Annex 6

# The Agricultural Survey in the Senegal River Valley

**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.

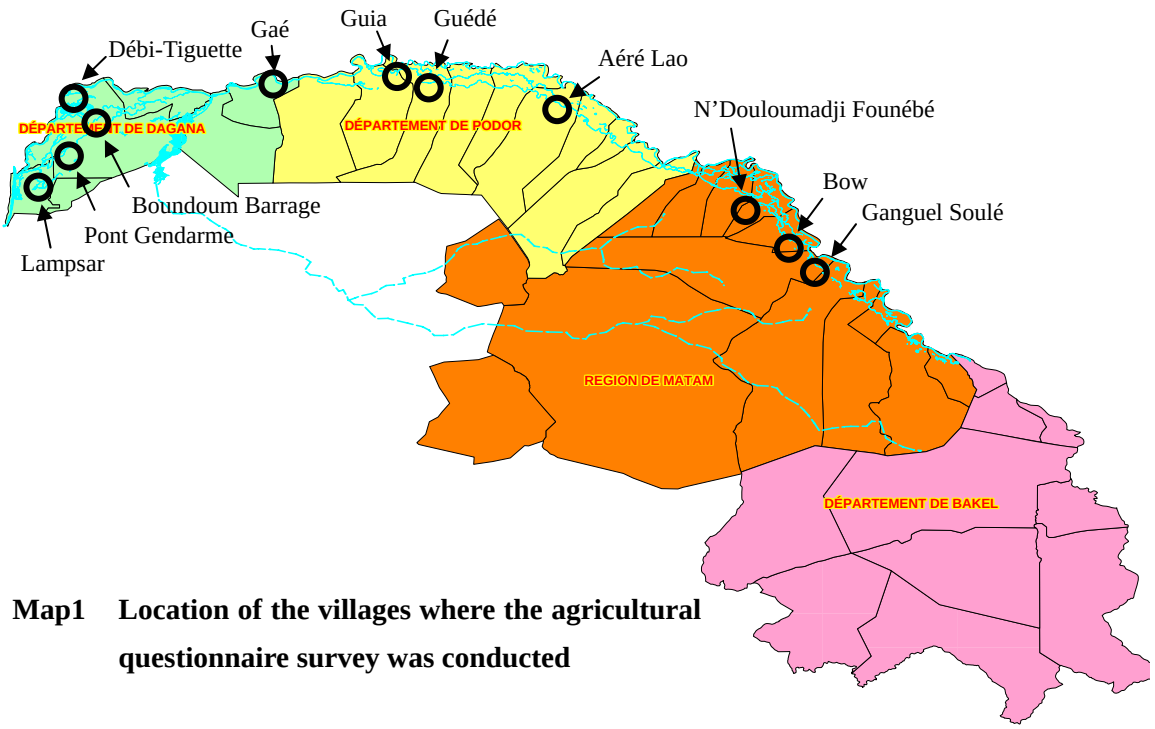
The 11 villages surveyed are listed below together with the location map.

Saint Louis: 1village (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 (decortiqeuse) 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 intermediaire) 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-Tiguet | Gaé | Mboundoun barrage | Pont gendarme | Aéré lao | Guia | Guédé | 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-Tiguet | Gaé | Mboundoun barrage | Pont gendarme | Aéré lao | Guia | Guédé | 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-Tiguet | Gaé | Mboundoun barrage | Pont gendarm | Aéré lao | Guia | Guédé | Bow | Ganguel soulé | N'Douloumadji founébé | Average |
| **Paddy (hot season)** | | | | | | | | | | | | |
| 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 |
| **Paddy (wet season)** | | | | | | | | | | | | |
| 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 |
| **Millet** | | | | | | | | | | | | |
| 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 |
| **Sorghum** | | | | | | | | | | | | |
| 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 |
| **Maize** | | | | | | | | | | | | |
| 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 |
| **Cowpea** | | | | | | | | | | | | |
| 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 |
| **Others** | | | | | | | | | | | | |
| 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 |
| Cattle | | | | | | | | | | | | |
| 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 |
| Horse | | | | | | | | | | | | |
| 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 |
| Donkey/mule | | | | | | | | | | | | |
| 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 |
| Camel | | | | | | | | | | | | |
| 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 |
| Sheep/goat | | | | | | | | | | | | |
| 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 |
| Chicken | | | | | | | | | | | | |
| 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 |
| Others | | | | | | | | | | | | |
| 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

