Biosciences for Farming in Africa: Media Fellowship Programme

Sixth Workshop Report
Round 2 – Nigeria

Front cover photo: B4FA media fellows and Nigerian experts at a field trip to NABDA's Molecular Biotechnology Centre, March 2013 – photo by Bernie Jones

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1. Fellowship advertisement and application form

Professional Development Opportunity

B4FA Media Fellowship

Application for participation

The Cambridge, UK-run ***Biosciences for Farming in Africa (B4FA)*** project is offering a Pan-African Professional Development programme over a six month periods to media professionals (including journalists, editors, broadcasters and producers) in our focus countries in sub-Saharan Africa – Ghana, Nigeria, Uganda and Tanzania. We are now recruiting participants for the second round of media fellowships in each country.

What is the programme about?

The theme of the Fellowship is to promote better understanding and dialogue on developments in agriculture and biosciences throughout Africa with specific emphasis on activities and research in our focus countries.

Subjects to be covered during the Fellowship include: the history of plant breeding and agricultural techniques, basic plant genetics, modern plant breeding and biotechnology for agriculture, the role of international and African industry (eg seed producers), regulatory frameworks and future opportunities and applications.

What will the Fellowship programme involve?

- Dynamic 4 day training course in each focus country
- Mentored field trips to regional scientific locations and projects of interest
- Supportive professional dialogue and mentoring from leading scientists, journalists and policy makers
- Opportunities for international travel and conference attendance for high achieving participants
- Opportunities for future paid mentoring
- Commitment to use learned skills and knowledge in the production of media pieces and facilitation to publish and produce relevant media pieces

What will participants get out of it?

- The Fellowship is unpaid. However, Fellows will receive expenses and per diems for training courses and field trips.
- The Fellowship will not infringe upon your responsibilities to current employment.
- Certificates will be provided on successful completion of courses and the Fellowship.
- Greater appreciation and understanding of current issues in agriculture, and the scientific work being carried out in Africa to help address these.
- Opportunities to hone reporting skills to bring important local stories to the attention of readers and listeners.
- Interaction with local and international experts.
- Benefit from mentoring by experienced African and international journalists.

If you wish to be considered for one of these Fellowships, please complete the online form available on b4fa.org in as much detail as possible, and submit it by 31 December 2012 together with all supporting material.

We will accept written material in Microsoft Word or PDF format, and audio material in mp3 format. If you wish to submit video material, please check with us first regarding the size and format of your file. If you are in employment in a media organisation, we require you to submit a letter of support from your editor, producer, managing editor etc indicating their willingness for you to participate and to permit you to attend the training courses.

We will be carrying out face-to-face interviews after shortlisting in late January and early February 2013. Proposed training dates for this year are mid-March for West Africa and mid-April for East Africa. Please ensure you will be available at these times before applying.

More details of the project and Fellowship can be found at b4fa.org

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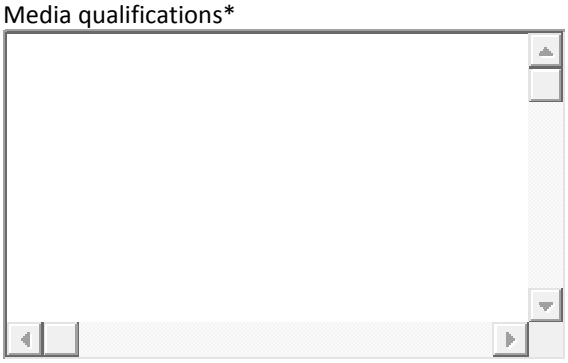
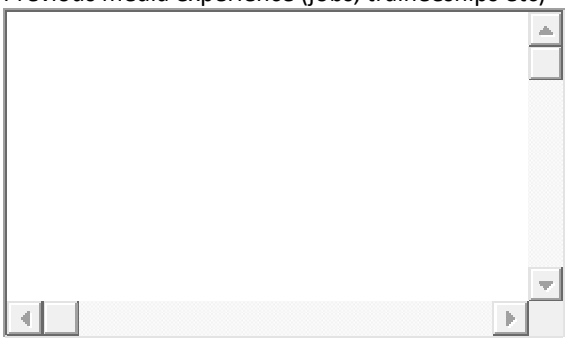
B4FA Media Fellowship - Online Application Form

- Which country are you applying for?*
  ○ Ghana ◉ Nigeria ○ Uganda ○ Tanzania
- Name* (Given Name) & (Family Name)
  First Last
- Address*
  Street Address Address Line 2 City
  State / Province / Region Zip / Postal Code
- Date of Birth* mm/dd/yyyy
- Gender*
  ☐ Male
  ☐ Female
- Office and/or mobile telephone number* (preferred contact no first)
- Email*
- Name of media organisation for which you work (if any)*
- Job title (Reporter, editor, freelance etc)*
- Please describe your role, and for how long you have worked in it *

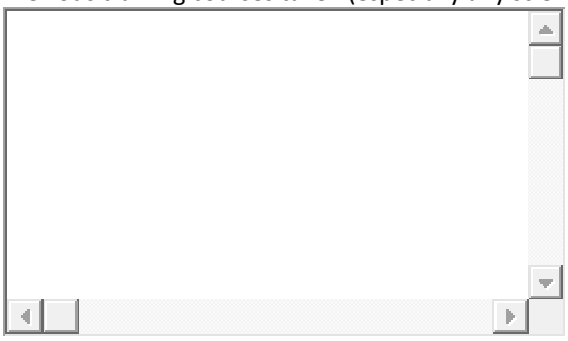
- Media qualifications*



- Previous media experience (jobs, traineeships etc)*

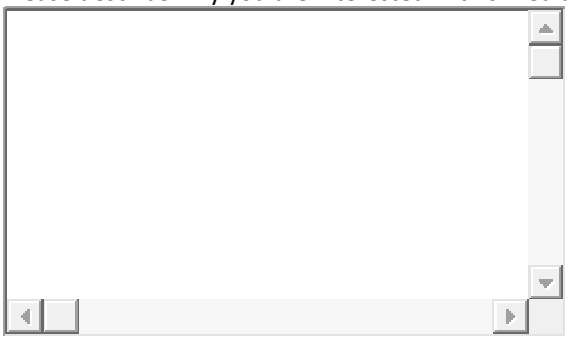


- Previous training courses taken (especially any science/ agricultural reporting courses)*

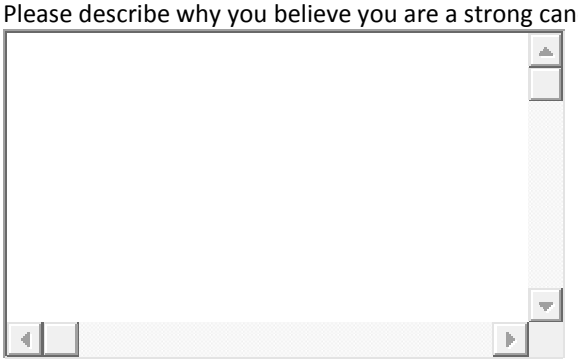


- List your current areas of interest in reporting*

- Please describe why you are interested in this Media Fellowship*



- Please describe why you believe you are a strong candidate for this Media Fellowship*



- Do you have the approval of your editor/producer etc to participate in this Fellowship for 6 months? *
  - ☐ Yes
  - ☐ No
- Name and position of approver*
- Please attach a letter of support*
- Examples of previous work:*
  All these pieces must be your own work – pieces found to have been copied will result in the disqualification of the candidate. Please submit up to 3 short pieces (up to 500 words each for print, or up to 3 minutes for audio/video) which you have produced in the last two years on an agricultural, scientific or technical issue. Please give a date and where the piece was printed or broadcast in each case. If you have NOT produced any agric, scientific or technical pieces in the last two years, please send us up to 2 examples of what you consider your best reporting on other issues, AND please write or record a NEW piece of up to 500 words or 3 minutes on an issue to do with agricultural, plant breeding or biotechnology currently in your country. Please copy and paste the text of your pieces in the boxes below, with their titles and when and where they were published. Alternatively, please attach them here, if your file is too big to upload on this form, contact us on the email address above

- Work 2

- Work 3

- Upload your work Preferably as a zip file

- Please list any experience you have of either farming or scientific research (if any) – eg former work, family engagement in these activity, experience from childhood etc.*

- If successful, are you able to commit to attending the mandatory training course and engaging with the Fellowship opportunities over the six month period?*

  ☐ Yes

2. Interview findings and candidates selected

For the second round in Nigeria we interviewed 50 print and broadcast journalists. Word of mouth had raised the profile of the fellowship, so there were some senior and high profile applicants. Although many of the journalists were from general, or business "beats" reflecting the low perceived importance of agriculture in the country, there were a number of applicants with a specific interest in science reporting.

