Stability and adaptability of cotton (*Gossypium hirsutum* L.) genotypes under multienvironmental conditions in Mozambique

M.P. Maleia; E.C. Jamal; J.W. Savanguane; J. João; J.O. Teca

XIV Meeting of Southern and Eastern Africa Cotton Forum (SEACF)
Harare, Zimbabwe, 4 – 6 July 2018

CIMSAN
Centro de **I**nvestigação e **M**ultiplicação de **S**ementes de **A**lgodão de **N**amialo

Why this study?

- Cotton (*Gossypium hirsutum* L.), is an important commodity in the world and in many developing countries including Mozambique;
- The yield of this cash crop is particularly low in Mozambique (< 500 kg/ha);
- The cotton research program in the country has been developing and introducing new different genotypes in order to find out the suitable varieties to the local production;

Why this study?

- One of the major challenges for cultivar recommendation is the genotype by environment interaction when the performance ranking of genotypes over environments is not constant;

- The identification of cultivars with high adaptability and stability to the local conditions is an option to deal with this fact;

- The environmental conditions of cotton growing regions in Mozambique are highly diversified and it leads to cultivar environmental variability.

Objective

This study aimed to assess the yield stability and adaptability of the new cotton (*Gossypium hirsutum* L.) genotypes under multi-environmental local conditions in Mozambique.

What was done?

Table 1: List of genotypes/treatments

Treatment	Genotype	Origin	
1	ALBAR SZ 9314	Zimbabwe	Check variety
2	BA919	Turkey	
3	CA324	Mozambique	Check variety
4	CHUREDZA	Zambia	Check variety
5	CIMSAN 1	Mozambique	
6	FK 37	Burkina Fasso	
7	FLASH	Turkey	
8	IMA1 -08-3917	Brazil	
9	IMA1 09-1708	Brazil	
10	IMA1 09-278	Brazil	
11	IMACD 058221	Brazil	
12	IMACD 06-6798	Brazil	
13	IMACD 8276	Brazil	
14	IMACD07-6372	Brazil	
15	IMAIAC 26	Brazil	
16	IP 60	China	
17	IP 63	China	
18	IP 75	China	

What was done?

The trials were established over two seasons (2014/15 and 2015/16)

What was done?

Table 2: Locals description and seasons where the multi-environment trials were laid out

Environment	Season/Year	Local
Env 1	14/15	Namialo
Env 2	14/15	Balama
Env 3	15/16	Cuamba
Env 4	15/16	Namialo
Env 5	15/16	Cuamba
Env 6	15/16	Balama

Local	Namialo	Balama	Cuamba
District	Meconta	Balama	Cuamba
Province	Nampula	Cabo Delgado	Niassa
Climate type	Semi-humid	Semi-arid	Humid tropical
Soil	Sandy loam	Alluvium	Loam

What was found out?

Table 3: Summary of combine ANOVA of seed cotton yield (Kg/ha) and Ginning Outturn (%)

Source of Variation	DF	Mean Square	
		CSY (kg/ha)	GOT (%)
Blocks/Environment	2	507360.8	12.73089
Environments (E)	5	35731792.2**	137.2884**
Genotypes (G)	17	839548.4**	48.77634**
G x E	85	524928.6*	13.60928
Residue (Error)	214	362432.7	11.99569
Total	323		
Overall Mean		2049.392	39.58936
CV (%)		29.37573	8.748512

What was found out?

Table 4: Decomposition of GxE interaction of seedcotton yield into principal components

Source of variation			DF	SS	MS
Interaction (GxE)			85	44618928.70	524928.60*
Principal Components	%	Accumulated %			
PC1	33.85	33.85	21	20136668.37	958888.97*
PC2	27.75	61.60	19	16509778.57	868935.71*
PC3	18.16	79.76	17	10803671.80	3.23*
Residue (Error)	-	-		77560587.20	362432.70