| | St. Louis | Dagana | | | | Podor | | | Matam | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Lampsar | Debi-Tiguet | Gaé | Mboundoun barrage | Pont gendarm | Aéré lao | Guia | Guédé | Bow | Ganguel soulé | N'Douloumadji founébé | Average |
| **Hoe** | | | | | | | | | | | | |
| 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 |
| **Plow** | | | | | | | | | | | | |
| 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 |
| **Sprayer** | | | | | | | | | | | | |
| 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 |
| **Thresher** | | | | | | | | | | | | |
| 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 |
| **Motor pump** | | | | | | | | | | | | |
| 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 |
| **Cart** | | | | | | | | | | | | |
| 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 |
| **Husking machine** | | | | | | | | | | | | |
| 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 |
| **Others** | | | | | | | | | | | | |
| 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-Tiguet | Gaé | Mboundoun barrage | Pont gendarme | Aéré lao | Guia | Guédé | Bow | Ganguel soulé | N'Douloumadji founébé | Average |
| Area (ha) | | | | | | | | | | | | |
| 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 |
| Number of parcel (GA) | | | | | | | | | | | | |
| 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-Tiguet | Gaé | Mboundoun barrage | Pont gendarme | Aéré lao | Guia | Guédé | Bow | Ganguel soulé | N'Douloumadji founébé | Average |
| Area (ha) | | | | | | | | | | | | |
| 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 |
| Number of parcel (PIV) | | | | | | | | | | | | |
| 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-Tiguet | Gaé | Mboundoun barrage | Pont gendarme | Aéré lao | Guia | Guédé | Bow | Ganguel soulé | N'Douloumadji founébé | Average |
| Area (ha) | | | | | | | | | | | | |
| 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 |
| Number of parcel (PIP) | | | | | | | | | | | | |
| 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 |
| Total | 18.83 | 81.08 | 19.68 | 68.54 | 34.35 | 9.06 | 20.70 | 19.94 | 15.60 | 17.41 | 17.60 | 322.79 |

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 | |
| Total | 20 | 20 | 20 | 20 | 18 | 20 | 20 | 21 | 28 | 20 | 21 | |
| | | | supplyer Union | | GIE CNCAS | 12 purchase 5 GIE | | | Producer | 12 Supplier 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-Tiguet | 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 |
| Total | 0 | 19 | 1 | 3 | 0 | | | | | | | 23 |

Sahel 201

| | Saint Louis | Dagana | | | | Podor | | | Matam | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Lampsar | Debi-Tiguet | 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 |
| Total | 1 | 25 | 6 | 12 | 15 | | | | | | | 59 |

Sahel 202

| | Saint Louis | Dagana | | | | Podor | | | Matam | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Lampsar | Debi-Tiguet | 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 |
| Total | 10 | 18 | 5 | 7 | 3 | 17 | 20 | 0 | 36 | | | 116 |

proposed easy processing into cous-cous

Sahel 108

| | Saint Louis | Dagana | | | | Podor | | | Matam | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Lampsar | Debi-Tiguet | 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 |
| Total | 9 | 3 | 4 | 12 | 1 | 0 | 0 | 20 | | | | 49 |

Jaya

| | Saint Louis | Dagana | | | | Podor | | | Matam | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Lampsar | Debi-Tiguet | 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 |
| Total | 0 | 0 | 4 | 0 | 0 | | | | | | | 4 |

