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Foreseeing Answers to Global Challenges
LISBON | 4 – 8 NOVEMBER 2024

Rice Diseases in Guinea-Bissau:

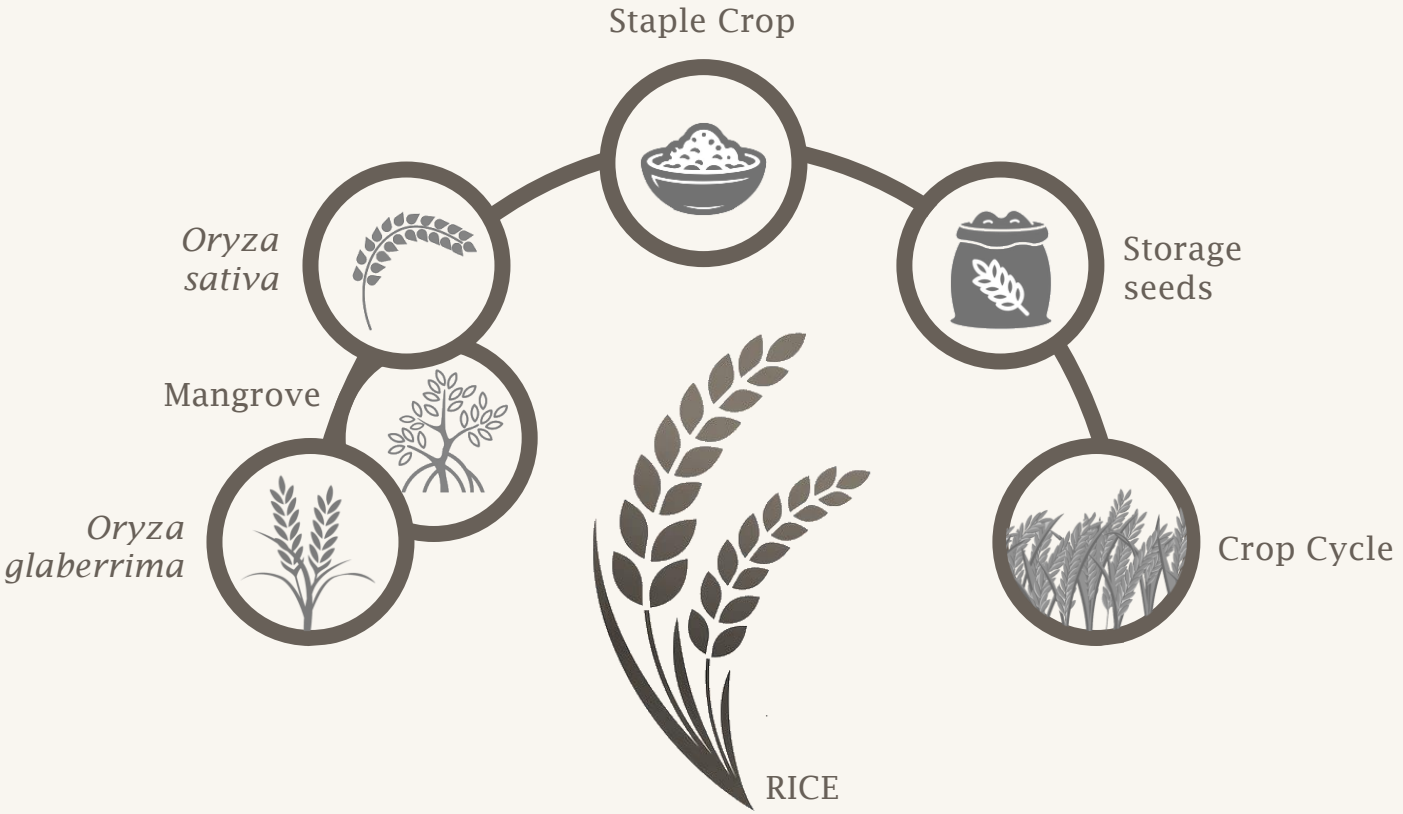
from storage to crop cycle

Sofia Conde*, Marina Temudo, Filipa Monteiro

* sofiaconde@isa.ulisboa.pt

Grant | FOOD/2019/412-700

Introduction



1

Hidden Secrets of Mangrove Swamp Rice Stored Seeds in Guinea-Bissau: Assessment of Fungal Communities and Implications for Food Security (*published*)