Interestingly we were able to engage with journalists with quite distinct "beats" in which they had built good reputations – for example reporting on women's issues, youth and photojournalism. Each of these applicants was interested in showing how biosciences and agriculture could be recast attractively to their own natural audiences.

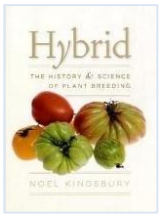
The ten most productive fellows from the first round were also asked to return as "alumni fellows" to act as mentors in their own right and also to consolidate their learning.

Prospective fellows selected from the interview round were:

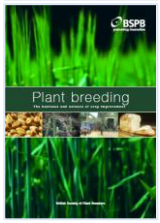
1.	**Aisha Ahmed**	News Agency of Nigeria (NAN), Kano
2.	**Blessing Abu**	NTA International
3.	**Edith Obiageli Nwapi**	News Agency of Nigeria (NAN), Abuja
4.	**Garba Danazumi Suleiman**	Voice of Nigeria, Kano
5.	**Hope Abah**	Media Trust Limited, Benue
6.	**Ifeanyi Charles Nwoko**	News Agency of Nigeria (NAN)
7.	**Ita Ikpang**	NTA
8.	**Jimoh Babatunde**	Vanguard, Lagos
9.	**John Abah Anthony**	Africasti.com
10.	**Kate Obande**	News Agency of Nigeria (NAN)
11.	**Kayode Olaitan Simeon**	Nan News Agency of Nigeria (NAN)
12.	**Kenneth Azahan**	The Road, Abuja
13.	**Ladidi Lucie Elukpo**	Guardian Newspapers
14.	**Magdalene Offiong Ukuedgor**	News Agency of Nigeria (NAN)
15.	**Muazu Elaze Abisabo**	Leadership, Katsina
16.	**Nura Sani Bello**	Radio Jigawa
17.	**Ojoma Akor**	Daily Trust
18.	**Rabi Mohammed**	NTA Sokoto
19.	**Salimat Garba**	News Agency of Nigeria (NAN), Abuja
20.	**Yusuf Adebowale**	NTA
21.	**Umar Akilu Majeri**	Amminiya Newspaper

3. Pre-course reading material

Material distributed on USB stick and physically (book) before training workshops took place.



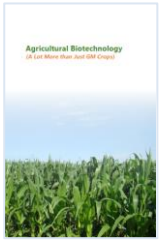
Noel Kingsbury: Hybrid – the history and science of plant breeding (Book)



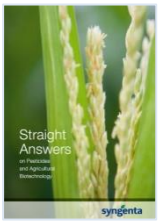
British Society of Plant Breeders – Handbook on Plant breeding

Conway and Waage: Science and Innovation for Development (Book)

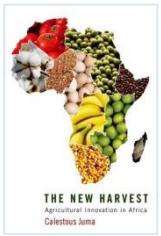
Sense About Science: I don't know what to believe – making sense of science stories



ISAAA guide to Agricultural Biotechnology



Syngenta's Straight Answers on Pesticides and Agricultural Biotechnology



Calestous Juma: The New Harvest – Agricultural Innovation in Africa

Mark Lynas' Speech at the Oxford Farming Conference (video)

4. Workshop Programme

Initial Dialogue and Training Workshop on Plant Breeding, Genetics and Biosciences for Farming in Africa

PROGRAMME

18 – 21 March 2013
Nicon Hilton Hotel, Abuja

Please arrive in Abuja on Sunday 17th March. Accommodation has been arranged.

Day 1 – Monday 18 March 2013

0900	**Welcome and Introductions** *Brian Heap; B4FA Project Leader* *Bernie Jones; B4FA Course Leader*
1000	**Issue Brainstorming** – *tea/coffee*
1030	**History of Plant Breeding and Agriculture** *Bernie Jones*
1100	**Fundamentals of Plant Genetics** *Moses Adebayo; Ladoke Akintola U of Technology, Ogbomoso*
	Practical Exercise – Inheritance of Traits
1200	**Practical Experiment – DNA extraction**
1245	**Lunch**
1345	**Fundamentals of Science Journalism** *Diran Onifade; Editor in Chief, AfricaSTI*
1415	**F1 Hybridisation** *Claudia Canales; B4FA*
	Practical Exercise – F1 Hybrids and saving seed
1500	**Break** – *tea/coffee*
1530	**Fundamentals of Genetic Modification** *Chris Leaver; University of Oxford, UK*
1615	**Video – Bad Science**
1645	**Journalism – Feedback**
	Dinner

Day 2 – Tuesday 19 March 2013

Breakfast

0900 **Local case-study 1 - Rice**
A T Maji; National Cereal Research Institute, Badeggi

Local case-study 2 – Date Palm
Dr Chukwuemeka R Eke; NIFOR

Local case-study 3 - Cowpea
Prof Mohammad Ishiyako; Ahmadu Bello University, Zaria

1030 **Discussion** – *tea/coffee*

1100 **Round table discussion sessions**

- **Journalism – Story Ideas**
- **Bjorn Lomborg – Golden Rice**
- **Journalism – Crafting a "Top"**
- **Why is GM so controversial?**
- **Why is agriculture not more popular with the media and public?**

Field Trip 1

1300 Depart – lunch on bus

Biotechnology Advanced Laboratory
Sheda Science and Technology Complex (SHESTCO)

Return to Nicon Hilton Hotel

1730 **Discussion and Journalism**

Dinner

Day 3 – Wednesday 20 March 2013

Breakfast

0900 **Local case-study 4 - Maize**
Moses Adebayo, LAUTECH

Local case-study 5 - Cocoa
Anna Muyiwa

Local case-study 6 – oil palm
Leonard Osayande Ihase; National Institute for Oil Palm Research

1030 **Discussion** – *tea/coffee*

1100 **Round table discussion sessions**

- **GM reality – from SeedFeedFood**
- **Practical Exercise – Marker assisted breeding**
- **Policy document: Regulation of GM in Africa**
- **What will give farmers faith in modern seeds?**
- **Will President Goodluck sign the Biotech Bill?**

Field Trip 2

1300 Depart – lunch on bus

Tissue Culture Laboratory
National Biotechnology Development Agency (NABDA)

Return to Nicon Hilton Hotel

1700 **Discussion and Journalism**

Launch of B4FA "Insights" booklet on biosciences in Africa

1800 **Launch Presentations**

Sir Brian Heap
Dr Prince Addae, AATF - tbc
Minister - tbc

Dinner Buffet

Day 4 – Thursday 21 March 2013

	Breakfast
0900	**Practical Journalism**
1030	**Break** – tea/coffee
1100	**Agricultural biotechnology and the regulatory environment** *Rufus Ebegba; Nigerian National Biosafety Authority, Abuja*
1145	**Agricultural biotechnology and industry** *Daniel Otunge; African Agricultural Technology Foundation, Nairobi*
	Discussion
1300	**Lunch**
1400	**Keynote Addresses** *Prof Turner Isoun; Former Minister of S&T of the Federal Republic* *Kevin Urama; ATPS* *tbc*
1500	**Prize-giving and closing** Next steps and opportunities Announcement of prize-winners for best articles produced Award of Certificates
1600	**Official Close** – tea/coffee

Participants with flights home on Friday 22nd March will receive funds for overnight accommodation.

5. List of participants and biographies

B4FA Media Fellows

Blessing Abu NTA International
rotsey4k@yahoo.com 8023200889

Edith Obiageli Nwapi News Agency of Nigeria (NAN), Abuja
edithnwapi@yahoo.co.uk 8036090081

Obiageli Edith Nwapi is from Aboh, Ndokwa East of Delta State. A journalist with NAN, she holds a Higher National Diploma in Mass Communication and a post graduate diploma in Management. I has worked with the Ministry of Health, Yobe State as well as the Yobe News (Newspaper). She is a keen horticulturalist and florist.