TCS-10

| | Saint Louis | Dagana | | | | Podor | | | Matam | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Lampsar | Debi-Tiguet | 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 |
| Total | 0 | 0 | 1 | 0 | 12 | | | | | | | 13 |

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-Tiguet | 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-Tiguet | 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-Tiguet | 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-Tiguet | Gaé | Mboundoun barrage | Pont gendarme | Aéré lao | Guia | Guédé | Bow | Ganguel soulé | N'Douloumadji founébé | Average |
| DAP (18-46- | 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-Tiguet | 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-Tiguet | Gaé | Mboundoun barrage | Pont gendarme | Aéré lao | Guia | Guédé | Bow | Ganguel soulé | N'Douloumadji founébé | Average |
| Merchant | | | 1 | | 3 | 4 | 1 | | | | 1 | 10 |
| Distributer | 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-Tiguet | 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-Tiguet | 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 availabilit | 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 wea 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-Tiguet | 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-Tiguet | 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-Tiguet | 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-Tiguet | 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-Tiguet | 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 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Lampsar | Debi-Tiguet | Gaé | Mboundoun barrage | Pont gendarme | Aéré lao | Guia | Guédé | Bow | Ganguel soulé | N'Douloumadji founébé | Total |
| 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 |

### Thresing Method

unit: number of respondent

| | St. Louis | Dagana | | | | Podor | | | Matam | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Lampsar | Debi-Tiguet | Gaé | Mboundoun barrage | Pont gendarme | Aéré lao | Guia | Guédé | Bow | Ganguel soulé | N'Douloumadji founébé | Total |
| 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 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Lampsar | Debi-Tiguet | Gaé | Mboundoun barrage | Pont gendarme | Aéré lao | Guia | Guédé | Bow | Ganguel soulé | N'Douloumadji founébé | Total |
| 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 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Lampsar | Debi-Tiguet | Gaé | Mboundoun barrage | Pont gendarme | Aéré lao | Guia | Guédé | Bow | Ganguel soulé | N'Douloumadji founébé | Average* |
| 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 |
| Total | 20 | 20 | 20 | 16 | 20 | 20 | 18 | 20 | 19 | 20 | 19 | 212 |

### 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 |
| Total | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 220 |

### 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 |
| Total | 20 | 20 | 20 | 20 | 20 | 32 | 20 | 20 | 27 | 24 | 39 | 262 |

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 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Lampsar | Debi-Tiguet | Gaé | Mboundoun barrage | Pont gendarme | Aéré lao | Guia | Guédé | Bow | Ganguel soulé | N'Douloumadji founébé | Total |
| 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 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Lampsar | Debi-Tiguet | Gaé | Mboundoun barrage | Pont gendarme | Aéré lao | Guia | Guédé | Bow | Ganguel soulé | N'Douloumadji founébé | Total |
| 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 garanttee | | | 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 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Lampsar | Debi-Tiguet | Gaé | Mboundoun barrage | Pont gendarme | Aéré lao | Guia | Guédé | Bow | Ganguel soulé | N'Douloumadji founébé | Total |
| 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 |
| Total | 29 | 20 | 20 | 24 | 20 | 20 | 20 | 20 | 22 | 22 | 20 | 237 |

| 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 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Lampsar | Debi-Tiguet | Gaé | Mboundoun barrage | Pont gendarme | Aéré lao | Guia | Guédé | Bow | Ganguel soulé | N'Douloumadji founébé | Total |
| 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 |
| Total | 22 | 54 | 20 | 8 | 27 | 14 | 40 | 6 | 60 | 28 | 83 | 362 |