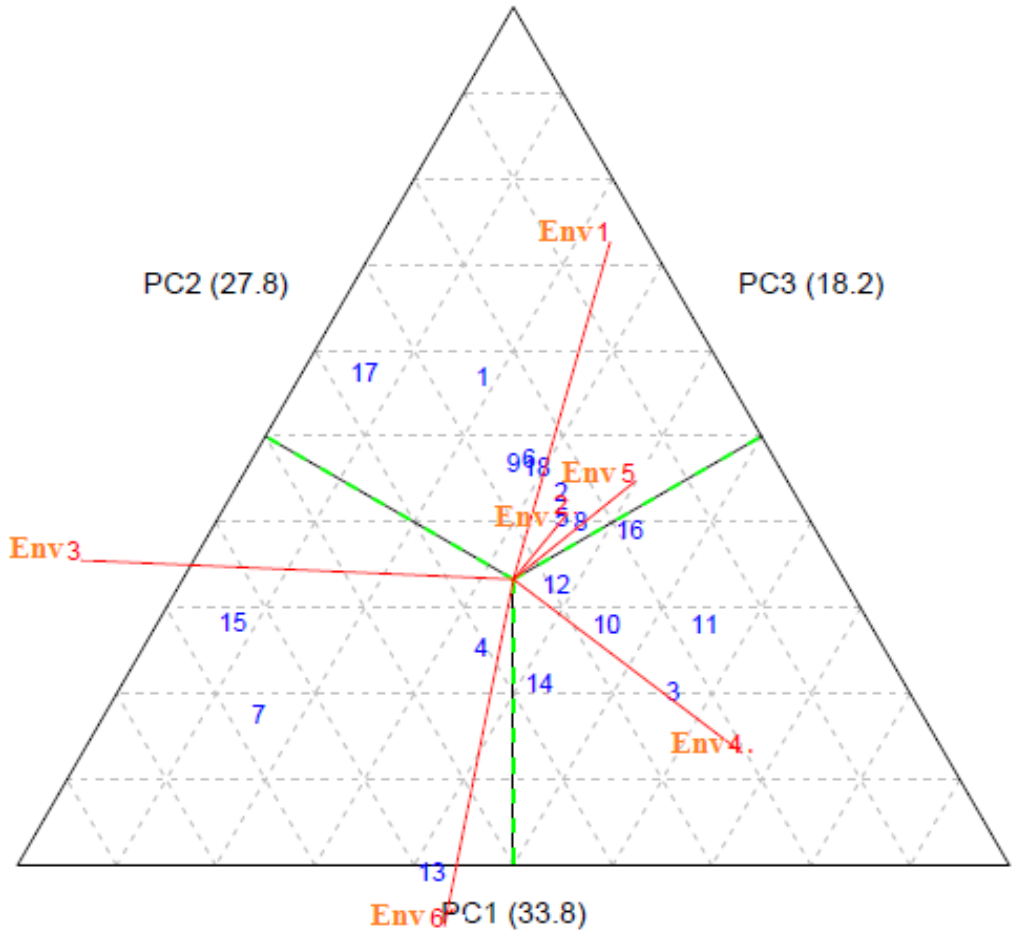

Figure 1. Graphic *triplot* of PC1, PC2 and PC3 of 18 genotypes in 6 environments for Seedcotton yield.

1. ALBAR SZ 9314; **2.** BA919; **3.** CA324; **4.** CHUREDZA; **5.** CIMSAN 1; **6.** FK37; **7.** FLASH; **8.** IMA1 -08-3917; **9.** IMA1 09-1708; **10.** IMA1 09-278; **11.** IMACD 058221; **12.** IMACD 06-6798; **13.** IMACD 8276; **14.** IMACD07-6372; **15.** IMAIAC 26; **16.** IP 60; **17.** IP 63; **18.**IP75.

ENV1: Namialo 2014/15; **ENV2:** Balama 2014/15; **ENV3:** Cuamba 2014/15; **ENV4:** Namialo 2015/16; **ENV5:** Cuamba 2015/16; **ENV6:** Balama 2015/16.