Garba Danazumi Suleiman Voice of Nigeria, Kano
garba_danazumi@yahoo.com 8033078353

Garba Danazumi Suleman was born in 1963 in Lere Local Government Area, Kaduna State, Nigeria. He attended the College of Advanced Studies, Zaria and Bayero University, and completed his NYSC one year programme at Federal Government College, Port Harcourt from 1991-1992. He was a full time farmer for 2 years before joining the journalism profession with Voice of Nigeria (VON) in 1997, and has continued to farm ever since. After being a progamme producer and Hausa newscaster in the Lagos Office for 12 years, he is now the Bureau Chief, VON, North West Zonal Office, Kano, where he still continues to report on issues including agriculture.

Hope Abah Media Trust Limited, Benue hopeabahabah@rocktmail.com

Ifeanyi Charles Nwoko News Agency of Nigeria (NAN)
ifeconc1@yahoo.com 7034335888

Ifeanyi Charles Nwoko was born in Enugu state Nigeria and is from Umuahia North Local Government Area in Abia state. He studied Mass Communication at the Institute of Management and Technology, Enugu. Currently he works on the Features Desk of the News Agency of Nigeria (NAN) in Abuja.

Ita Ikpang NTA
itaikpang@yahoo.com 8035759667

Jimoh Babatunde Vanguard, Lagos
jimbabs2002@yahoo.co.uk 8034073107

John Abah Anthony Africasti .com
7035136421

Kate Obande News Agency of Nigeria (NAN)
k8obande@yahoo.com 8065183396

Hailing from Benue State, Kate speaks English and Idoma fluently and is 25 years old. She studied Mass Communication at the Nasarawa State University, Keffi and now works as a reporter with the News Agency of Nigeria.

Kayode Olaitan Simeon Nan News Agency of Nigeria (NAN)
this_that101@yahoo.co.uk 8030426188

Olaitan is a journalist and feature writer of more than two decades experience, covering virtually all beats, with a bias towards reporting agriculture. Born in 1966, he holds a BA Hons degree in Linguistics from the University of Ibadan and professional certificates in journalism.

Kenneth Azahan The Road, Abuja
kenazahan@yahoo.com 8032667203

Ladidi Lucie Elukpo Guardian Newspapers
ladidilucie@gmail.com 8130273963

Hailing from Kogi State, Nigeria, Ladidi Lucy Elukpo is 25 years old and holds a BSc degree in Botany from the University of Jos. She also has a passion for photography and holds a number of photographic qualifications. Presently, she works with Guardian Newspapers as a 'reportive photo-journalist', with a particular focus on youth issues. She has particular interests in disseminate information to the general public about developments in science and agriculture.

Magdalene Offiong Ukuedgor News Agency of Nigeria (NAN)
magfanga@yahoo.com 8133780627

Magdalene was born in 1982 in Calabar, Cross River State. She is an English graduate from the University of Calabar and currently worsk with the News Agency of Nigeria (NAN) as a correspondent on the Agriculture, Environment and Water Desk.

Muazu Elaze Abisabo Leadership, Katsina
richmuaz@gmail.com 8038236607

Nura Sani Bello Radio Jigawa
8033498828

Ojoma Akor Daily Trust
infoojoma@yahoo.com 8066030592

Ojoma Akor is a senior reporter, and runs the Women/Home Front desk of Daily Trust Newspapers, where she writes on issues concerning women, including women and agriculture. Akor has published several articles on women farmers who constitute over 60 % of farmers in the country and has done reports on the moringa plant, labour saving technologies, having your own vegetable garden among others which reflects her interest in agriculture generally. She holds a BA degree and MSc in Mass Communication from Kogi State Universit,y Anyigba and Benue State University, Makurdi respectively. She has worked in Media Trust Company Ltd , publishers of Daily Trust and other titles for five years.

Rabi Mohammed NTA Sokoto
adawiyyah4real@gmail.com 8039726805, 8079779213

Salimat Garba	News Agency of Nigeria (NAN), Abuja	
	cutechemmy@yahoo.com	8030623335
Yusuf Adebowale	NTA	
	Ayoatjournalist07@yahoo.com	7034243412

Adebowale Yusuf is a principal producer with the NTA, and a graduate of Mass Communications from the University of Lagos. His area of interest is developmental communication with emphasis on grassroots and agricultural development

Umar Akilu Majeri	Amminiya Newspaper	
	umarakilumajeri@gmail.com	8096254241

B4FA Media Fellow alumni

Abdallah El-Kurebe	Vanguard Newspaper,	
	www.elkurebe@gmail.com	07085259999

Abdallah el-Kurebe is from a farming community in Kurebe village of Niger State. He has been in the journalism profession for 23 years reporting on various subjects for Hotline, National Echoes, Horizon, Just and People Monthly news magazines as well as This Weekend, The Companion and Newspage newspapers. He presently reports for Vanguard newspaper as Sokoto State correspondent and freelances for TheRoad and National Trail newspapers. He is married with children.

Akinwunmi Kole Dawodu	News Agency of Nigeria Abuja	
	bobojay_22@yahoo.com	08032858584
Baraka Bashir	Freedom Radio, Kano	
	barbash4gh@yahoo.com	08037022649
Bassey Ita	Akwa Ibom	
	bbtreasure3@yahoo.com	08094436789
Bilikisu Ado Zango	Radio Kano	
	bilbazlove@yahoo.co.uk	08035191628
Elizabeth Achagh Torkwase	Harvest FM, FRCN Makurdi	
	talk2liz77@gmail.com	08033930020
Eyo David Charles	Daily Trust Newspaper, Calabar	
	eyopeace@yahoo.com	08023515659

Eyo Charles was born in Ijebu Ode in Ogun State but is from Akwa Ibom State. He speaks Yoruba, Efik, Ibibio, English and some Hausa. His higher education was at the Nigerian Institute of Commerce, Ketu followed by a two year programmes with the Writing School, Sussex, UK and the Business Training Institute, Manchester (Lagos study centres). He continues to pursue academic programmes with the International Institute of Journalism, affiliated to the University of Maiduguri. He started his journalism career in 1988 with Development Outlook Magazine, in Lagos, and has since worked for New World Magazine (Lagos), New Kingdom Trumpet (Calabar), Todaysports newspaper (Lagos), and Union

newspaper (Uyo). He is currently with Media Trust Ltd. Eyo Charles has travelled extensively in West Africa, visiting Senegal, Cape Verde, Gambia, Cameroon, Ivory Coast, Togo, Benin Republic and Ghana. He is passionate about music, writing and travelling. He is married with children

Hassana Salisu Abubakar Freedom Radio, Kano
salisuabubakarh@yahoo.co.uk 08033782797

Mohammed Kandi Peoples Daily, Abuja
kandimo2003@gmail.com 08061307241

Born to the family of the late Alhaji Muhammad Saidu Kandi, Mohammed Kandi is an indigene of Lapai Local Government Area of Niger State, Nigeria. He graduated from Kaduna Polytechnic with a Higher National Diploma in Mass Communication. He has worked as a professional journalist at Vision FM and now with Peoples Media Limited, publisher of Peoples Daily Newspaper for four years.

Ugonma Cokey Voice of Nigeria
ugonmacokey@yahoo.com 08034048771

Ugonma Cokey is a Chief News Producer with Voice of Nigeria - Nigeria's sole external broadcast station. She has worked with VON for 18 years in different capacities, including as reporter, editor, producer and presenter. But currently she is the head of the online unit which she edits and supervises. She started her career in print journalism before moving to television and radio. Her reporting is mainly on agric, climate change, environment and development related issues. Ugonma Cokey is an UNFCCC fellow and UNFCCC+COM fellow, and has a number of awards including 2011 winner of the UNFCCC/CDM Africa Radio journalist contest and winner of the 2010 Farm Radio International script writing competition on healthy communities.

B4FA Experts, Presenters & Mentors

Adebayo Moses Adeolu Ladoke Akintola University, Ogbomoso
adebayovam@yahoo.com

Moses holds a BAgric in Plant Science from Obafemi Awolowo University, Ile-Ife, Nigeria and an MSc in Plant Breeding and Crop Science from the University of Ibadan. He was successful in winning a place in the first year intake to the West African Centre for Crop Improvement (WACCI) scholarship programme at the University of Ghana, Legon, through which he has been pursuing his PhD studies and submitted his thesis. He is on the academic staff at the Dept of Crop Production and Soil Science, Ladoke Akintola University of Technology (LAUTECH), Ogbomoso where he has responsibility for genetics and plant breeding. He has also carried out his research work at the International Institute for Tropical Agriculture (IITA), Ibadan, where he worked on drought tolerance in maize. Moses is happily married with three children.