2

The Fungal World of Mangrove Swamp Rice: Insights into Guinea-Bissau's Crop Cycle (*under analysis*)

agronomy

MDPI

Article

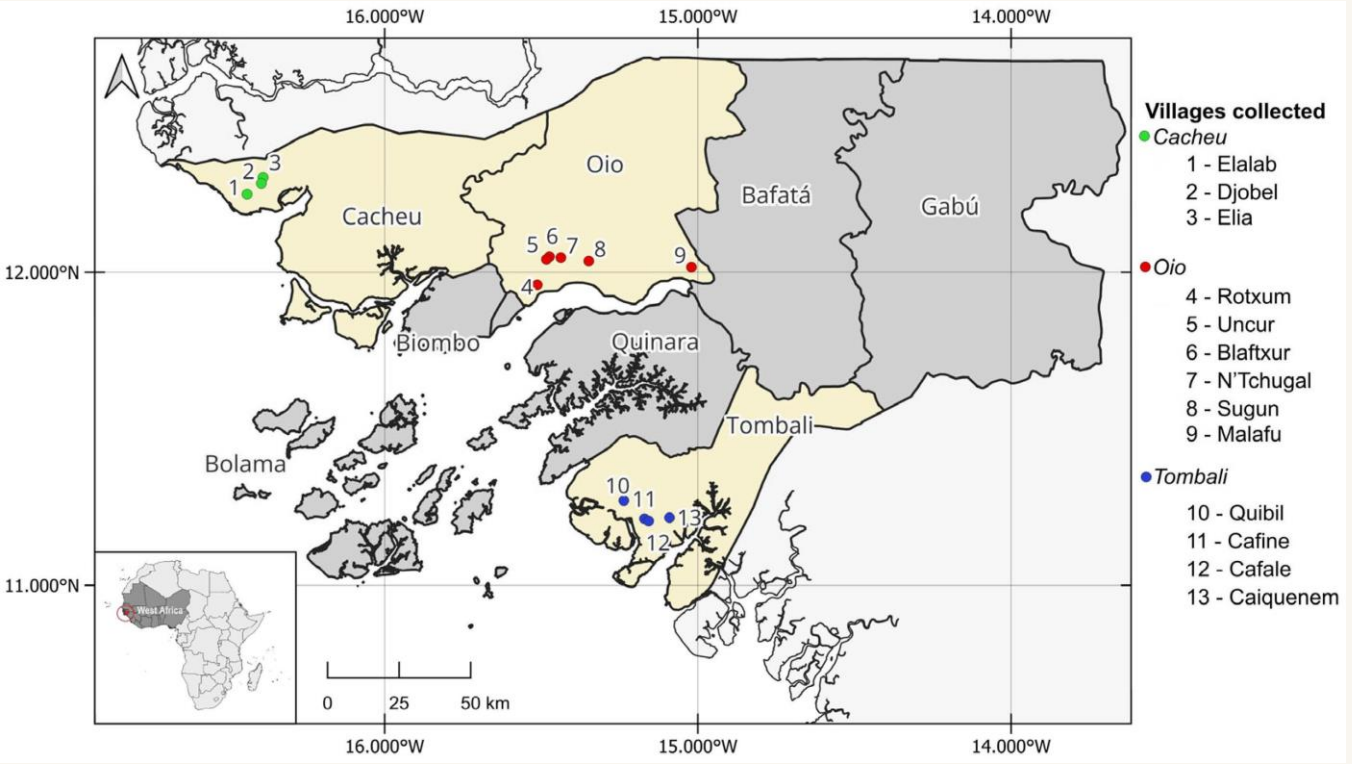
Hidden Secrets of Mangrove Swamp Rice Stored Seeds in Guinea-Bissau: Assessment of Fungal Communities and Implications for Food Security

