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# *“Breeding for resilient cowpea and Seed multiplication of Improved varieties in Cameroon”*

1

*Funded by :*  
**KIRKHOUSE TRUST**

*Presented by :* Sobda Gonné  
**PI, IRAD**

**ABC-ACP Annual Meeting, Zambia 26<sup>th</sup> February – 2<sup>nd</sup> March 2023**

## ➤ **PART I: Breeding Activities**

- Background
- Objectives
- Achievements

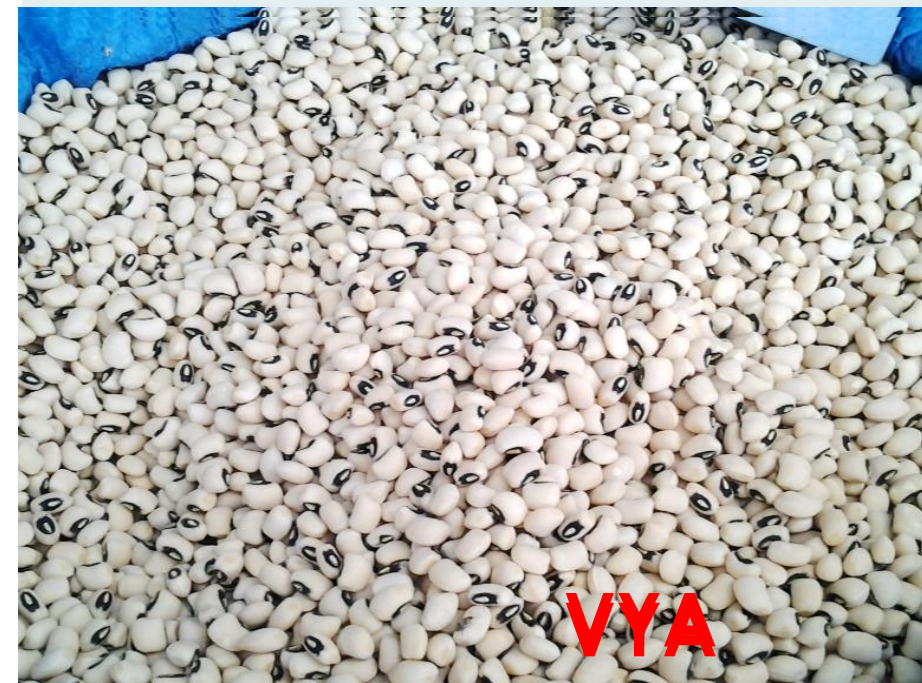
## ➤ **PART II: Seed multiplication**

## ➤ **Capacity building and Training**

## ➤ **Acknowledgements**

## BACKGROUND

- In 2000, IRAD Released 04 cowpea varieties : CRSP, BR1, LORI and Vya
- However, Yield reduced due to many constraints: Pest weed Striga, Insects and diseases
- Two of most farmers' preferred : LORI and Vya





# Some of the main Constraints

4

- ▶ Cowpea yields are generally high (1.5 to 3 t/ha),
- ▶ Average yields at farmers' field ranging 0.2 - 0.5 t/ha (AgriSat, 2022).
- ▶ Striga
- ▶ Insects
- ▶ Diseases

**1. Striga**



**2. APHID**



**3. Brow blotch**

# OBJECTIVES

5

- To develop farmers' preferred high yielding cowpea varieties and well adapted in Cameroon
  - Apply MAB in the development of improved cowpea resistance to Pest weed Striga, insects and diseases
  - Develop cowpea varieties for earliness

