- + Control of grain moisture
- + Elimination of impurity
- + Immediate bagging and proper storage

## QUALITY CONTROL IN PROCESSING

### Use of Modern Rice Mill



- + Cleaning dry paddy
- + Removing husks and bran thoroughly
- + Separating milled rice by length into head rice, large broken, fine broken and mixed



Head rice

Dry paddy

Broken rice





CONTROLE DE QUALITE DANS  
LES CHAMPS



*Fraîchement  
usiné*



# SENRIZ

## de la vallée

Un produit du programme de transfert de technologies exécuté dans le cadre du Plan  
Directeur de l'Etude sur la Réorganisation de la Production de riz au Sénégal

Direction de l'Analyse, de la Prévision et des Statistiques (DAPS),  
Ministère de l'Agriculture et de l'Hydraulique, Sénégal

Appuyé par

L'Agence Japonaise de Coopération Internationale (JICA)

Contact: DAPS 8646413 / SAED 9611380



CONTROLE DE QUALITE DANS  
LA TRANSFORMATION

添付資料10

SENRIZイベントを報じた新聞3紙の記事



# SOLEIL

## *REORGANISATION DE LA PRODUCTION DU RIZ : La coopération japonaise finance une étude*

*Une étude sur le riz est en cours dans le cadre de la coopération japonaise. Elle est confiée à un bureau d'étude japonais qui travaille en collaboration avec la Direction de l'analyse, de la prévision et des statistiques (Daps), chargée de la coordination, et d'un Comité directeur élargi aux autres acteurs de la filière. La durée de cette étude, qui couvre l'ensemble du territoire national, est de 24 mois (novembre 2004- octobre 2006).*

*« Afin de rendre le riz sénégalais plus compétitif par rapport au riz importé, des recherches bibliographiques, des ateliers, des enquêtes, des tests aux champs ont été exécutés. Il ressort de ces investigations que des efforts doivent être fournis à tous les niveaux de la filière pour atteindre cet objectif ». C'est ce que nous a révélé M. Cheikh Thioune, le chargé de la filière à la DAPS.*

*La production, couvrant seulement 20 % des besoins nationaux, doit être impérativement augmentée et l'étude a entrepris des actions dans ce sens. Mais, la faible production n'est pas la seule contrainte identifiée. Seulement, selon M. Thioune, l'étude a identifié d'autres problèmes à résoudre en priorité et en tant que préalables à l'atteinte de la compétitivité du riz local, qui reste l'objectif majeur de l'étude. Ces problèmes sont principalement liés au revenu des producteurs de riz, à la qualité du riz, aux coûts de production et à la commercialisation », a ajouté M. Cheikh Thioune.*

*A cet effet, une expérience test, qui va de la production du paddy, sa transformation dans une rizerie spécialement importée du Japon, à son conditionnement et à sa commercialisation, a été menée dans la vallée du fleuve Sénégal. La DAPS et la Mission japonaise de l'Etude aimeraient porter à la connaissance du public les résultats obtenus, dont notamment les différents lots de riz blanc ». Ce sera à partir d'aujourd'hui, à la place de l'Indépendance.*

## 【邦訳】 SOLEIL (12月22日付)

### 稲作再編：日本の援助

米流通に関する JICA 調査が現在実施されている。セネガル側実施機関は DAPS。調査期間は、2004年の11月から2006年の10月までの24ヶ月間である。

「セネガル国産米に輸入米に対する競争力を取り戻すことを目標にして、これまでに様々な調査、ワークショップ、圃場試験、そして聞き取り調査が行われてきた。調査の開始から現在に至るまで、この目標に向けて惜しみない努力が積み重ねられてきたことは疑いようが無い」チーフカウンターパートのチューン氏はこう説明した。

セネガル国産米は、国内需要の20%を満たすに過ぎない。セネガルにおいて、米の増産は必須である。しかし、生産量の低さだけが米セクターが抱える問題ではなかった。チューン氏によれば、

この調査によってより重要かつ早期に解決すべき問題が浮き彫りになったという。それは精米の品質に関する問題であり、米生産者、精米業者など関係者全ての収益に直接的に影響する重要な問題であった、とチューン氏は続けた。

JICA 調査団及び関係者の努力によって、生産から精米にいたる一貫した品質向上のための技術移転プログラムが実現に至った。このプログラムのために日本の技術による近代的な精米機が輸入されセネガル河畔に設置された。JICA 調査団及び DAPS は、今回の調査で得られた知見と、その成果としての高品質国産米を市民に公開することを目的として、本日より独立広場においてキャンペーンを開催する。