Sofia Conde [1,2,*], Amidu Barai [2,3,4], Sílvia Catarino [5], Gonçalo J. Costa [6], Sónia Ferreira [7,8], Idília Tavares [3], Maria Rosa Ferreira [3], Marina Padrão Temudo [1] and Filipa Monteiro [2,5,*]

Material and Methods | Samples Collection

1 **Sample Collection**: 3 Regions | 13 Villages | 30 Farmers
[samples of ≠ varieties and/or ≠ storage structure]

2 **Laboratory Analysis**: Germination rate; Fungal Identification / DNA barcoding analysis; Aflatoxins Content



Material and Methods | Laboratory Analysis

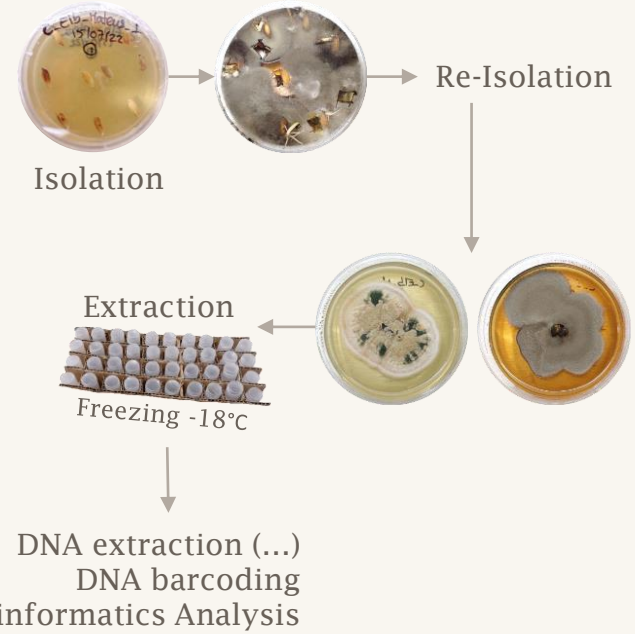
2

Germination rate

64 samples x 3 repetitions = **192 trials**
100 seeds / Petri dish
Measurements at day 3, 5, 10 and 14

Fungal Identification

64 samples x 3 repetitions = **192 trials**
- Fungi re-isolation
- Extraction and freezing for DNA barc. ID (**N=70**)



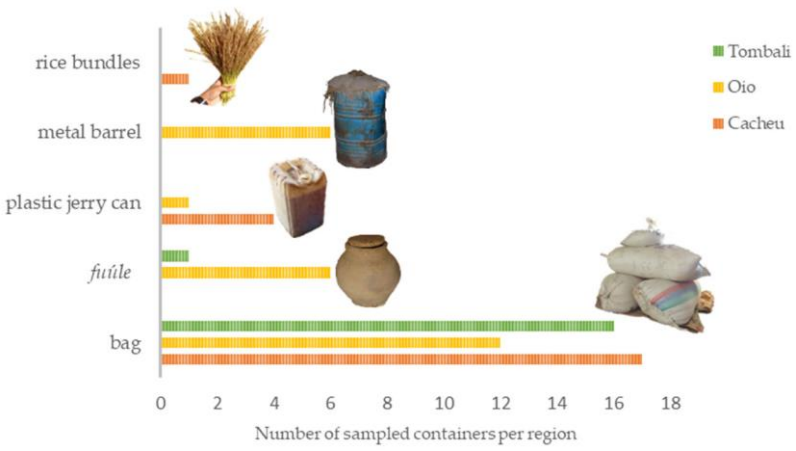
Aflatoxins Content

Mixed samples per village
Sub-samples for analysis
Aflatoxin analysis (B1, B2, G1, G2)

Results

| Samples Collection

- Farmers select and separate rice seeds by specific characteristics, then dry, thresh, and store them.
- Storage containers vary widely, including bags, barrels, and traditional structures like *fuúle* and *biré*/psangá.
- Polyethylene bags are the most used rice storage containers across all ethnic groups and regions.