Alexander Augustine Abutu Africa Science, Technology and Innovation News
alexyabutu@gmail.com

Alex edits environment and agriculture stories for Daily Trust, one of Nigeria's national daily papers, and works for the News Agency of Nigeria covering science and related issues. A graduate of Benue State University with a degree in Mass Communication, Alex authored the most discussed story ever

published by the Science for Development Network (SciDev.Net) and was honoured in London as one of the" journalists that changed the world".

Anna Muyiwa Researcher, Cocoa Research Institute of Nigeria
adenikies@yahoo.com

Chris Leaver Emeritus Professor, University of Oxford
chris.leaver@plants.ox.ac.uk

Chris Leaver is Emeritus Professor of Plant Sciences at the University of Oxford. He was awarded the CBE for his distinguished contributions to science of plant development. He is a member of The European Molecular Biology Organisation, Fellow of The Royal Society, Humboldt Prize-winner, and has had a longstanding record of engagement in informing the public understanding of the role modern plant breeding.

Chukwuemeka R Eke Nigerian Institute for Oil Palm Research, Benin City
nemeka51@yahoo.com

Dr Eke holds a PhD degree in Plant Physiology/Tissue Culture from Edo State University (now Ambrose Alli University). Currently, he serves as a Chief Research Officer and Head of the Physiology Division of the Nigerian Institute for Oil Palm Research (NIFOR), as well as Assistant Head of the Technology and Product Development Department of NIFOR. He has over twenty peer reviewer research publications in International and National Journals.

Daniel Otunge African Agricultural Technology Foundation, Nairobi
d.otunge@aatf-africa.org

Daniel Otunge, a Kenyan, is a development communication expert with over 10 years' experience. He holds a Master of Arts degree in Philosophy, a Postgraduate Diploma in Mass Communications, and a Bachelor of Arts degree in Sociology from the University of Nairobi. Daniel is waiting to graduate with an MA in Development Communication from the University of Nairobi. Prior to joining AATF, Daniel was the head of Communication and Advocacy at the African Seed Trade Association (AFSTA) where he helped establish and manage the communication department responsible for corporate communication, membership relations, events management, strategic communication, logistics and biotechnology outreach programme targeting seed companies and national seed trade associations in Africa. Before joining AFSTA, Daniel worked for about six years as Communication Officer with the International Service for the Acquisition of Agri-biotech Applications (ISAAA AfriCenter). Daniel also teaches mass communication and development communication at St Paul's University, Limuru, Kenya, as an adjunct lecturer. As Regional Coordinator of the Open Forum for Agricultural Biotechnology (OFAB), Daniel is responsible for effective and efficient coordination and management of OFAB activities in Africa.

Diran Onifade World Federation of Science Journalists & AfricaSTI
diranx@msn.com

Julia Vitullo Martin Journalist
jvm@belnord.org

Julia Vitullo-Martin (PhD, University of Chicago) is a New York-based independent journalist who is a Senior Fellow at Columbia University's Center for Urban Real Estate and Director of the Center for Urban Innovation at the Regional Plan Association. Her work focuses on development issues such as comparative economic analysis, planning and zoning, waterfront development, public housing, environmental review, and historic preservation and design. Her current project, The Future of Urban Food, looks at the functions and benefits of food in local economies.

Vitullo-Martin has been widely published in a variety of newspapers and magazines, including the Wall Street Journal, the New York Times, the New York Review of Books, the New York Post, the New York Daily News, Monocle, Forbes, and Fortune, as well as academic journals. She has authored and edited three books, including Breaking Away: The Future of Cities (Century Foundation Press, 1996). She served as co-director of the Templeton-Cambridge Journalism Fellowships at the University of Cambridge from 2033 through 2011.

Leonard Osayande Ihase Nigerian Institute for Oil Palm Research, Benin City
osasihase@yahoo.com

Mr Ihase holds a BSc degree in Botany with a second class (Upper Division) and an MSc degree in Cell/Molecular Biology from the University of Benin. Having pursued his doctoral stiudies, he is now on the verge of defending his PhD thesis from the same University. He is presently a Principal Research Scientist with the Nigerian Institute for Oil Palm Research with expertise in molecular markers with a focus on oil palm.

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Dr Mohammad Faguji Ishiyaku hails from Faguji, Giade LGA of Bauchi state. A trained Plant Breeder/Molecular Geneticist, he received his PhD from the University of Reading, UK. His BSc and MSc studies were are Ahmadu Bello University and the University of Jos, respectively. Dr Ishiyaku started his career with the Bauchi State Ministry of Agriculture where he held different posts including that of Principal Research Officer in the World Bank supported Afforestation Project. He has also worked with IITA, as Research Associate in the cowpea breeding programme. Dr Ishiyaku is currently the national Cowpea Breeder at the IAR of Ahmadu Bello University, Zaria. His main research focusses on the introduction of various quality traits into popular Nigerian cowpea varieties. He is currently the Principal Investigator for the maruca resistant transgenic cowpea project, country focal person for the SABIMA Project, and team leader, Tropical Legume II (Cowpea) Project. He teaches both Undergraduate and Postgraduate Courses in the Department of Plant Science, Ahmadu Bello University where he was formerly Head of Department.

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Sharon Schmickle is an award-winning journalist with 30 years of experience covering local, national and international news. As a reporter for the Minneapolis Star Tribune, her beats included the Washington bureau during the 1990s and covering wars in Iraq and Afghanistan during the 2000s. She also covered science with emphasis on agriculture and biotechnology. More recently, her science coverage has appeared in the Washington Post, MinnPost.com and the web site of the Pulitzer Center on Crisis Reporting in Washington DC. Beyond graduating from the University of Minnesota's School of Journalism, Sharon has studied under fellowships including the Templeton-Cambridge 2007 science journalism fellowship at Cambridge University in England, the Knight Science Journalism program at Massachusetts Institute of Technology and the Council For the Advancement of Science Writing Inc. in

New York. Her journalism awards include: McClatchy Presidents Award for a series about attitudes in Japan toward genetically modified foods, Pulitzer Prize finalist for coverage of the U.S. Supreme Court justices and federal judges, National Press Club's Washington Correspondent of the Year for coverage of the federal budget as it affected one Minnesota community, Overseas Press Club of America first place award for coverage of agricultural trade friction between France and the United States. Sharon has taught writing, journalism and public affairs at Macalester College, the University of St. Thomas and the University of Minnesota's Humphrey Institute.

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Professor Sir Brian Heap FRS leads the B4FA project. He is Research Associate, Centre for Development Studies, University of Cambridge, and President of the European Academies Science Advisory Council. Formerly Master of St Edmund's College, Cambridge, he is a Fellow of the Royal Society where he also served as Foreign Secretary and Vice-President. An honorary Fellow of the Royal Agricultural Society, Brian was Director of Research at the Institute of Animal Physiology and Genetics Research (Cambridge and Edinburgh) and at the UK's Biotechnology and Biological Sciences Research Council. He has been engaged in public issues of biotechnology, population growth, sustainability and science policy working with the World Health Organization, the UK– China Forum and the European Commission.

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Based in Strasbourg, France, Bernie Jones specialises in the development and science policy and communications area. He has been Interim Executive Director for the InterAcademy Panel and the InterAcademy Medical Panel, International Director of Shaw Trust – a UK disability charity, Head of International Policy at the Royal Society, and Executive Director, European Academies Science Advisory Council. He has also worked in the commercial arena, spending 8 years working in a variety of roles at British Airways plc. Bernie is a graduate of the Universities of Edinburgh and Cambridge in the UK, with degrees in Cognitive Science, Computer Science and Experimental Psychology.

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Chide studied law at the University of Ibadan and was called to the Nigerian Bar as a Solicitor and Advocate of the Supreme Court of Nigeria. She is a prolific writer and has published articles and a book on Law in Nigeria. She is a multi-linguist, speaks the three major Nigerian languages and has a diploma in French. She is also a Chartered Secretary and a Chartered Mediator.

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Claudia Canales is a plant molecular biologist based at Oxford University, United Kingdom with a near decade of experience in plant genetics research. She worked as Senior Project Officer for the ISAAA, based in the Philippines. A graduate of the University of Reading in Environmental Biology, she gained a DPhil in Plant Genetics at Oxford.