# ACHIEVEMENTS

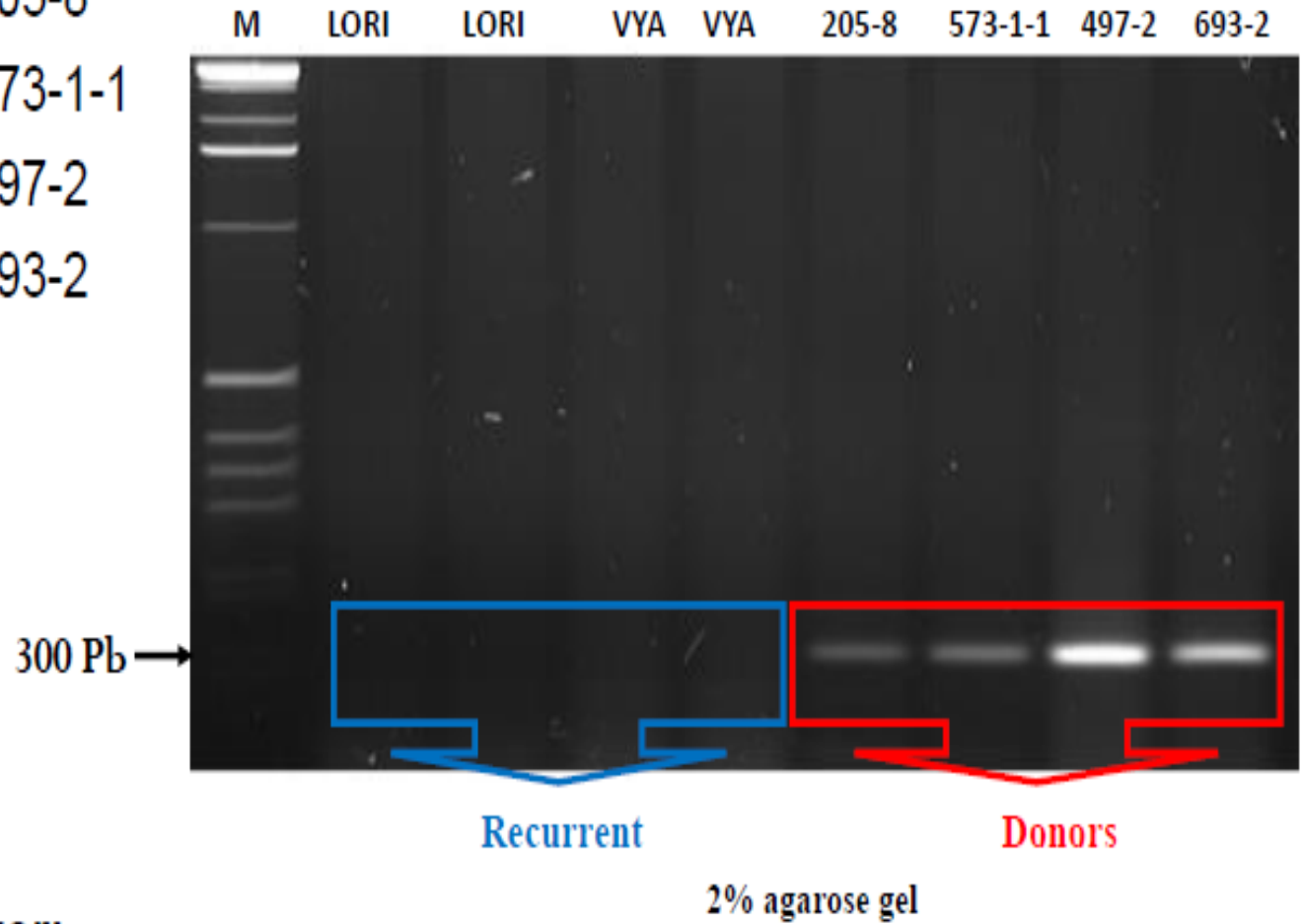
6

## ► Activity 1: Development of Cowpea varieties resistant *Striga gesneroides*

- 02 donors from IITA : IT98K-205-8 and IT99K-573-1-1
- 02 recurrent parent from IRAD : LORI and Vya
- 01 SSR marker from Prof. Timko's Lab (UVA): C42-2B
- 04 Improved cowpea lines resistant to striga developed:
  - ✓ IR15-MA02 (LORI-2)
  - ✓ IR15-MA33 (LORI-3)
  - ✓ IR16-MA-P
  - ✓ IR16-MA-K

✓ **Parental lines**

- IT98K-205-8
- IT97K-573-1-1
- IT97K-497-2
- IT93K-693-2



✓ **01 marker:**

Primer	Séquence (5'-3')
C42-2B	F_5'-CAGTTCCTAATGGACAACC-3'
	R_5'-CAAGCTCATCATCATCTCGATG-3'

✓ **Pot screening**

- 500 mg of striga seeds
- Soil infested with striga seeds 01 week before and watered
- Scoring