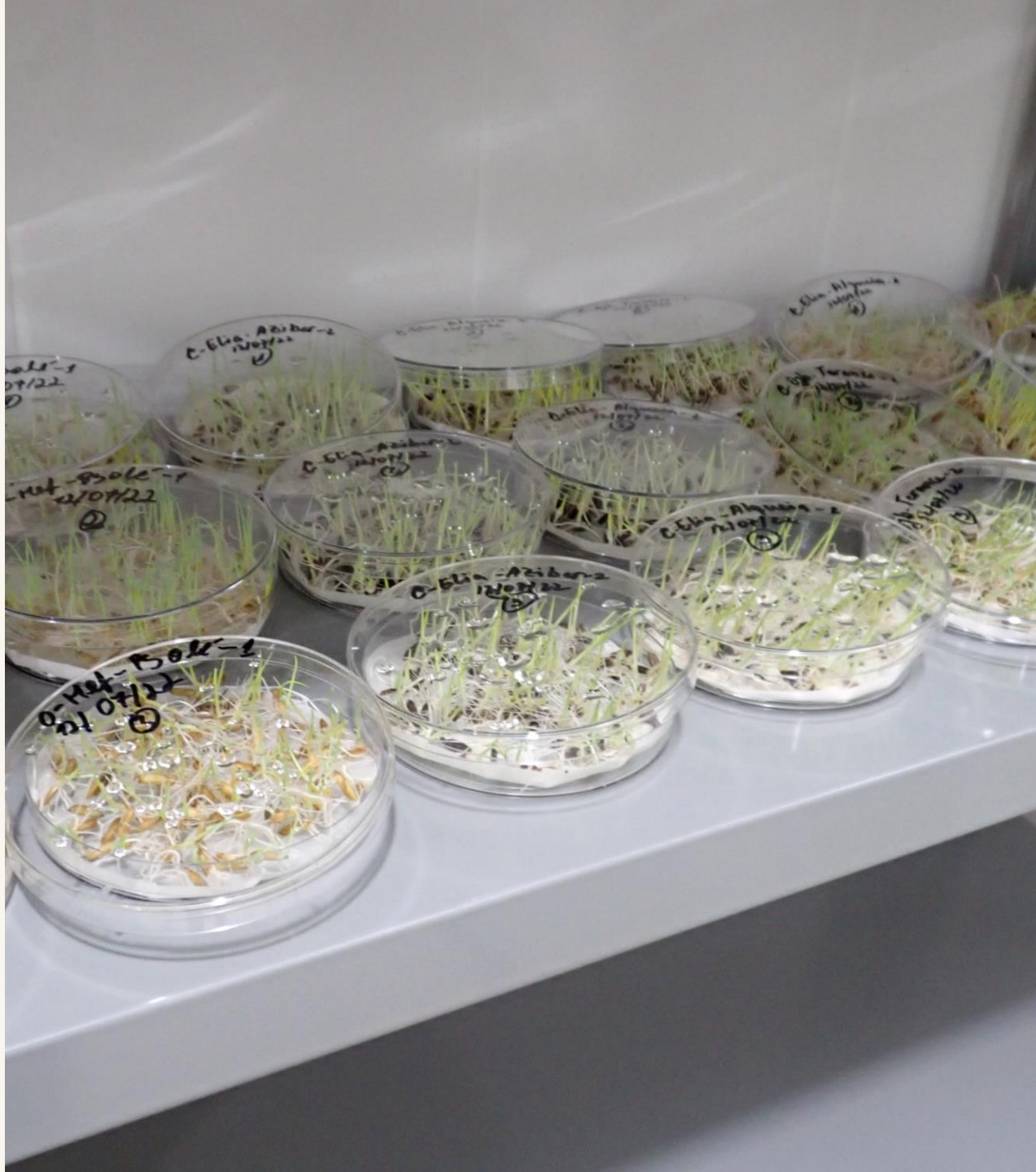


Results

| Germination Rates

- **High Germination Rates:** All rice varieties tested had strong germination, achieving over 95% by day 14.
- **Variations by Species:** No significative variations were found between *Oryza glaberrima* and *Oryza sativa.*