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

### Technologies need to be obtained

unit: number of respondent

| | St. Louis | Dagana | | | | Podor | | | Matam | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Lampsar | Debi-Tiguet | Gaé | Mboundoun barrage | Pont gendarme | Aéré lao | Guia | Guédé | Bow | Ganguel soulé | N'Douloumadji founébé | Total |
| 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 |
| Total | 21 | 36 | 18 | 29 | 24 | 33 | 40 | 35 | 45 | 32 | 58 | 371 |

| Others | | | | |
|---|---|---|---|---|
| | Lampsar: | monitor cropping calendar | Aere lao: | 14 extension and training<br>3 processing |
| | Debi-Tiguet: | cultivation technique<br>combine harvestor<br>thresher<br>area expansion | Bow | 2 yield increase<br>2 production technique<br>2 cropping calendar<br>1 harvest<br>1 marketing |
| | Gae: | 2 training<br>1 herbicide utilization | | |
| | Mboundoun barrage: | cultivation technique | Ganguel soule: | 2 yield increase<br>1 good organization<br>1 area expansion |
| | Pont gendarme: | 9 training on new technology<br>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 | Aere lao: | 7 processing |
| | | 4 transport products | | 7 training and extension |
| | | 1 weed | | 1 marketing |
| | | 1equipment | Guia: | 5 soil degradation |
| | Debi-Tiguet: | 4 road condition | Guede: | 3 training and advice |
| | | 1 expensive seed | Bow | 4 no machinery |
| | | 1 remoteness of field | | 3 small area |
| | Gae | 3 lack of labor | | 3 low quality of development |
| | | 2 delayed cultivation | Ganguel soule: | 8 small farm land |
| | | 2 bad development | | 3 delayed cultivation |
| | | 1 weak transport | | 1 fertilizer |
| | | 1 lack of combine | | 1 land levelling |
| | | 1 bad weeds | | 1 low price of rice |
| | Mboundoun barrage: | 11 delay in following cropping calendar | N'douloumadji founebe: | 5 inadequate group activities |
| | | 1 enclavement | | |
| | | 1 delay in credit obtenance | | |
| | | 1 marketing | | |

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

**Appendix to Annex 1**

No.

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

**Nom de l'enquêteur: _____; Date:_____ (jj/mm/année)**
**Nom de l'enquêté: _____; Nom du village: _____ ;**
**Arrondissement_____; Départment:_____; 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 équipments 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.pulverisateur; 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 | | | | | |
| | Especes (F/ha) | | | | | |
| | Méthode: 1. Tracteur loué; 2. Animal loué; 3. Animal personnel; 4. Main d'oeuvre externe; 5. Main d'œuvre familiale; 6. Autre _____ | | | | | |

| | | |
|---|---|---|
| 11. | Etes-vous satisfait du tracteur ou de l'animal pris en location? | (1.Oui 2.Non) si non, pourquoi?<br>(1.le nivellement n'est pas bien fait; 2.les blocs de terre sont trop larges; 3.labour trop profond; 4. autre _____) |

**Appendix to Annex 1**

No.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| *Semis* | | | | | | | |
| 12. | Quel type de semis faites-vous? | (1. semis direct, 2. repiquage)<br>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?<br>(1.espèces; 2.repas; 3.espèces et repas) Nombre_____;<br>Jours_____; Superficie_____ha; Espece:F._____/personne | | | | | |
| 16. | Quelle quantité de semences utilisez-vous? | _____kg/ha | | | | | |
| 17. | Quelle est la superficie de la pépinière? | _____$m^2$ 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 | 4.autre | | |
| | | _____kg | _____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?<br>(1.espèces; 2.repas; 3.espèces et repas) Nombre_____;<br>Jours_____; Superficie_____ha; Espece:F._____/personne | | | | | |
| *Fertilisation* | | | | | | | |
| 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) | Prix (F./sac) | | |
| | | DAP | | | F._____ | | |
| | | Urée | | | F._____ | | |
| | | | | | F._____ | | |
| | | | | | F._____ | | |
| 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.crédit 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?<br>(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;<br>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 | | | | | |
| *Protection des cultures* | | | | | | | |
| 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.dommages 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 | Marbrure | Pyriculariose | Autre |
| | 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?<br>(1.espèces; 2.repas; 3.espèces et repas) Nombre_____; Jours_____;<br>Superficie_____ha; Espece:F._____/personne | | | | | |