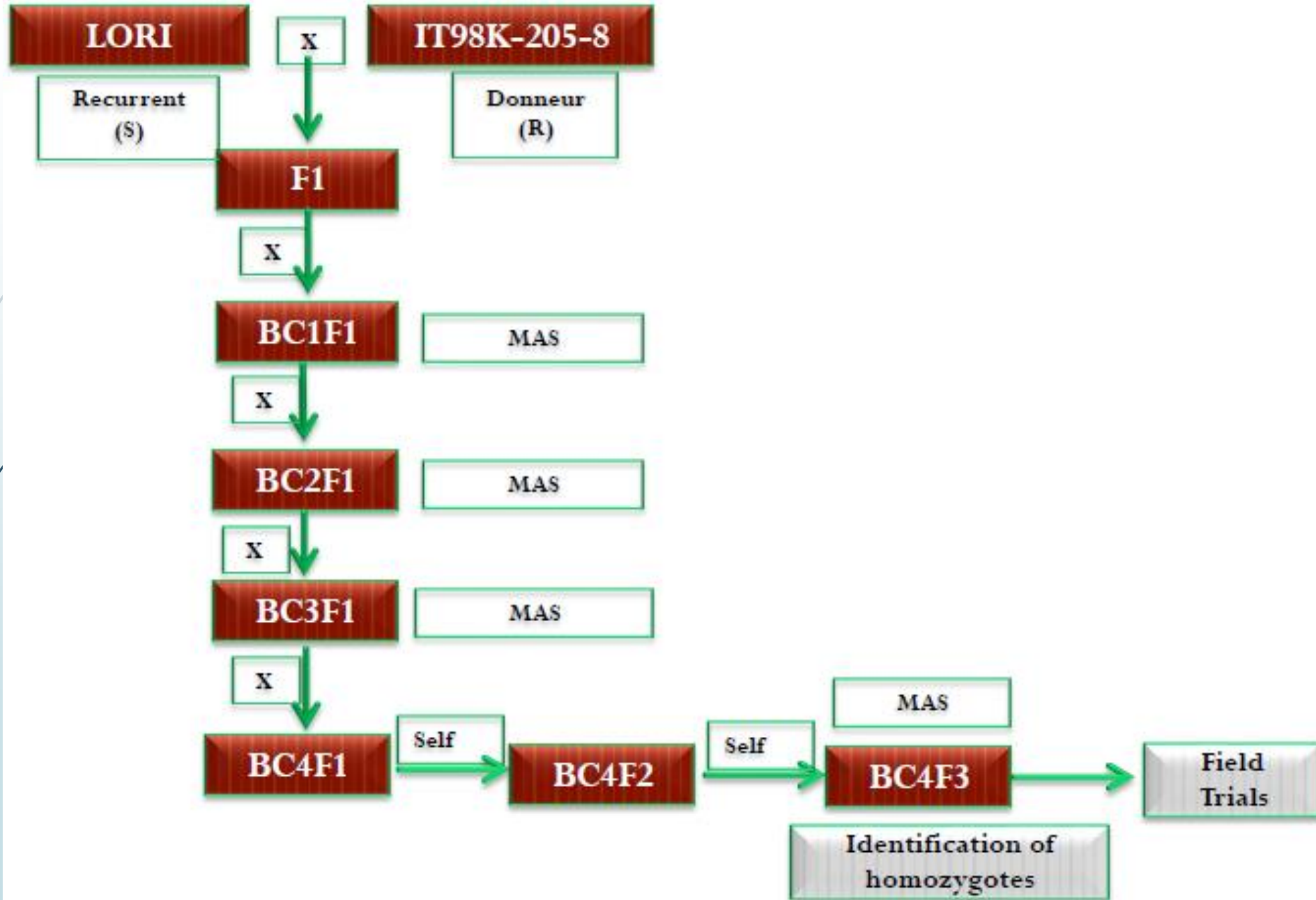
**Recurrent**

**Donors**



# Introgression of striga resistance

8





# Screening of stiga resistant lines SSR Marker C42-2B

IR16-MA-P : 36 seeds



IR16-MA-K : 33 seeds



Marker: C42-2B; P<sub>1</sub> = VYA= Recurrent parent; P<sub>2</sub> = IT99K-573-1-1= Donor; C= Control = no DNA