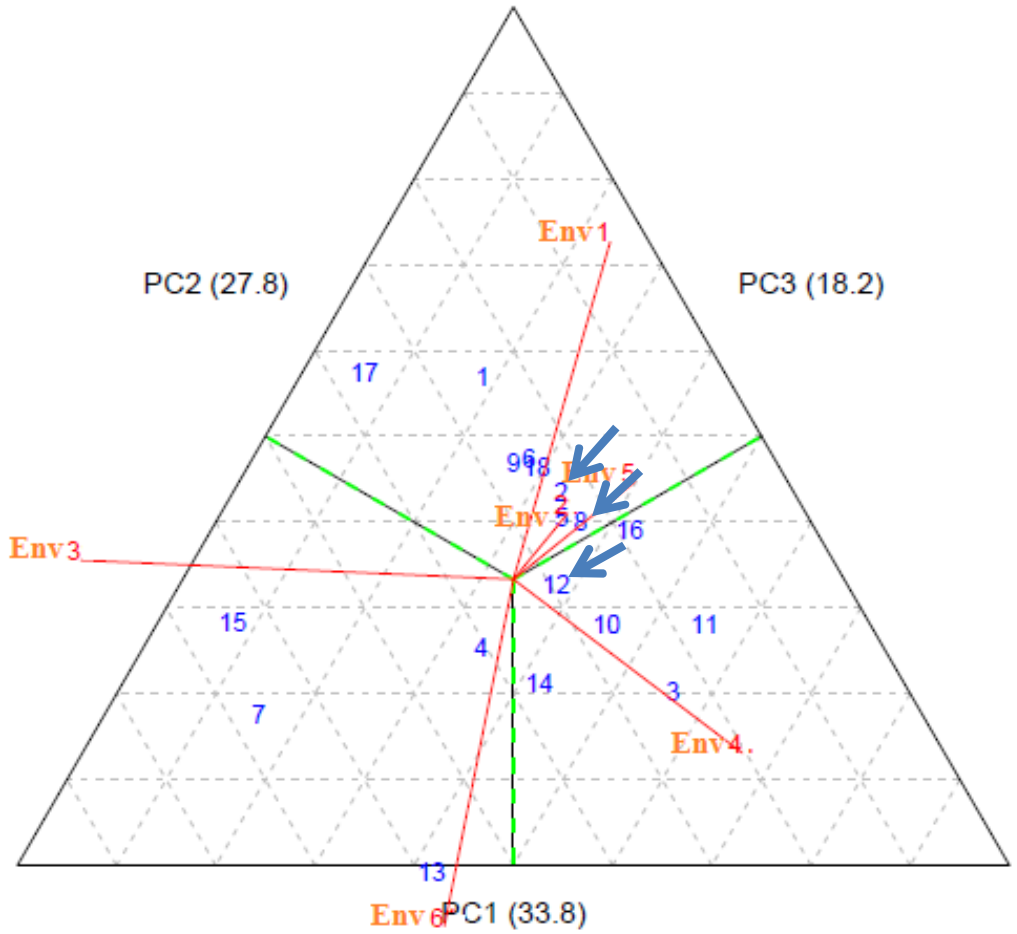

Figure 1. Graphic *triplot* of PC1, PC2 and PC3 of 18 genotypes in 6 environments for Seedcotton yield.

1. ALBAR SZ 9314; **2.** BA919; **3.** CA324; **4.** CHUREDZA; **5.** CIMSAN 1; **6.** FK37; **7.** FLASH; **8.** IMA1 -08-3917; **9.** IMA1 09-1708; **10.** IMA1 09-278; **11.** IMACD 058221; **12.** IMACD 06-6798; **13.** IMACD 8276; **14.** IMACD07-6372; **15.** IMAIAC 26; **16.** IP 60; **17.** IP 63; **18.**IP75.

ENV1: Namialo 2014/15; **ENV2:** Balama 2014/15; **ENV3:** Cuamba 2014/15; **ENV4:** Namialo 2015/16; **ENV5:** Cuamba 2015/16; **ENV6:** Balama 2015/16.