**Appendix to Annex 1**

No.

| | | | | | | |
|---|---|---|---|---|---|---|
| 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.manoeuvre; 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 | | | |
| *Gestion de l'eau* | | | | | | |
| 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.selon 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 èlevés; 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_____) | | | |
| *Récolte et battage* | | | | | | |
| 45. | Comment récoltez-vous le riz? | | (1.location de moissonneuse; 2.main d'oeuvre non familiale; 3.main d'œuvre 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 derniere? | | (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'œuvre 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 utisez 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) | | | |
| *Transport, Consommation et commercialisation* | | | | | | |
| 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 | | | |

**Appendix to Annex 1**

No.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 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. | Oú 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)<br>Si oui, combien de fois par jour vous mangez du riz ? (____fois)<br>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_____) | | | | | |
| ***Encadrement*** | | | | | | | |
| 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 substaniellement vos productions de riz ? | (1.Oui, 2.Non) Si oui, quelle est la nature de l'assistance?<br>(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_____) | | | | | |
| ***Financement*** | | | | | | | |
| 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.commercant | 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?<br>(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?<br>(FCFA_____; par quelle structure __) (cf. 67 pour le nombre) | | | | | |
| ***Problèmes rencontrés*** | | | | | | | |
| 70. | Quels sont les trois problèmes majeurs auxquels vous êtes confrontés dans la culture du riz?<br>(1.bénéfice faible; 2.pas de débouchès 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!

Annex 7

# Agricultural Survey in the Casamance

## 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 dominantlyof 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 ethnical profile.

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

| | Villages | Department | Population | household | Ethnical distribution |
|---|---|---|---|---|---|
| Kolda Region | | | | | |
| 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 | ? | Mandings (100%) |
| 10 | Coudomp (Hamdallay?) | Sediou | ? | ? | ? |
| Remarks: * villages where irrigated rice cultivation is practiced | | | | | |
| Ziguinchor Region | | | | | |
| 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%), Baïnounk (30%), Balante (10%), Mandingue (10%) |
| 8 | Nyassia | Ziguinchor | 452 | 49 | Diola (100%) |
| 9 | Loudia Oulof | Ziguinchor | 474 | 51 | Peul (60%), Diola (20%), Ouolof (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[1]

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 fertiilizer 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.

[1] 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 each 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 stape.

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 incdlude 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[2]**

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%),

[2] 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 knifes. 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

unit: number

| | Anambé Basin | | | | | | Total | Outside Anambé | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dialakegni | Soutoure | Mbalocounda | Fass Pathe | Anambe | S. Kareba | | 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

unit: number

| | Basin Anambé | | | | | | Total | hors de Anambé | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dialakegni | Soutoure | Mbalocounda | Fass Pathe | Anambe | S. Kareba | | 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

unit: ha

| | Anambé Basin | | | | | | Total | Outside Anambé | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dialakegni | Soutoure | Mbalocounda | Fass Pathe | Anambe | S. Kareba | | S. Keita | S. Brasso | Diereng | Goudomp | |
| Paddy(dry season) | | | | | | | | | | | | |
| 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 |
| Paddy(rainy season) | | | | | | | | | | | | |
| 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 |
| Millet | | | | | | | | | | | | |
| 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 |
| Sorghum | | | | | | | | | | | | |
| 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 |
| Maize | | | | | | | | | | | | |
| 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 |
| Cowpea | | | | | | | | | | | | |
| 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 |
| Groundnut | | | | | | | | | | | | |
| 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 |
| Others | | | | | | | | | | | | |
| 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