IR15-MA-02 : 20 seeds



IR15-MA-33 : 20 seeds



M = LADDER; S = RECURRENT; R = DONOR; MARKER = C42-2B

FIG. 1: 2% AGAROSE GEL FOR STRIGA RESISTANT LINES



# Field Trials





# Improved Stiga resistant cowpea lines released

11



**LORI-2**



**LORI-3**





## ► Activity 2: Introgression of Aphid resistance to *Striga* resistant improved lines

- 01 donor from SARI-Ghana : SARC-1-57-2
- 02 recurrent parents from IRAD : LORI-2 and LORI-3
- 01 SSR marker from Prof. Timko's Lab (UVA): CP171/172
  - ✓ F\_5'-GTAGGGAGTTGGCCACGATA-3'
  - ✓ R\_5'-CAACCGATGTAAAAAGTGCACA-3'
- Advancing BC<sub>4</sub>F<sub>2</sub> to BC<sub>4</sub>F<sub>3</sub> for crosses:
  - ✓ IR15MA-02 x SARC-1-57
  - ✓ IR15MA-02 x SARC-1-57



## ✓ Parental lines

- SARC-1-57-2
- IR15-MA02 and IR15-MA33

## ✓ 01 marker

Primer	Sequence (5'-3')
CP171/CP172	F_5'-GTAGGGAGTTGGCCACGATA-3' R_5'-CAACCGATGTAAAAAGTGCACA-3'

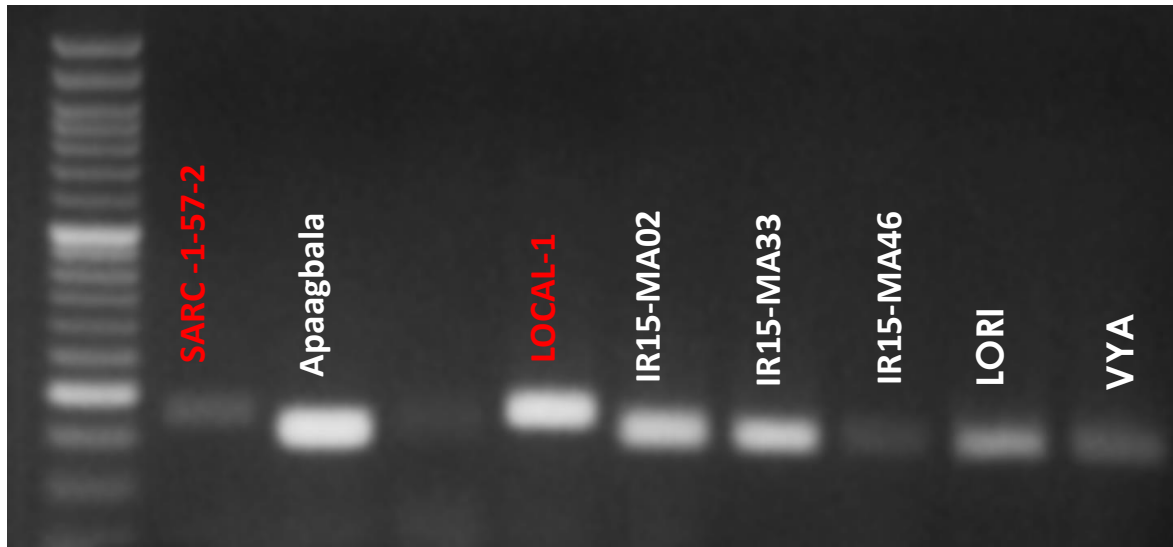


FIG: 2% AGAROSE GEL

## ✓ Screening

- Collect and rearing of Aphid
- Seedling at 02 leaves-stage, infest with 05 Aphids of 4-days old;
- Scoring 8 days after infestation (death of seedling of susceptible check (Apaabala))