## **LE QUOTIDIEN**

### ***RIZ - Promotion du riz local : La qualité pour accrocher le consommateur***

*Les Sénégalais, grands consommateurs de riz, pourront bientôt acheter la production locale dans les grandes surfaces, en sachet de deux kilos. La production nationale de riz tourne autour de 100 mille tonnes dans la vallée du fleuve Sénégal. Cependant, la consommation annuelle sénégalaise est de 600 mille tonnes. Et chaque Sénégalais consomme environ 80 kg de riz par an. Il y a là un marché porteur pour les producteurs de riz local, qui entendent relever le niveau de la production et la qualité du riz. Mais pour cela, il faut surtout que l'Etat limite les importations. C'est là certain des raisons de l'organisation de la journée de promotion du riz local. Elle a été rendue possible grâce au programme triennal de recherche exhaustive sur la filière riz, en cours depuis 2004, et dont l'achèvement est prévu pour 2006.*

*Pour M. Oumar Top, le secrétaire général du ministère de l'Agriculture et de l'Hydraulique qui présidait la manifestation d'hier, «le grand problème ce n'est pas de produire en quantité suffisante mais de produire un riz de qualité qui satisfasse les populations. Nos ménages sont exigeants. Il est grand temps de faire la relation entre la production et la qualité. Il y avait des problèmes d'écoulement dans la vallée, mais la sensibilisation par des journées de promotion va nous permettre de mieux faire connaître le riz local. Nous allons commencer par pénétrer les grandes surfaces». M. Top visitait les stands montés à la Place de l'indépendance, par la Société de développement agricole de la vallée de l'Anambé (Sodagri), la Société d'aménagement et d'exploitation des terres du delta (Saed) et par l'Institut de technologie alimentaire (Ita), qui travaillent tous dans le domaine du riz, en compagnie de l'ambassadeur du Japon.*

*C'est à la demande du ministère de l'Agriculture et de l'Hydraulique, qu'une étude a été menée par des consultants japonais. Elle avait pour objectifs principaux d'identifier les actions les plus appropriées pour la promotion du secteur riz au Sénégal dans tout son processus, depuis la production, en passant par la transformation, la distribution et la consommation. Dans le cadre de cette étude, la Direction de l'analyse, de la prévision et des statistiques (Daps), appuyée par le bureau de l'Agence japonaise de coopération internationale (Jica), a eu l'initiative de lancer des journées de promotion du riz sénégalais. Une occasion, selon son excellence l'ambassadeur du Japon au Sénégal, M.Akira Nakajima, «de faire savoir au public sénégalais qu'il existe dans son pays du riz d'excellente qualité. Elle nous offre également l'opportunité de souligner que*

*cette filière locale a de beaux jours devant elle. Elle permettra aussi de mettre à jour les améliorations à apporter depuis la culture, la production, et la transformation, pour une qualité toujours meilleure et dans le souci d'aller à la rencontre des préférences du consommateur».*

*L'Institut de technologie alimentaire (Ita) a beaucoup participé à cette initiative en s'intéressant à la valorisation du riz dans la vallée. Leurs enquêtes auprès des consommateurs ont montré qu'il y avait un problème de qualité à cause du mélange de différentes variétés de riz. L'Ita a fait des analyses physico-chimiques qui ont permis de connaître les variétés qui sont adaptées aux plats sénégalais. Les possibilités d'élargir ce volet du riz local afin de satisfaire tous les besoins des populations sont bien réelles. «Et je puis vous assurer que le gouvernement du Japon, dans le cadre de sa coopération bilatérale avec le Sénégal, est tout disposé à œuvrer aux côtés des autorités sénégalaises pour la réussite de l'expansion du riz sénégalais. Nous serons ravis de mettre toute notre technologie et notre savoir-faire au service des intervenants sénégalais afin de donner à votre pays toutes les chances d'atteindre une production qui lui permette de s'auto-satisfaire pour la consommation de riz», a conclu M. Nakajima.*

Safiètou KANE - 

## 【邦訳】LE QUOTIDIEN(12月23日付)

### 米、国産米のプロモーション：品質が消費者を捕まえる

米を主食とするセネガル国民は、まもなく 2kg のすてきな袋に詰められた国産米を買うことができるだろう。セネガル川沿岸地帯の米生産量はおよそ 10 万トンである。しかし、セネガル国民の 1 人当たり米消費量は約 80kg で、セネガル国全体における年間の米消費量は 60 万トンに達している。国産米の生産量の増加と品質の向上によって新たな市場が開ける余地は十分にある。しかし、その実現には公的な輸入規制が必要であろう。それが、現在幾つかの組織が国産米をプロモートする理由である。国産米市場開拓を可能にする徹底した調査が 2004 年から 2006 年にかけて実施中である。

農業省次官は、昨日行われた国産米プロモーションに参加しこう語った。「(国産米の)問題は、その生産量不足のみにあるのではなく、消費者に受け入れられる品質に達していないことも重要な問題である。我が国の消費者は、品質をも求めている。生産量の増加と品質の向上には多大な時間がかかるだろう。セネガル川生産地帯からの流通にも問題はある。しかし、本日のキャンペーンは我々に国産米の品質がここまで高められることを知らしめてくれた。この米と一緒に前進しようではないか。」農業省次官はこの後、在セネガル日本大使とともに、独立広場に設けられた特設会場を回り、SODAGRI、SAED、ITA のブースで米について多いに語り合った。