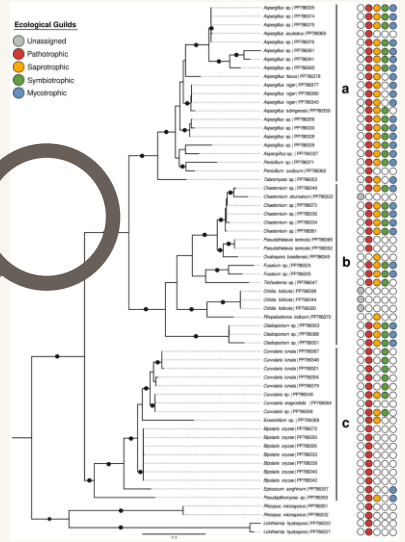
Rice species	Rice Varieties [Vernacular Name]	Language	Region
Oryza glaberrima	*Edjur*	Baiote	C
	Etele		C
	Malu rassa	Balanta	O
	Bakongabu		C
	Balenabu	Felupe	C
	Batumpaiabo		C
Oryza sativa	*Tanham/Atanham*	Balanta	O
	Caublak/Caublac		C/O/T
	DEPA		O
	Seli/Sili		O
	Var 29 (landa Arruz project)	Creole	T
	Yaca branco		T
	Yaca ieie		O
	Yaca sau/xau		O/T
	Tomor/Etomoray	Felupe	C
	Iacai branco		C
	Iacai adi	Felupe/Baiote/Creole	C
	Iacai preto		C
	Iacai vermelho		C
	Barakonde	Mandinga	O
	Mamusso	Susu	T
	Sampena/Quisampena		O



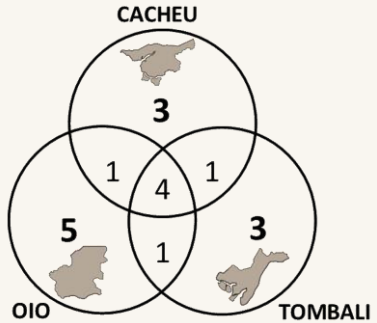
Results

| Fungal Identification (DNA barcoding)

- **Fungal taxa:** N=26 (18 genera, 16 species)
- **Main genera:** *Aspergillus*, *Curvularia*, and *Bipolaris*
- **Health-Related Genera:** mycotoxin production (*Aspergillus & Fusarium*)
- **Regional Fungal Correlations:** Similarities between the fungal compositions of Oio and Cacheu.



| Ecological guilds



| Number of fungal genera between regions

Results

| Aflatoxin content

- Results obtained from all 13 villages screened revealed an aflatoxin content (total and B1, B2, G1, and G2) of **< 1.0 µg/kg for all samples**

Discussion

- Traditional rice storage practices are declining, replaced by modern containers.
- Key mycotoxigenic fungi were detected, yet aflatoxin levels remain safe.

Conclusions

- Study reveals high germination rates, safe fungi levels, and potential for improved post-harvest management innovations.
- **First baseline of fungal communities present in stored rice seeds from mangrove swamp rice production in Guinea-Bissau.**

The Fungal World of Mangrove Swamp Rice: Insights into Guinea-Bissau's Crop Cycle
(*under analysis*)

Material and Methods

Field Collection

1 Square Method

GENERAL

- GPS location
- Phenological State
- No. of hills per quadrante
- Water parameters (T°C; mS/cm; ppt; pH)
- Photographic register