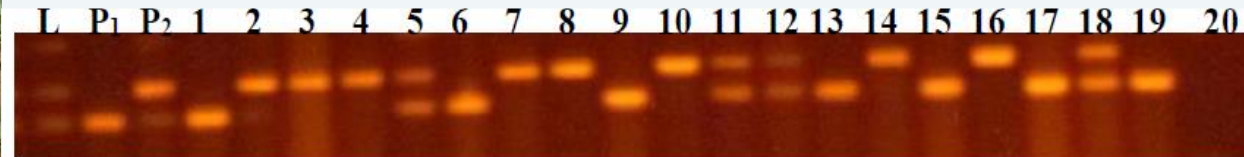


# Selfing of BC<sub>4</sub>F<sub>2</sub> in the screenhouse

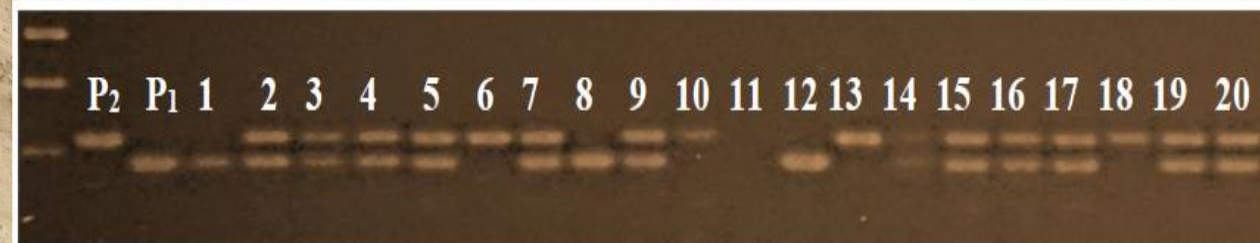


FIG.2: ADVANCING BC<sub>4</sub>F<sub>2</sub> TO BC<sub>4</sub>F<sub>3</sub>

## GENOTYPING BC<sub>4</sub>F<sub>2</sub> USING SSR MARKER CP171/172



P<sub>1</sub> = IR15-MA33; P<sub>2</sub> = SARC-1-57; 1 to 20 : Individuals



P<sub>1</sub> = IR16-MA-K; P<sub>2</sub> = SARC-1-57; 1 to 20 : Individuals

FIG.4: H-PAGE 6% ACRYLAMIDE GEL

## ► Activity 3: development of Cowpea resistant to diseases

- Targeted: *Brown blotch*, *Fusarium wilt* and *Macrophomina*
- 01 donor for *Brown blotch*: KN-1
- 02 donors for *Fusarium* : CB46 and TV410
- Research activities on *Macrophomina* planned for the next phase of the project

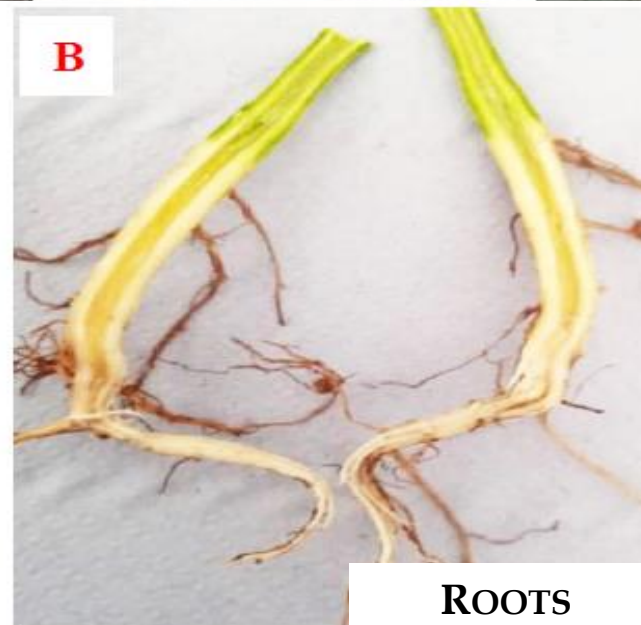


# Diseases symptoms *Fusarium* on parental lines



## ✓ **Root-dip method** (Nirmaladevi and Srinivas, 2012)

- Conidia suspension ( $10^6$  per ml)
- Inoculate 3 weeks-old seedlings
- Uproot, carefully wash under tap water
- Trimmed with sterilized scissors
- Submerge into conidia suspension for 30 min
- Transplant seedlings into minipot containing sterilized soil
- Scoring of disease from 2 week after up to 45 days



**ROOTS**



**Disease symptom**



**TABLE 1: POPULATIONS DEVELOPMENT**



CROSSES INVOLVING	NBER OF BC1F1 PLANTED	NBER OF BC2F1 SEEDS HARVESTED	TRAIT TARGETED
IR16-MA-K x KN-1	30	50	<b>BROWN BLOTCH</b>
IR16-MA-P x KN-1	20	35	
IR15-MA-02 x KN-1	22	38	
IR15-MA-33 x KN-1	25	45	
IR15-MA-02 x CB46	30	58	<b>FUSARIUM</b>
IR15-MA-33 x CB46	35	49	
IR15-MA-02 x TVU410	20	41	
IR15-MA-33 x TVU410	25	50	