日本のコンサルタントによって行われている調査は、正に農業省の要望に合致したものである。この調査の主目的は、生産者から精米そして流通と生産者に至るセネガルの米セクター全ての改善のために最も効果的な計画を提言することである。この調査の一環としての本日のセネガル国産米プロモーションは、DAPS と JICA の主導によって実施に至った。中島在セネガル日本大使は、次のような言葉を贈られた。「本日は、セネガル国民にとって自国産米が素晴らしい品質であることを

知る良い機会となったと思います。さらに、生産者、精米業者、流通業者の全てが消費者のニーズに応えるために常に向上心を絶やさないとことの重要性を明らかにしたといえます」

ITA もセネガルの国産米に着目し、研究を行っている。彼らによれば消費者によって指摘された国産米の問題は、品種が混じっていることが主な原因であることが明らかとなっている。ITA は理化学分析によって、セネガル国産米の特性とセネガル料理への適正を把握している。消費者のニーズに対処すべく国産米の扉は広く開けられたといえる。「日本国政は、セネガル国との二国間技術協力において、セネガル側の協力を得て国産米の品質向上と消費の拡大に寄与したと確信しております。我々は、我々の持つ技術と能力が、消費者が満足できる品質の米を生産することに対して貢献できたことをうれしく思います」中島大使はこう結んだ。

Safiètou KANE - 

## Wal Fadjri

### *Promotion de la consommation du riz local : des riziculteurs de la Vallée du fleuve se lancent*

24 Décembre 2005

*Publié sur le Web le 28 Décembre 2005*

*Elh. S. Nourou Dia*

*Senriz. C'est à travers ce produit que les riziculteurs de la vallée du fleuve Sénégal entendent assurer la promotion du riz local. Ils ont profité de la "Journée de promotion du riz sénégalais" organisée, hier, pour lancer leur produit. Le riz est blanchi et provient du paddy sec.*

*Sa transformation est effectuée par des rizeries neuves et modernes. Et puis, les promoteurs de Senriz renseignent, à travers les emballages du riz, sur les données du contrôle de la qualité. Une démarche qui, de l'avis du secrétaire général du ministère de l'Agriculture, Oumar Top, permettra au riz local d'être plus compétitif et de pouvoir concurrencer le riz exporté. Cela d'autant que "la nouvelle production des riziculteurs de la Vallée a la qualité qui peut satisfaire les exigences des consommateurs, en matière de qualité".*

*Cela est rendu possible, souligne M. Top, grâce à l'appui de l'Agence japonaise de coopération internationale (JICA) qui, avec la Direction de l'analyse, de la prévention et des statistiques du ministère de l'Agriculture, a permis la réalisation du plan directeur de l'étude sur la réorganisation de la production de riz au Sénégal. Des études qui ont permis, avance-t-il, de comprendre qu'il faut faire le lien entre la production et la consommation. Un pari gagné. Car, rappelle-t-il, "il y a des années où, de manière récurrente, dans la vallée du fleuve Sénégal, à la fin de la campagne des productions, on avait d'énormes problèmes pour l'écoulement de ces productions". Ce qui, du reste, n'est qu'un vieux souvenir, soutient-il. A l'en croire, "depuis quelque temps, le problème de l'écoulement ne se pose plus" par le seul fait que "le riz local est devenu plus compétitif".*

*Pour l'heure, Senriz n'est disponible que dans certaines grandes surfaces. Toujours est-il que les promoteurs nourrissent l'ambition de couvrir tout le pays de ce riz "bien de chez nous".  
Promotion de la consommation du riz local : des riziculteurs de la Vallée du fleuve se lancent*

*Wal Fadjri (Dakar)*

【邦訳】Wal Fadjri (12月28日付)

国産米の消費推進－セネガル川流域の米生産

Elh. S. NOUROU DIA

SENRIZ。セネガル川流域の米生産者は、このプロジェクトが国産米のプロモーションになると確信している。昨日、彼らは“国産米プロモーションの日”のための新米を送り出した。彼らの物は、真っ白な米となって運ばれてきた。

精米は、新品の最新鋭精米機によって行われた。さらに、SENRIZのパッケージは、品種、刈り取り時期、精米時期品質といった品質に係わる情報を明示している。農業省次官は、「今回のアプローチで、国産米が輸入米に十分対抗できることを確信した。SENRIZの品質は消費者のニーズを満足している。」こう語った。

次官はまた、JICAの協力による調査によってマスタープランが策定されたことに対して感謝の意を表した。この調査は、生産者から消費者に至る過程でのコメ流通に係わる関与者の密接な連携の重要性も認識させることができたとも語った。

セネガル川生産地帯からの流通の問題は残されている。しかし、それは古い記憶となるだろう。国産米の競争力の向上がそれを解決するでしょう。

数時間後、SENRIZは残り僅かとなった。開拓者は、国産米がセネガル国全体に行き渡らせるという希望を持っている。

*Elh. S. Nourou Dia*