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Eve Watts is based in Kampala, Uganda, and has worked in Africa for the past 10 years in a variety of projects including both human development and agricultural private enterprise. Her main focus has been on governance, policy development, agriculture and social development. She holds a Bachelor of Social Work and a Doctor Juris from Murdoch University.

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Based in London with a strong experience of communicating about why science and technology matter, Molly has worked as a global consultant and for a number of innovative global companies in the science and technology sector and has developed and implemented multiple communication strategies, including social media, web sites, infographics and other creative materials. She holds a Master's degree in Cultural Anthropology from the City University of New York and taught anthropology at Baruch College (CUNY) and George Mason University in the United States.

6. Training course and Field Trip highlights

The training workshop took place at the Transcorp hotel in central Abuja over a four day period, and included an enhanced number of games/simulations, a practical exercise (DNA extraction), and two afternoons of field trips to the Biotechnology Advanced Laboratory at SHESTCO and NABDA's tissue culture laboratory. We also held the Nigeria launch of the B4FA book of essays "Insights" on one of the evenings of the workshop.

Participation

All but one of the fellows selected at interview attended the workshop – we understand the remaining one had left the profession.

Programme

The new format for the workshops – paralleling that used in Ghana – further revised the East African format to include a specific session on the historical aspects of plant breeding and agriculture. Hybrids were also tackled in a separate lecture, and the fundamentals of genetics once more had a stand-alone session. A further game had been devised to demonstrate marker-assisted selection, and this was combined with sessions designed to encourage interactive debate between the fellows, challenging them to discuss issues of journalism and social acceptability of GM food in their country.

We needed to restructure this programme halfway through the first day when internal transportation issues delayed two of our speakers, one of whom was due to present a critical part of the training on the first morning. Through some creative programme changes, and a willingness to make an ad-hoc presentation by one of our international experts, we managed to successfully cover this gap.

Fellows

The issue faced by the Nigeria fellows continues to be that agriculture is not regarded as a nationally important topic. Those fellows who have been trying to change the situation are slowly finding some traction, though it will be a challenge to try to overcome the power that oil has in the national psyche.

Language again played a part in causing some difficulties for those fellows who work in their local languages rather than English – but in the main they were able to cope.

Innovation

Feedback continued throughout the course appreciating its innovative nature – especially the combination of scientific presentations and expertise combined with the opportunity to learn about the fundamentals, and take part in practicals and games to consolidate the learning. We introduced a new game demonstrating marker-assisted selection, which worked especially well since several of the case studies dealt with the same technology. The addition of the interactive debate sessions tackling journalism issues as well as the public acceptability and uptake of GM foods in Nigeria proved to be very enjoyable and – at times – raucous.

The DNA extraction also continued to be as popular as ever, with everyone keen to try (several times).

Local scientific participation

The local scientists who participated were good and reacted positively to the opportunity. Some expressed surprised that we had even identified their institute, and were curious how we had done so, since they had had little external reaction up to this point. In order to foster some understanding in the journalists, we asked our scientific experts in this round of workshops to speak briefly about what attracted them to the work, and why they became scientists in the first place, and these personal stories have resonated with journalists and B4FA communications colleagues alike.

Field trips

For the field trips, the group divided into two at each facility, which then toured separately.

At SHESTCO fellows saw a number of experiments being carried out on different aspects of biosciences (despite staff officially being on strike) and were able to follow the fundamental stages of tissue culture at NABDA (including a novel technique for carryout tissue culture that was being evaluated for Nigeria).

Given the size and resources of Nigeria, however, it was striking just how poor the laboratories were in comparison to those elsewhere in sub-Saharan Africa.

Journalism exercises

We only asked fellows to produce a single piece of journalism for mentoring and judging. This afforded us the chance to work with them in depth on improving the piece, as well as carrying out side-exercises on crafting the title, and a top, and thinking about audiences for their piece. Some fellows nevertheless produced more than one. Alumni fellows had the choice of whether to produce their own piece or whether to mentor the new fellows in the production of theirs.

Continuity

Fellows were delighted that we had decided to extend all the fellowships to the end of the project, and felt there was high value in remaining part of the fellowship and benefitting from further engagement and future opportunities.

7. List of in-course journalism pieces produced

Journalism exercises – in course pieces produced by media fellows.

Genetic Modification Necessary, Harmless – Experts

By Muazu Elazeh, Katsina

As the controversy over the propriety or otherwise of using genetically modified seeds rages, experts on agriculture and biotechnology have insisted that using improved seeds was both necessary and harmless even as they stressed that plant modification started many years ago

Speaking at a media fellowship forum organized by Biosciences for Farming in Africa (B4FA), experts observed that increased population and the need to ensure sustainable food security has underscored the need for genetically modified seeds.

A discussant at the forum, Bernie Jones said plant breeding started with the concept of diversity in traits because living things are variable noting "modification started thousand of years ago when farmers select best variety of crops to plant for the next year."

Jones noted that the need to have high variety yields so as to ensure bumper harvest necessitated the idea of genetic modification and urged media men to disseminate information that will help farmers adopt the idea of using genetically modified seeds.

In a not so dissimilar tone, a United Kingdom based biological scientist, Braian Heap noted that ensure the production of high variety seeds that are resistant to diseases noting "food produced from genetically modified seeds are safe and there are no reported cases of hazards."

The media fellowship forum drew participant from different print and electronic medium who would be exposed to scientific information on the need to strengthen agriculture and food production through the use of genetically modified seeds and high yielding varieties of crops.

Experts urge journalists to disseminate objective information about biotechnology

Akinwunmi Kole-Dawodu

Training

Abuja, March 18, 2013 (NAN) Experts at the ongoing Biosciences for Farming in Africa (B4FA) media fellowship training programme for journalists, have urged participants to always disseminate objective information about biotechnology.

A cross-section of them told the News Agency of Nigeria (NAN) on Monday in Abuja that Africa needed to embrace a technology-driven strategy that would facilitate its agriculture.

Prof. Brian Heap, the B4FA Project Leader, urged participants to support and convey to farmers about new studies on agricultural extension services and innovations in farming.

He stressed that agriculture created the right opportunities for socio- economic development in Africa.

Heap called on all stakeholders to promote the development of agricultural research and projects.

''For Africa to have a robust economy, as well as recuperate and compete favourably with best farming communities around the world, it must embrace technology driven strategies,'' he said.

Heap also stressed the need for African governments and farmers to urgently adopt genetically modified crops, saying that it could help in the quest to attain food security.

Earlier, B4FA Course Leader, Dr Bernie Jones, said that plant breeding could help the farmer to achieve great results in high and quality yield in crops thereby bringing about bumper harvest.

He recalled that plant breeding had been on for years as farming itself and that better results could be achieved with the aid of genetic modification of crops.

The B4FA's six-month fellowship programme for journalists was launched this year.

The programme is aimed at bridging the gap between science and the public by promoting better understanding and dialogue on developments in agriculture and biosciences throughout Africa.

It is also aimed at encouraging dialogue and promoting better understanding of the available options for improving agricultural productivity in Ghana, Tanzania, Nigeria and Uganda.

The intention was also to enhance reportage of science and agriculture-related issues, especially food production challenges. (NAN)

AKD/AMY/MAU

Improving rice production through biotechnology

By Hope Abah, Makurdi

Rice is a staple food in Nigeria. Consumers of rice in the country would be happier to eat the locally produce grain if the variety is improved to meet international standard such that can compete favourable with the foreign-Mama Gold specie.

Even farmers in Nigeria who have long cultivated rice with very little income to serve their household purposes after each harvest season would now be certain of making more money by producing a generation of high-yield transformed local rice free from stone and longer in size.

Importers of rice would no longer have to play the 'hide and seek game' to beat regulatory authorities in their attempt to smuggle in the commodity to the country as government currently places a ban on importation of rice inorder to help boost local production with a view of growing its economy.

The possibility of realizing this lofty dream is already in place and here with us following a recent Nigerian scientist determination to regenerate the local rice through genetic diversity made possible by biotechnology application that can advance rice seedling to become better, nutritious and satisfying.

This would be, if the Bio-safety act is sign into law by President Goodluck Jonathan to give the researcher, Dr. Afolabi of Sheda Science and Technology Complex (SHESTCO), Abuja an opportunity to domesticate the idea such that small scale farmers can grow and increase production of rice.