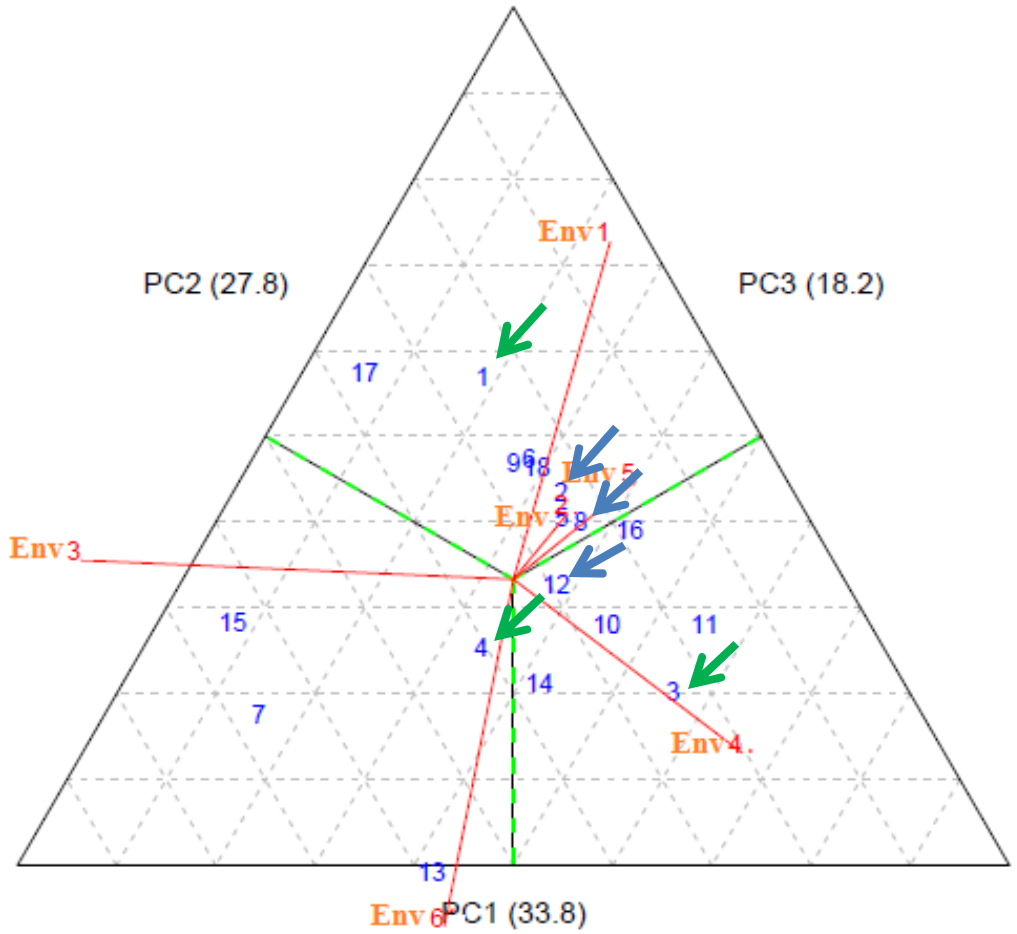

Figure 1. Graphic *triplot* of PC1, PC2 and PC3 of 18 genotypes in 6 environments for Seedcotton yield.

1. ALBAR SZ 9314; **2.** BA919; **3.** CA324; **4.** CHUREDZA; **5.** CIMSAN 1; **6.** FK37; **7.** FLASH; **8.** IMA1 -08-3917; **9.** IMA1 09-1708; **10.** IMA1 09-278; **11.** IMACD 058221; **12.** IMACD 06-6798; **13.** IMACD 8276; **14.** IMACD07-6372; **15.** IMAIAC 26; **16.** IP 60; **17.** IP 63; **18.**IP75.

ENV1: Namialo 2014/15; **ENV2:** Balama 2014/15; **ENV3:** Cuamba 2014/15; **ENV4:** Namialo 2015/16; **ENV5:** Cuamba 2015/16; **ENV6:** Balama 2015/16.

CONCLUSIONS

Å The seed cotton yield is highly affected by environment complex than genotype itself;

Å Among the evaluated new genotypes é

IMACD 06-6798;
IMA1 08-3917 and
BA919;

presented an acceptable adaptability and potential stability.

IIAM

Cotton Research and Seed Multiplication Centre of Namialo (CIMSAN)

Manuel P. Maleia

Researcher
Genetics and Breeding (MSc)

Phone: +258 26340042

Fax: +258 26340042

Cell: +258 82 8760 040

+258 84 4588 271

E-mail: mmaleia@gmail.com

E.N. nº 8, Km 90, via Nampula - Nacala
Website: www.iiam.gov.mz
Namialo - Nampula
Moçambique

Thank you !!!

Koshukuru

Kanimambo

Wazviita

Ngiyabonga

Asanti sana

Muito Obrigado

Acknowledgments

UNIVERSIDADE CATÓLICA DE MOÇAMBIQUE

PLEXUS

jfs san