# Activity 4: Development of early maturing Cowpea

- 02 donors identified : CB27 and IT00K-1217



CB27

IT00K-1217



CB27

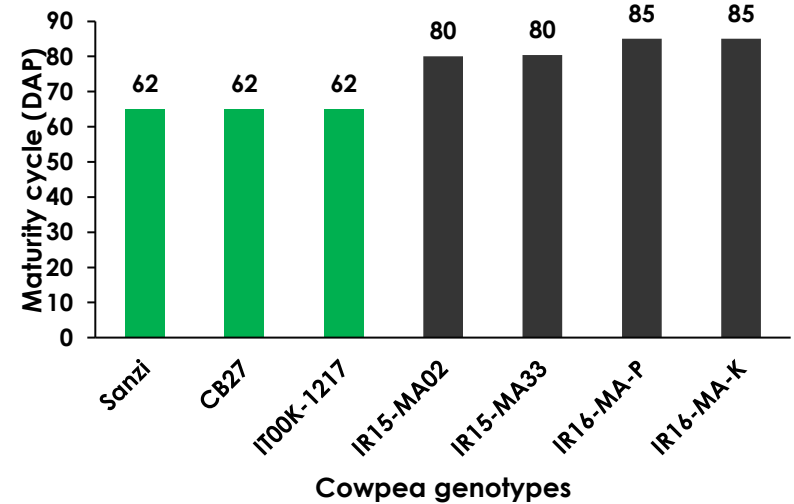
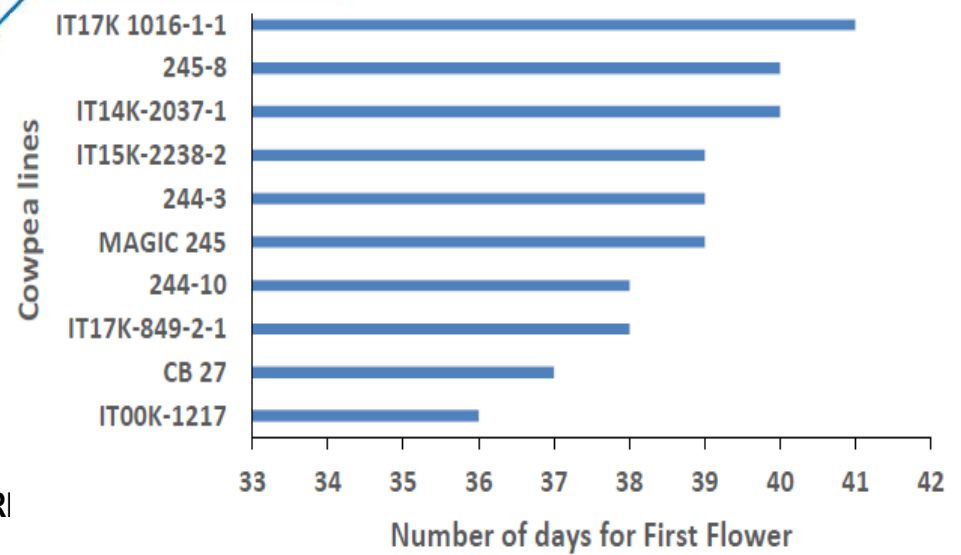


FIG. 5: SCREENING OF COWPEA LINES FOR EARLY MATURITY



**TABLE 2: POPULATIONS DEVELOPMENT FOR EARLINESS**

CROSSES INVOLVING	NBER OF BC <sub>1</sub> F <sub>1</sub> PLANTED	NBER OF BC <sub>2</sub> F <sub>1</sub> SEEDS HARVESTED
IR15-MA-02 x CB27	34	48
IR15-MA-33 x CB27	38	55
IR15-MA-02 x IT00K-1217	27	40
IR15-MA-33 x IT00K-1217	35	50

**FIG. 6: DEVELOPMENT OF BC<sub>2</sub>F<sub>1</sub>**

## **PART II: Seeds Project**



# OBJECTIVES

21

- Facilitate farmers' access to quality cowpea seeds for yield increase and food security
- Produce basic seeds of improved and varieties developed under KT project.
- Maintain seeds purity