Already, the Bio-safety act which provides the rules on the implementation of genetic modulation crops-an innovation for better breed and healthier variety that would replace the older thinner rice has been passed by the National Assembly.

With this development, families would no longer worry about getting value for money spent on buying rice at the local market and small scale farmers will increase productivity in commercial quantity with less stress.

Benue state for instance, where nearly all the 23 local government areas of the state have arable land for rice growers and produce in commercial quantity at; Naka-Gwer West, Kwande, Oju, Ushongo, Buruku, Kastina-Ala and Agatu local governments respectively would boost its state economy and create jobs for the large unemployed in the 8th poorest state in the country.

It also means that the types of rice grown in the state mainly; swamp, upland, and floating rice would benefit immensely from drought stress yields as high breed seeds available for farmers to cultivate have the capacity to wither the storm all year round by suppressing the old model that does not yield much.

Rice specialist and chairman of Rice Farmers Association (RIFAN) in Benue state, Fidelis Iyorumgwa Akosuss admitted that the 2000 registered farmers of the association have been exposed to this

modern technology and needs a bit of government's attention to feed the country and Africa by extension.

Similarly, the Benue chairman of All Nigeria Farmers Association (AFAN), Aondona Hembe Kule believed that the federal and state governments can increase funding in the agricultural sector to boost the food needs of the country.

"The farmers need adequate tools to supplement high quality production. Government has to come up with deliberate policy to encourage more farmers in the production of rice.

"If government would look into the challenges of providing more tractors to supplement production, provide loans for farmers and construct good roads from hinterlands to available market places, there would be visible improvement not just in production but in income a few years ahead", added Kule.

Nigeria can't afford to neglect biotechnology in agric —experts

By Jimoh babatunde with agency reports

With a growing population that is expected to hit 400million people by 2050, the question agitating the minds of people is how are we going to feed ourselves?

Some are of the opinion that except we use modern tools of science and technology to increase yield, increase resistance of crops to draught and to diseases and pests that we can not achieve food sufficiency.

But others are arguing that the traditional method of farming has not failed us but that the system has failed to make it workable by refusing to fund it and that technology will pollute the environment.

Despite the arguments for and against the introduction of biotechnology in Nigeria, the proponents for the adoption of technology are not relenting as they feel that it holds the ace to the country's food problem.

One of the proponents said that genetically modified (GM) foods would boost agricultural productivity by assisting in the development of new crops and in combating insects that destroy plants and animals.

Genetically modified (GM) foods are produced, using the technology of Genetically Modified Organisms (GMOs). GMOs are organisms whose genetic material (gene) has been altered, using genetic engineering techniques.

Dr. Abba Y. Abdullah, an Agricultural and Natural Resources Consultant once stated that, "Technology-based agriculture is the future of agriculture in West Africa. We need to improve our productivity to ensure food security because food insecurity and concerns over livelihood and resources are behind many of the conflicts we are having in West Africa.

Without technological inputs and biotechnology, there is no way we can achieve food security in West Africa."

Diran Makinde, Director of NEPAD agency of Africa Bio Safety Network of Expertise in an interview with this reporter in Arusha last year said the percentage of small scale farmers are actually very large as they range between 70 and 80 %.

"We know that these are the groups of farmers that are not exposed to any form of technology, they have been using the same form of practice for many years. And it is high time we developed the attitude of actually adopting technology to improve the quality of life of our farmers.

"So this is one of the reasons we need to drive it home to our government especially and other stakeholders that we need to harness science and technology in Africa development."

Prof. Diran Makende added that Africa and Nigeria in particular, needs the new technology as it ensures food and environmental security.

“When you look at the population of Nigeria, if we can embrace the innovation, we can be assured of food security.

“We need this tool to actually make our food secure,” he said.

Prof. Eucharia Kenya, an expert in biotechnology and Science Communication, in an interview said “Biotechnology guarantees food security and allows us to develop new crops, new types of animals as well as prevent infectious insects in our environment.

“Most of our crops cannot survive due to some insects which are depending on these crops as their own food; with the application of this technology, crops and other organisms will survive.

“Due to the African environment, insects have overpowered crops and animals, but with the new technology, our environment, crops and other organisms are saved.”

Biotechnological intervention can help revamp and boost Nigeria’s cotton production, according to Prof. Chris Echekwu, a plant scientist from the Institute for Agricultural Research (IAR), Ahmadu Bello University (ABU).

He said this in a paper presented on the prospects of enhanced cotton production with the use of biotechnology during the Open Forum on Agricultural Biotechnology (OFAB) in Katsina state last year.

But for Nigeria to adopt the use of modern biotechnology tools in agriculture there must be a biosafety law.

President Goodluck Jonathan assenting the bill on biosafety as passed by the National Assembly will launch the country into the production and commercialization of Genetically Modified Organisms (GMO) with the capacity to increase crop production, ensure food security, and improve rural livelihoods.

The House of Representative passed the bill in 2010 and the Senate did same in 2011, but the President has not assented to it since then said a source

“The passage of the bill will be great,” said Dr Oyekanmi Nash, Program Director, and West African Biotechnology Workshop Series. “Biotechnology holds the key to some of our problems in agriculture and health, and the earlier we tap into it, the better,” he added.

Prof. Bamidele Solomon, the Director-General, National Biotechnology Development Agency (NABDA), believes that the adoption of GMOs in Nigeria would increase the farmers’ yield and income as well as help in checking youth unemployment.

If the biosafety bill is assented to, Nigeria will join other African nations, such as Burkina Faso, Egypt, and South Africa in cultivating GMO crops.

BT technology can assist Nigeria's food security – Solomon

JIMOH BABATUNDE

Just as there have been calls for adoption of genetically modified crops in Africa as a means of providing food for the teeming population, so also there have been objections to its introduction based on ethical and moral issues. Our Correspondent, JIMOH BABATUNDE presents the views of Prof. Bamidele Solomon and Dr. Diran Makinde on this debate.

Prof. Bamidele Ogbe Solomon, Director General, Nigeria Biotechnology Development Agency, is a sad person in the sense that he is pained by the inability of the country to benefit from biotechnology in agriculture because of lack of enabling law. He revealed his pains and others on the issue of biotechnology in agriculture in Nigeria and why the country has been left behind by other countries on the continent. Here is an excerpt .

On biotechnology in agriculture

One of the aspects of the side event which I was supposed to look at as a promoter is regulation. My major concern is that we should not be over regulated.

Because regulation that is not science based could become bias and could stifled even development where people begin to have what you call perceived unintended effect and say if we eat this thing that in hundred years we will develop four legs. Such perception cannot be based on science , so such discussion has to go on.

I also wanted as an agency to see where the other African countries have reached Vis a Vis the East African countries and the direction Nigeria can go.

Already in Nigeria we have three crops in confirmed field trial which is the BT cowpea in Zaria, the African bio fortified sorghum also in Zaria and the Cassava plus in Umudike .

There are many crops that are of great importance both nationally and internationally. For example, is the cotton. We know the Nigerian dilemma is in the sense that almost all the textile mill in the country is closed down and one of the problems is that of shortage of raw materials and now the major raw material for cotton worldwide is from genetically modified cotton (BT Cotton) .

Over 70% of the total world cotton is BT cotton. The Americans, China , South Africa and even Burkina Faso are involved in this BT cotton and we are wearing the cloths made from them, so why can't we get Nigerians to do it.

So one of the things we need to do as an agency is how to start the domestication of this technology.

The genes for this are already own by many companies outside . Monsanto is the leader, they are the one giving the technology to them in Burkina Faso. We have Bayer , which is German. They are giving the technology to them in the Cameroon . Nigeria is now in between, we are looking for partners that will be able to work with us in Nigeria.

Nigeria: Addressing Hunger, Poverty Through Genetic Modification

By Muazu Elazeh

In Nigeria, farmers face numerous challenges principal among which is the seemingly decline in farm yields due to climatic factors, lack of improved agro-in puts and the decrease in soil fertility which has affected the ability of the soil to give the desired farm yields.

Climatic factors like drought specifically and the existence of pest and other diseases have continued to pose serious challenge to the nation's shrinking farming population with the resultant out being increased poverty as the farmers are increasingly being at the risk of barely having enough to feed and unable to solve their teething financial problems.