DISEASES

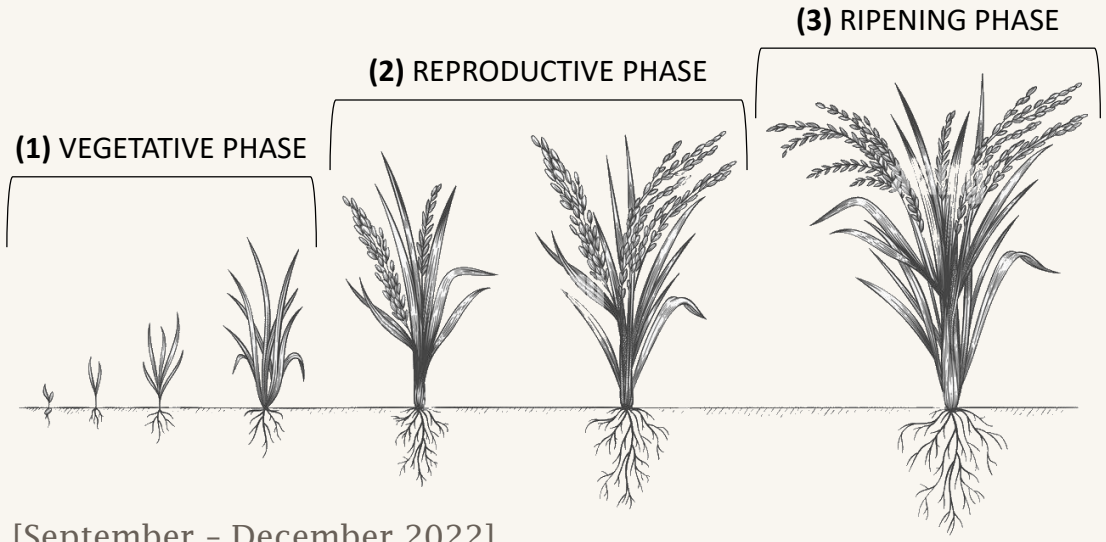
- Record, photography and collection of tissues with disease symptoms
- Incidence and severity

Material and Methods

Field Collection

1 — Sampling Effort

Number of Sampling Points (SP) calculated according to the area of each rice field in the different villages.



[September – December 2022]

A-C. Overview of villages and rice fields (Cafine, Malafu, Elalab)
D-F. Sampling points distribution (red dots), location of the villages (yellow circles), and rice field area (coloured in yellow).