# Seed multiplication

22

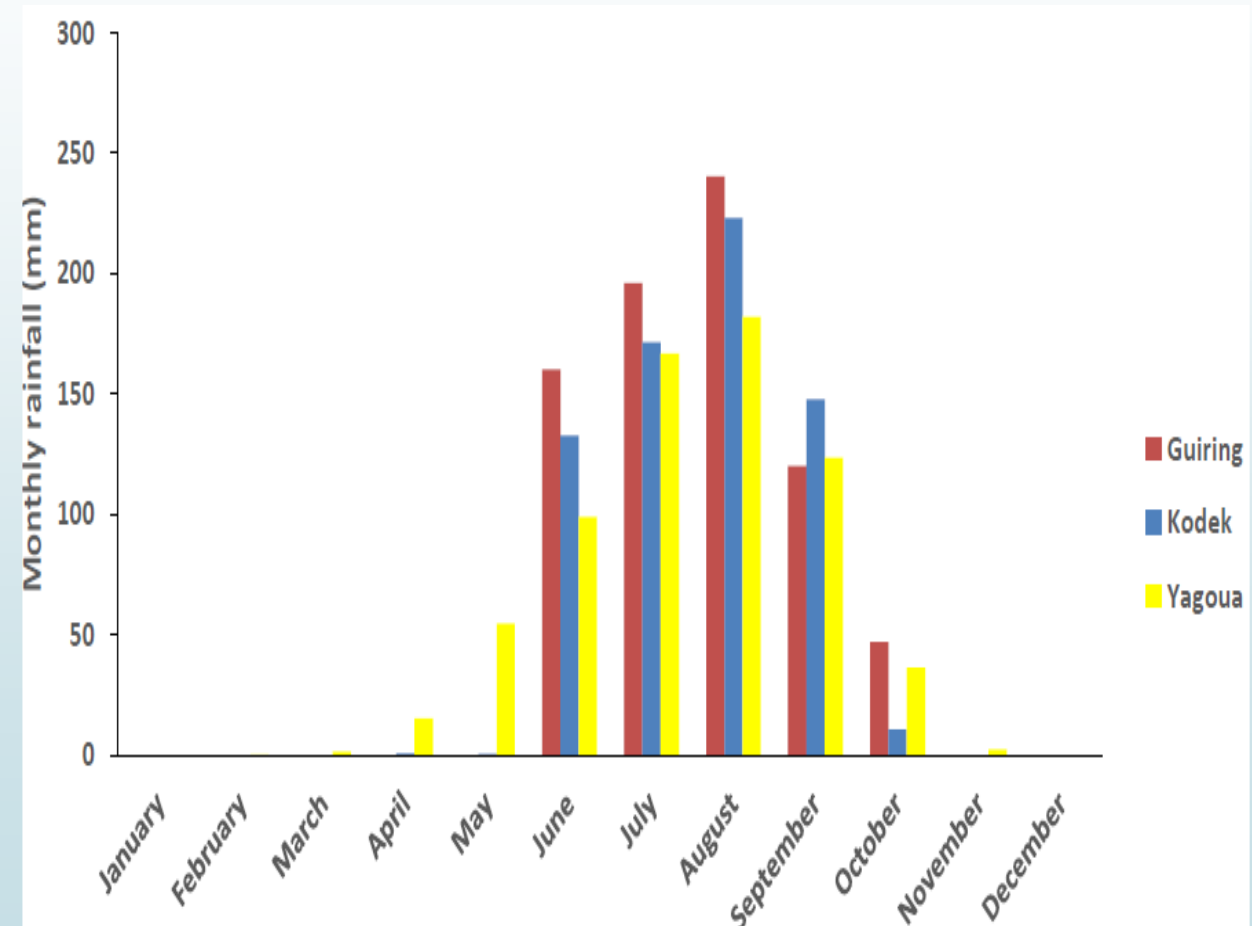


FIG 7 : LOCATION OF THE SEED PRODUCTION





FIG. 8: COWPEA PLANTS AT FLOWERING STAGE





**FIG. 9: COWPEA PLANTS AT MATURITY STAGE**





**FIG. 10: HARVESTING OPERATION AT KODEK**





**FIG. 11: COWPEA PODS AT THE THRESHING STATION**





**FIG. 12: THRESHING WITH A MACHINE**



**FIG. 13: SEEDS CLEANING AND CALIBRATION**





FIG. 14: SEEDS STORAGE USING PICS BAGS



# LIST OF FARMERS' ORGANISATIONS COLLABORATING WITH IRAD FOR SEEDS ACTIVITIES IN FAR NORTH

29

S/N	Division	Location	Name of Farmers' NGOS	Name of responsible	Tel Num
1	Diamaré	Gazawa	SOOPS MA SWAA SHELIN	MAFEWA DANIEL	693838443
2	Diamaré	KATOUAL	SCOOPS DJOUMOKOUM AYE	Alioum Bello	695186825
3	Diamaré	Zamala	FERME de Gazwa	DRMADER-EN	676400148
4	Diamaré	Gazawa	SCOOPS DJINIVOU	NdJidda YAYA	661257158
5	Diamaré	Zamala	GIC Assedjao	Djibilla	
6	Diamaré	Meskine	SCOOPS COPAN	Sakatai DERIK	
7	Diamaré	Zamala	GIC NGA NGA	DAGUIDAM Esther	675462788
8	Diamaré	Dogba	GIC PALNANG et Amis	Palnang	
9	Diamaré	Dourga Bamguel	GIC Djinadra	Yada atikoum patrice	693322651
10	Diamaré	Tchere aboussang	GIC SOLDYBA	Bouba	655818155
11	Diamaré	Zamala	SCOOPS AOUDI	Boubakary haman	
12	Diamaré	Zamala	GIC AGUI	ZIKI TCHANG	699419968
13	Mayo Danay	YAGOUA	SOCOPEL	ABOLBA	
14	Mayo SAVA	MORA	COOP-CA PROSASEN	ABOUBAKAR	698483517
15	Mayo SAVA	TOKOMBERE	SCOOPS PROTOK	FERDINARD TSAYANKABA	698030041
16	Mayo SAVA	YOLDE DADI	SCOOPS PROSEM	MOUCHE DOGDJA	697084958
17	Mayo SAVA	Kourgui	SCOUPS des PNK	YAKOUBA Paul	658226642
18	Mayo SAVA	TOKOMBERE	Maison du Paysan	Abba Boukar	698483517