Available statistics indicates that a significant part of the world's population faces or at best, is at the risk of facing hunger due to apparent food insecurity. In fact, it is estimated that no less than one billion people are hungry with three billion in poverty.

Sadly enough, a sizeable percentage of the world's hungry and poor people tenant in sub Saharan Africa and Asia where researches had indicated that the largest increases in population will occur in its megacities.

As should be expected, with population explosion as is being envisaged in African megacities, there is the likelihood of pressure on resources including food. But what is the state of agriculture in these countries generally and in the African countries specifically?

Agriculture in Africa is riddled with the challenge of lack of available fertilizers, dearth of infrastructure especially irrigation and access to transport network. Sadly enough too, there is the challenge of total lack of government and industry support for research and translation of same into field.

Of course, challenges of agriculture in Africa are enormous part of which includes lack of education and support to farmers, lack of improved seeds and the growing mass apathy to farming.

Arguably, these challenges and the need to address the eminent threat of hunger necessitated the need to adopt biotechnology in agriculture through the adoption of plant breeding and the use of genetic modification so as to ensure the availability of both improved animals that will give good quality meat as source of protein and, high yielding varieties of crops to engender sustainable food security.

Specifically, experts have insisted that giving the poor state of agriculture and the alarming danger of hunger, the best African countries could do was to adopt the use of improved seeds.

Researches have shown that biotechnology through the use of planting breeding and genetic modification helps a nation to produce and have more food to feed its population and even export some.

Indeed, as a demonstration of its commitment to supporting the fight against food insecurity and concomitant with its believe that there was no reason whatsoever for any one living in any part of the world to be hungry, a United Kingdom based international non governmental organization- Biosciences for Farming In Africa (B4FA) is championing the adoption of genetic modification through training.

The B4FA training is under its media fellowship scheme in sub Saharan Africa as part of measures to ensure the contribution of journalists in supporting the adoption of biotechnology.

The B4FA fellowship is to promote better understanding and dialogue on developments in agriculture and biosciences throughout Africa with specific emphasis on activities and research taking place.

Sub-Saharan Africa which is one of the areas B4FA is conducting its programme, in spite of having enormous land resources, has the largest population of those living in poverty with eminent threats of hunger even as the agricultural sector is bedeviled with enormous challenges.

To address these challenges, experts advocates the use of improved technology through the adoption of genetic modification and plant breeding so as to get high yielding varieties of crops that will translate to large production of food and ultimate address the danger of eminent hunger.

It is widely held believe that plant breeding is an old idea as it started with the concept of diversity in traits because living things are variable. Farmers, even in the early age, select best crops and store them for planting so as to get better yields. This essentially is what underscores the idea of genetic modification.

Addressing participants at a media fellowship forum organized by B4FA, the programme director, Bernie Jones who underscored the need to adopt biotechnology in agriculture insisted that modification started long years ago and the central thing was taking the best variety.

Although experts have stressed the need for adoption of the technology of genetic modification in places where incidences of hunger are high like sub Saharan Africa, it is interestingly to note that in an increasingly globalised world, the need for adoption of genetic modification in a global scale cannot be underestimated.

But what does genetic modification entails? Basically, it involves the adoption of biotechnology through breeding and the use of improved seeds so as to increase productivity.

Through scientific researches, genetically modified seeds have been developed that has the ability of providing high yields and importantly, maturing at relatively less period than our conventional crops.

Dr Chukwuemeka Eke is of the Nigeria Institute of Oil Palm Research (NIFOR). He told journalists during a media fellowship training organized by B4FA that an average Nigerian farmer of date palm could earn as much as two million naira annually through the cultivation of date palm using the improved yield.

Eke observed that in line with NIFOR's mandate of supporting yield improvement of palm, the agency through painstaking research, had been able to identified high yielding varieties of palm insisting that

through selection, early maturing palm which mature in two years as against the 7-15 years have been identified.

Indeed, available researches indicate that the gains of biotechnology are enormous especially in ensuring food security and in the process, helping Nigeria for instance, to effectively feed itself.

Since in sub Saharan Africa, hunger, poverty and diseases appears to be our major albatross, effectively adopting biotechnology, or at least, adopting those aspect of biotechnology that suits our immediate needs will provide valuable gains in food production and health care.

Interestingly, there is a broad scientific consensus that genetically modified crops and food are safe for human consumption as they are subject to some of the most rigorous scientific safety assessment, hence nullifying some of the wrongly held believe that GM foods are not safe to eat.

Perhaps there may not be better time than now for industry players, policy makers and indeed, the entire nation including of course our farming population to support in ensuring the adoption of biotechnology through the use of genetic modification so as to engender sustained food security and increased income for players in the agricultural sectors especially farmers.

B4FA Trains Journalists On Plant Breeding, Biotechnology

Muazu Elazeh

Determined to support the use of genetic modification in agriculture, a United Kingdom based nongovernmental organization-Biosciences for Farming in Africa- (B4FA) conducts training to Nigerian journalists on how to disseminate information on biotechnology.

The B4FA training was under its media fellowship scheme in sub Saharan Africa as part of measures to ensure the contribution of journalists in supporting the adoption of biotechnology.

The B4FA fellowship is to promote better understanding and dialogue on developments in agriculture and biosciences throughout Africa with specific emphasis on activities and research taking place.

Sub-Saharan Africa which is one of the areas B4FA is conducting its programme, in spite of having enormous land resources, has the largest population of those living in poverty with eminent threats of hunger even as the agricultural sector is bedevilled with enormous challenges.

Speaking at the opening session, programme director, Bernie Jones, said the history of crop breeding was a long one as according to him, the idea started with the concept of diversity in traits because living things are variable.

Jones insisted that genetic modification started many years ago noting that the idea was informed by the need to select best variety of seeds for planting so as to ensure increased yields.

In a thought provoking lecture, Professor Chris Leaver disclosed that over one billion population of the world is hungry with 3 billion in poverty and noted that technology of genetic modification should be applied in places like sub Saharan Africa where incidences of hunger was high.

Essentially, journalists were exposed to the technology of plant breeding, biotechnology and the importance of genetic modification as factors necessary for reduction of hunger while ensuring sustainable food security.

Wide range of issues aimed at equipping journalists with the necessary skills to report issues related to technology and science journalism were discussed.

In an interview, one of the key discussants, Brian Heap, a biological scientist, stressed that genetic modifications has so many advantages and if properly adopted, could eliminate the challenges of hunger through sustainable food security.

Heap stressed that food produced from genetically modified seeds are safe and had been used for long years in western countries of America and Europe noting that there has been no reported cases of hazards.

It is expected that at the end of the training, the participating journalists who would earned the position as fellows of B4FA, will be better informed about biotechnology so as to effectively preach the gospel of genetic modification and engender discussion on how to reposition agriculture through reports and programmes.

Genetically Modified Crops For Food Insecurity

By Jameelah Hamisu Mai Iyali,

Freedom Radio

Food is an essential component of human existence that is very important for human survival as man eats to live strong, fit and healthy. However, the growing population of the world makes consumption higher against cultivable crops across the world.

In view of this, this piece of writing seeks to highlight how genetically modified crops can help in reducing the burden of insecurity, especially in Nigeria when the mature.

INTRODUCTION

Genetically modified crops also called GMCs, GM Crops or Biotech Crops are plants, that their encoded genetic molecule (known as Deoxyribonucleic Acid-DNA) has been modified by applying technological application that uses biological systems. Crops that are genetically modified resist pests and agents causing harm to plants and they help to improve growth of these plants to assist in farmers' efficiency.

Usually, genetically modified crops are initiated to introduce a new feature like resistance to certain pests, diseases or environmental conditions, the production of certain nutrient or pharmaceutical agent into plants, which do not occur naturally in **A Genetically Modified Tomato** the Crop Species.

SAFETY OF GENETICALLY MODIFIED CROPS

When we talk about safety of Genetically Modified Crops, it simple implies it safety in terms of consumption and its sustenance in the food chain of consumers. Genetically modified food has quietly become second nature in the United States of America for quite sometimes, due to the level of technology in that part of Globe and this has led to increase rate at which many foods eaten contained genetically modified ingredients, though people are seemingly not aware of this development.