unit: head

| | Anambé Basin | | | | | | Total | Outside Anambé | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dialakegni | Soutoure | Mbalocounda | Fass Pathe | Anambe | S. Kareba | | S. Keita | S. Brasso | Diereng | Goudomp | |
| Bovins | | | | | | | | | | | | |
| 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 |
| Cheval | | | | | | | | | | | | |
| 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 |
| Ane/mule | | | | | | | | | | | | |
| 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 |
| Muton/chèvre | | | | | | | | | | | | |
| 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 |
| Poules | | | | | | | | | | | | |
| 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 |
| Autres | | | | | | | | | | | | |
| 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

unit: ha

| | Anambé Basin | | | | | | Total | Outside Anambé | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dialakegni | Soutoure | Mbalocounda | Fass Pathe | Anambe | S. Kareba | | S. Keita | S. Brasso | Diereng | Goudomp | |
| IR1529 | | | | | | | | | | | | |
| Total | 0 | 0 | 0 | 0 | 0 | 9 | 9 | 0 | 0 | 0 | 0 | 0 |
| number | 0 | 0 | 0 | 0 | 0 | 4 | 4 | 0 | 0 | 0 | 0 | 0 |
| Average | | | | | | 2 | 2.3 | | | | | |
| maximum | | | | | | 3 | 3 | | | | | |
| minimum | | | | | | 2 | 2 | | | | | |
| | | | | | | | | | | | | |
| Sahel 202 | | | | | | | | | | | | |
| Total | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 0 | 0 | 0 | 0 | 0 |
| number | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| Average | | | | | | 3 | 3.0 | | | | | |
| maximum | | | | | | 3 | 3 | | | | | |
| minimum | | | | | | 3 | 3 | | | | | |
| | | | | | | | | | | | | |
| Sahel 108 | | | | | | | | | | | | |
| 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 |
| | | | | | | | | | | | | |
| Jaya | | | | | | | | | | | | |
| Total | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| number | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| Average | | | | | | 1 | 1.0 | | | | | |
| maximum | | | | | | 1 | 1 | | | | | |
| minimum | | | | | | 1 | 1 | | | | | |
| | | | | | | | | | | | | |
| TCS-10 | | | | | | | | | | | | |
| Total | 7.35 | 4 | 0 | 0 | 14.8 | 3 | 29.15 | 0 | 0 | 0 | 0 | 0 |
| number | 3 | 2 | 0 | 0 | 4 | 2 | 11 | 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 | | | | | |
| | | | | | | | | | | | | |
| Others | | | | | | | | | | | | |
| 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

unit: number of respondents

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

1

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

Table 7 Land Preparation Method

unit: number of respondents

| | Anambé Basin | | | | | | Total | Outside Anambé | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dialakegni | Soutoure | Mbalocounda | Fass Pathe | Anambe | S. Kareba | | S. Keita | S. Brasso | Diereng | Goudomp | |
| Labour | | | | | | | | | | | | |
| 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 |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| Offsetage | | | | | | | | | | | | |
| 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 Anim | 1 | | | | | | 1 | | | 2 | 1 | 3 |
| Hired labor | | | | | | | 0 | | 4 | | | 4 |
| Family labor | | | | | | | 0 | 1 | 7 | 8 | 8 | 24 |
| | | | | | | | | | | | | |
| Boue | | | | | | | | | | | | |
| 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 |
| | | | | | | | | | | | | |
| Planage | | | | | | | | | | | | |
| 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

unit: FCFA/ha

| | Anambé Basin | | | | | | Total | Outside Anambé | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dialakegni | Soutoure | Mbalocounda | Fass Pathe | Anambe | S. Kareba | | S. Keita | S. Brasso | Diereng | Goudomp | |
| Labour | | | | | | | | | | | | |
| 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 |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| Offsetage | | | | | | | | | | | | |
| 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 |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| Boue | | | | | | | | | | | | |
| 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 |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| Planage | | | | | | | | | | | | |
| 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

unit: kg/ha

| | Anambé Basin | | | | | | Total | Outside Anambé | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dialakegni | Soutoure | balocounda | 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 |
| | | | | | | | | | | | | |