Material and Methods

1 Square Method

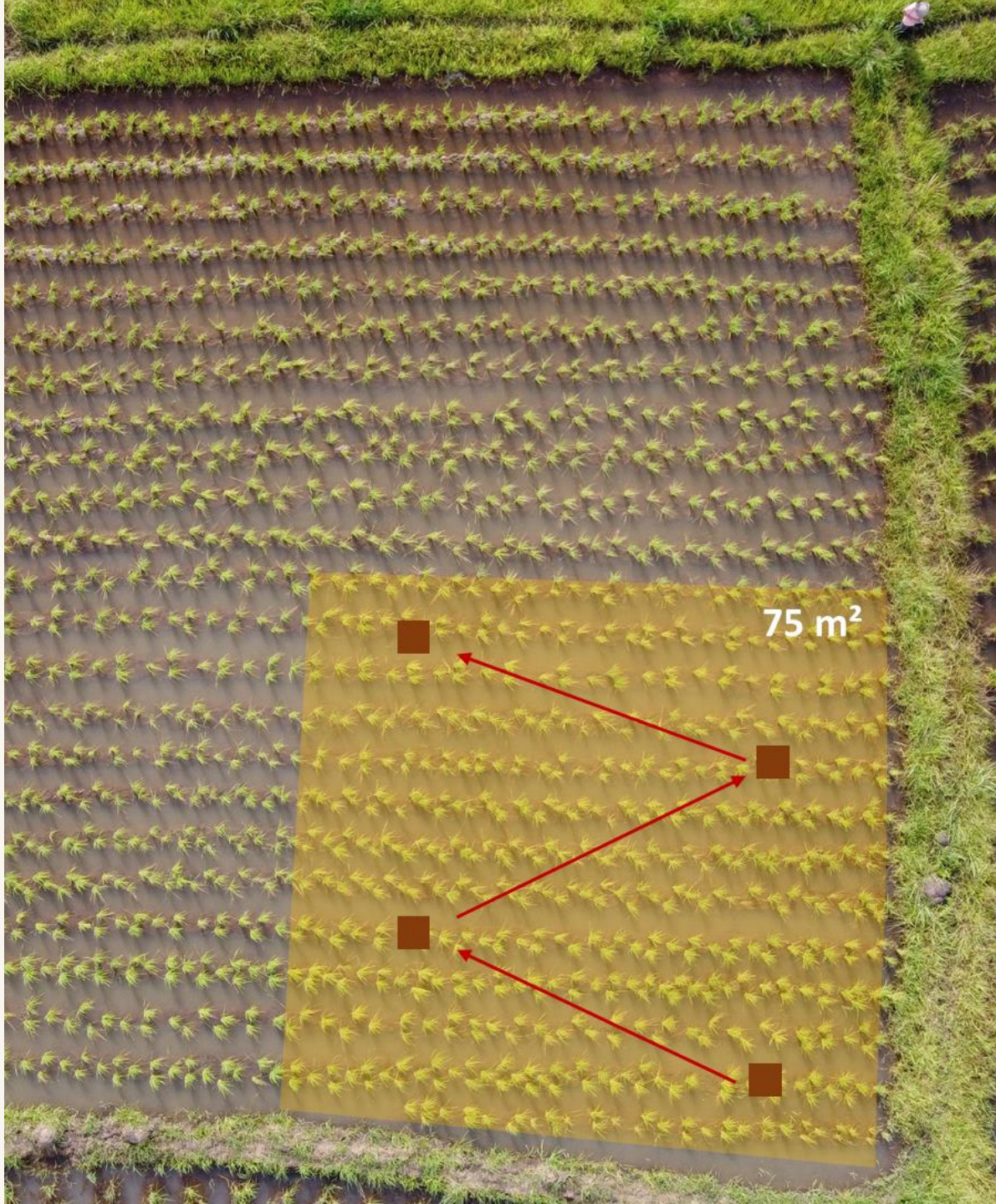
SQUARE METHOD (SM): 10% of the total area

Area of SP: 75 m² (SM)

Minimum of SP: 3

SP distribution: ZigZag

Number of replicas: 4/ SP

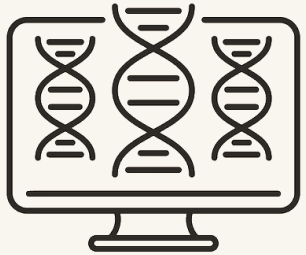


Material and Methods

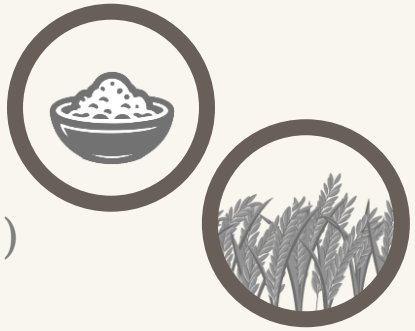
2

Genomic DNA (gDNA) extraction followed the protocol of the innuPREP Plant DNA Kit, according to the manufacturer's instructions.

→ Sent to **biocant** company for **metabarcoding IT2 sequencing** *(under bioinformatic analysis)*



Results



Integrated approach (food and crop)

Validation of unidentified species to Guinea-Bissau

→ *Bipolaris oryzae*

Expected Outcomes

- Determination of common fungi between rice cycle phases / regions that can be pathogenic to the crop
- Distribution patterns between regions / phases of the rice cycle (occurrence maps; incidence and severity)
- ID of the diseases present in the studied mangrove rice fields
- Most important diseases that might affect rice productivity
- ID most critical cycle phase to mitigate the diseases

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Thank you

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