19	Mayo SAVA	TOKOMBERE	Maison du Paysan	Abba Boukar	698483517
20	Mayo SAVA	MORA	KOUTCHAGBA Jeremie	KOUTCHAGBA Jeremie	699368840
21	Mayo Kani	Mouda	SCOOPS AGRO/PAST MOUDA	BADAH Mathieu	
22	Mayo Kani	GUIDIGUIS	BLAOGA BAGAMLA PIERRE	BLAOGA BAGAMLA	690056514
23	Mayo TSANAGA	Bering	DJIBRILLA DJAORO	DJIBRILLA DJAORO	690069701
24	Diamaré	Kaliawo	Iya Hamadama	Iya Hamadama	658774447
25	Mayo TSANAGA	Wouro dole	GIC RISKOU LEDDI	ABOUBAKAR HAMADOU	696571330

# Training of seeds growers

30



**ORGANIZED BY ICRC, AAH, WFP IN COLLABORATION WITH IRAD AND THE MINISTRY OF AGRIC**



# CAPACITY BUILDING

31

Table 4 : List of Scholarship granted

<b>Level</b>	<b>Hosting Institution</b>	<b>Beneficiaries</b>	<b>Period</b>
PhD	University of Ghana	Dr SOBDA Gonné	2013 - 2016
Master	University of Maroua	SAFTIA KaliB	2016 - 2017
Master	University of Maroua	FANKOU Merline	2017 - 2018
Master	University of Maroua	JULIENNE Dieu-Donnée	2020 - 2021
Master	University of Maroua	YANNE Sophie	2021-2022



# Students from University of Maroua

32





# STAFF

33



**Dr Sobda Gonné, PI**



**Dr Iyalé Liliane, Lab Technician**



**Mr Amedep David, Data management**



**Dr Zaiya Arlette, Molecular Breeder**



**Mrs Fakou Merline, Scientist working on diseases**



**Mr Gnapou Dieudonné, Data management**



# ACKNOWLEDGEMENTS

34

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- ▶ We highly appreciate the funding of the infrastructure and equipment screenhouse, molecular biology lab and pathology Lab.
- ▶ Thankful to the consultants and the whole KT team for their guidance and very useful advices.



# Thank You For Your Kind Attention

35