Table 10 Irrigation Cost

unit: FCFA/ha

| | Anambé Basin | | | | | | Total | Outside Anambé | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dialakegni | Soutoure | balocounda | 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 | | | | | |
| | | | | | | | | | | | | |

Table 11 Fertilizer Dosage

unit: kg/ha

| | 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 |
| | | | | | | | | | | | | |

Table 12 Time of Fertilizer Application

unit: days after sowing

| | 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 |
| | | | | | | | | | | | | |

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 bein | high cost | 1 water quantity | | | 2 water quantity | | |
| unsatisfied | 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 bein | 3 levelling | | | | siltation | water stagnation | |
| unsatisfied | | | | | 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 | | | | | | |
|---|---|---|---|---|---|---|---|
| | Dialakegni | Soutoure | Mbalocounda | Fass Pathe | Anambe | S. Kareba | Average |
| 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 Cunsumption

unit: number of respondents

| | 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 |

## Table 19 Frequency of Rice Eating

unit: frequency per day or week

| | 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 | | 3 | 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 | | | | | | | |

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

## Table 20 Most Importang Food

unit: number of respondents

| | 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 | | | |

## Table 21 Problems on Agriculture

unit: number of respondents

| | Anambé Basin | | | | | | Total | Outside Anambé | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dialakegni | Soutoure | Mbalocounda | Fass Pathe | Anambe | S. Kareba | | S. Keita | S. Brasso | Diereng | Goudomp | |
| Problem | | | | | | | | | | | | |
| Low profitability | | | | | | 1 | 1 | | | | | 0 |
| Difficulty in marketing | 7 | 9 | 1 | 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 |

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 | Niaguis | 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 | Niaguis | 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 | Niaguis | Niassia | Sindian | Tenghory | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Riz(wet season) | | | | | | | | | | | |
| 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 |
| | | | | | | | | | | | |
| Millet | | | | | | | | | | | |
| 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 |
| | | | | | | | | | | | |
| Sorghum | | | | | | | | | | | |
| 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 |
| | | | | | | | | | | | |
| Maize | | | | | | | | | | | |
| 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 |
| | | | | | | | | | | | |
| Cowpea | | | | | | | | | | | |
| 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 |
| | | | | | | | | | | | |
| G. nuts | | | | | | | | | | | |
| 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 |
| | | | | | | | | | | | |
| Others | | | | | | | | | | | |
| 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 |

| Total | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 | Niaguis | Niassia | Sindian | Tenghory | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Cattle | | | | | | | | | | | |
| 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 |
| | | | | | | | | | | | |
| Horse | | | | | | | | | | | |
| 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 |
| | | | | | | | | | | | |
| Donkey/mule | | | | | | | | | | | |
| 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 |
| | | | | | | | | | | | |
| Sheep/goat | | | | | | | | | | | |
| 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 |
| | | | | | | | | | | | |
| Poultry | | | | | | | | | | | |
| 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 | Niaguis | 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 | Niaguis | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Plough | | | | | | | | | | | |
| 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 |
| | | | | | | | | | | | |
| Harrow | | | | | | | | | | | |
| 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 labo | 9 | 2 | 6 | 3 | | 4 | 1 | | 2 | 3 | 30 |
| Other | | | | | | | | | | | 0 |
| | | | | | | | | | | | |
| Bunding | | | | | | | | | | | |
| 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 |
| | | | | | | | | | | | |
| Levelling | | | | | | | | | | | |
| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Plough | | | | | | | | | | | |
| 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 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| Harrow | | | | | | | | | | | |
| Total | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| number | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| average | | | | | | | | | | | |
| maximum | | | | | | | | | | | |
| minimum | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| Bunding | | | | | | | | | | | |
| 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 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| Levelling | | | | | | | | | | | |
| 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 villlages 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 dung | 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 | Niaguis | 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 | Niaguis | 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 | Niaguis | Niassia | Sindian | Tenghory | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| number | 4 | 1 | 9 | 7 | 6 | 1 | 2 | 0 | 3 | 8 | 41 |
| chemicals | 2 | 1 | 6 | | | | | | | | 9 |
| Biological c | 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 | Niaguis | 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 | Niaguis | 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 | Niaguis | 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 | Niaguis | 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 | Niaguis | 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 labo | 9 | 9 | 8 | 6 | 9 | 9 | 7 | 10 | 2 | 3 | 72 |

Table 45 Condition of labour employment

| | Coubalan | Cabrousse | Diouloulou | Tendouck | Mlomp | Loudia wolof | Niaguis | 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 | Niaguis | 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 | Niaguis | 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 labo | 5 | 3 | 6 | 1 | 1 | 1 | | | | | 17 |
| Other reaso | 1 | | | | 1 | | | | | | 2 |

Table 48 Threshing method

| | Coubalan | Cabrousse | Diouloulou | Tendouck | Mlomp | Loudia wolof | Niaguis | 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 | Niaguis | 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 | Niaguis | 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 | Niaguis | Niassia | Sindian | Tenghory | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| self-consumption | | | | | | | | | | | |
| 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 |
| | | | | | | | | | | | |
| Sale | | | | | | | | | | | |
| 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 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| Gift | | | | | | | | | | | |
| 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 | Niaguis | 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 | Niaguis | 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 | Niaguis | 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 | Niaguis | 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 | Niaguis | 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 | Niaguis | 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 | Niaguis | 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 | Niaguis | 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 | Niaguis | 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 | Niaguis | 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 | Niaguis | 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 | Niaguis | 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 | Niaguis | 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 | Niaguis | 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

Annex 8

# Soils in the Casamance Area

**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 $km^2$, 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[1]. 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[2]. 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[3]. 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

[1] 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.

[2] This area includes heavy clay soil area along the Casamance river.

[3] 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 2,600$m^2$, while those in the upper slope are smaller between 10 and 200$m^2$. 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 cost, 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$^{th}$ 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 decreases 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 kg$P_2O_5$/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 $P_2O_5$, and 40 kg/ha for $K_2O$, respectively, by combined use of urea and compound (N: $P_2O_5$: $K_2O$ =10:10:20)[4]. On the other hand, the recommendation by the extension agent (PIDAC) is, using the same fertilizers, 33kgN/ha, 5kg $P_2O_5$/ha, and 10kg $K_2O$/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 |
| $K_2O$ (mg/100g) | 30.6 | 30.6 | 36.3 | 24.5 | 46.2 |

[4] This dosage may be for modern varieties.

| | | | | | |
|---|---|---|---|---|---|
| $Na_2O$ (mg/100g) | 40.9 | 51.1 | 48.3 | 34.1 | 54.5 |
| $P_2O_5^*$ (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 t~~The depth of water table and quality of the groundwater were measured ~~of~~ 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 kg$P_2O_5$/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.

Annex 9

# Pamphlet and Poster of

# SENRIZ

## 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 □108 | √□201 | □202 |
| Récolté : | □ Nov 05 | √□ Déc 05 | □ Jan 06 |
| Usiné : | √□ Déc 05 | □ Jan 06 | □ Fév 06 |
| | □ Mars 06 | □ Avril 06 | □ Mai 06 |
| Type : | □ Entier | □ Mixte | √□ Brisé |

A.9 - 1

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

SENRIZ ★ de la vallée

**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

Annex 10

# Report of three major newspaper publishing companies on the launching of SENRIZ

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 révélai 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.

S.F.LO

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* -

Wal Fadjri

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

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'Agriculteur, 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".

24 Décembre 2005
Publié sur le Web le 28 Décembre 2005

Elh. S. Nourou Dia