Experts in food technology say about 60% to 70% of processed foods on United States grocery shelves have genetically modified ingredients, which means some of it might have crossed US border to other countries. Presently, most common genetically modified foods are soybeans, maize, cotton, and rapeseed oil, which imply that some breakfast and fast-foods like cereals, snack foods and soda made products, could likely have genetically modified ingredients.

Talking about safety of Genetically Engineered Crops, from experts' point of view they are safe in the sense that they resist disease better, this is as a result of insecticide and other ingredients that are involve since the time of seedling, planting and germination which give optimum protection from infant to the time they must have grown fully for storage, preservation and consumption, which means they can be produced on large scale to save people from hunger in famine areas (thus: durability as a result of resistance to disease).

Also, Genetically Modified Crops are safe to and they can also provide much-needed food in starving nations considering their durability, it means they can be transported and preserve safety for a longer

time than naturally grown crops, which would enhance exchange of food and further storage in large quantity in the face of food security in affected regions on the world.

The safety of GMCs has also been established in the area of stress resistance, where it can withstand stress resulting from moving the crops from one place to another, which means it can be useful in checking food shortage, which means crops will not easily spoil when transporting them from cultivation point to consumption end.

One of the major challenges of food crop is food poisoning which mostly arise from preservation efforts, however genetically modified crops provide benefits to farmers, consumers and the agricultural industry because its ingredient composition enable GMCs to resist herbicide which usually result to food poisoning emanating from preservation.

From the little analysis above, it is clear that if genetically modified crops are practiced accordingly in the world and in Nigeria as a country; it would lead to having resistance crops and enough food since they would be produced through technological applications that use biological systems, hence less human effort and high productivity.

Conclusion

Genetically modified crops are important considering experts' views and comments on the development and crops produced from the process are quite safe for consumption if ingredient combinations are appropriate. Hence, genetically modified crops are a good deal considering its high production potential.

However, the European Union has argued that crops that are organically produced (soil grown) are healthier and that it will be at the disadvantage of developing economies, because it is only nations that have bio-technology equipment that will dominate world food supply, which they say may increase food insecurity pressure rather than help reduce it.

Similarly, coming back home to Nigeria, genetically modified crops seem not to be the answer or an alternative to providing safe food and check food insecurity because the country has zero technological advancement to pursue such goal and lacks regulatory and monitoring instruments to check excesses that may result from wrong chemical (ingredients) combination, which may lead to food poisoning and health hazards.

Adopting Bio-Safety Law In Nigeria

JAMILA HAMISU MAI IYALI

Bio-safety bill is a proposal that is forwarded to the National Assembly to be sign into law in order to make provision for safe handling, transport, use, transfer and release of any genetically modified organisms so as to prevent or reduce risks to biological diversity, environment and human health, to enhance promotion and management of research and development in the field of biotechnology and ensure implementation of global *Protocol on Biosafety to the Convention on Biological Diversity in Nigeria.*

Adopting such a bill means providing legal backing to activities that hat to do with biological diversity and modification on organisms in the country.

Introduction

Signing bio-safety bill into law according to experts is very important, but the question is, what bio-safety is:

Biosafety according to Wikipedia, the free encyclopaedia is defined as the prevention of large-scale loss of biological integrity, focusing both on ecology and human health.

Biosafety as a concept is related to several fields including:

- **Ecology:** It is concern with imported life forms from beyond ecoregion borders.
- **Agriculture** Here it centralizes on reducing the risk of alien viral or transgenic genes, reduce the risk of food bacterial contamination.
- **In medicine** it implies organs or tissues from biological origin, or genetic therapy products, virus; levels of lab containment protocols measured in order of danger) etc.

Though, Biosafety in agriculture, chemistry, medicine and exobiology are wider, yet they require application of the precautionary principles in biological systems.

In order for biosafety and biotechnology to strive and survive in Nigeria as a developing economy, there is an urgent need for signing into law the Biosafety Bill to achieve the following:

If the Biosafety bill in sign into law, Nigerians will be able to exploit potentials available in modern biotechnology because it will be a practice that has legal backing, thus regulation and protection for those involve would be established, which will in turn contribute to environmental, human and socio-economic safety.

When the biosafety bill is sign into law, the country will attain development in the area of technology because it will give a rise to increase use of biotechnology, which would be an addition to what was obtained in the country, thus improved output and technological base of the country on global platform.

Biosafety bill if signed into law could help solve the problem of high expenses in the area of food importation because the use of biotechnology in food production would be fully employed having

governing law in that respect, thus: checking food insecurity in the country, especially among small-scale farming population that composes large part of farming population in Nigeria.

Having a law on biosafety would also help in safeguarding the environment and human health because such law implies central authority, which will make controlling adverse effect of genetically modified organisms and product through assessment of such organisms and management of related risks accordingly by authorities concern.

Passing into law biosafety bill will make provision for the establishment of a competent agency that would work with relevant bodies in order to create platform for farmers, technologists and other stakeholders in appropriate use of biotechnological applications in innovations and general development of the country.

Taking agriculture for instance, Nigeria would be able to produce more agricultural products through genetically modified crops which is a product of biotechnology, and if this succeeds it will help in reducing the burden of food insecurity, huge investment in importation and meeting international standards when it comes to use of technology in food production.

The Law will also promote national security through the application of DNA finger printing for crime detection, paternity testing and identification among others. It will also promote active commercialization of the research and development projects in the country's universities and research institutes, which will in turn improve the economy.

However, signing into law the biosafety bill may not really mean development for the country on the other hand, considering the fact that Nigeria the law may not benefit Nigeria immediately in the sense that thorough research into biotechnology in this part of the world would have to start afresh and may end up to be beneficial to developed countries, which could led to further exploitation as it happens in the international trade arena, where the developed countries continue obtaining raw materials from developing nations and sell same back to them after production as finished goods at higher rate.

Federal Government Establish NABDA To Assist Farmers

BY UMAR AKILU MAJERI,DUTSE

It has been identified that Nigeria is among the African state producing the best cocoa seed in the world one of the major problem that affecting the life of the Nigerian farmers is lack of commitment from te government site.

Investigation conducted by our reporter gathered that if the federal government could invest more money in cocoa production in the country as as encouraging farmers in producing date palm as well as maize production the issue of poverty could e a story.

One of the scientists who deliver a paper at B4FA Seminar in Abuja Mr. Chukwu Emeka Eke from Benin who is from NIFOR date palm call on the federal to encourage state governors in the cou8ntry to plant date palm in their state by doing so it will help them to eradicate the menace of poverty in their state

According to investigation conducted by our reporter in the last 500 years Nigeria was bless with different varieties of farm produce but due to lack of commitment from the policy makers the value of our crops is diminishing

It has been observed that most of our crops today has now been modified to a better staged which include cassava, maize, rice, sorghum, cocoa ,palm oil, cotton, which all are among the African crops the modern days crops we have today in the country is often not an indigenous crops it is normally import to Nigeria.

In the area of biotechnology the federal government has contribute greatly by installing the national biotechnology development agency in 2001 to ensure that many people are trained or educate to e ale to to use biotechnology for the development of the country.

The essence of establishing the centre is to create more food opportunities to people in the country and also to have more raw materials to users including the industries and end users because the federal government want the people in the country to be very rich by benefiting from the biotech

Time to brace up for GM products

By Eyo Charles

The way it looks, if care is not taken now Nigeria is going to be left behind by much of Africa, having since been given several miles by Western countries that have gone the way of biotechnology or genetically modification of crops to further secure their food base.

The real danger will be that the food crisis in the country would become deadlier thereby putting into question the sincerity of the government.

The popular refrain *change is the most constant thing* has been very apt. Without it, this world would be very stagnant. Many that are progressive minded who keep up with the changing times find that they positively evolve.

Today's world is made much more conducive and simple to live in because a lot of people accept new ideas, discoveries and innovations which have improved their lives, society; and knowledge transformed and peoples of the world becoming more harmonious following better understanding.

In many countries today, even in Africa, for instance, Burkina Faso, South Africa, Egypt, Mali, Ghana, etc are presently experiencing economic booster from their agricultural output because they have officially embraced new scientific findings. They have encouraged their farmers to equally apply these new modern techniques. As a result, they are having increasing outputs in food production.

These new processes have enabled their small and big time farmers to mass produce foods that they need to eradicate ravaging hunger and thereby sustaining their ever increasing population.

Gradually, therefore, having seen the progress being made by many African countries that are GM-compliant in this regard, clearly it will become a matter of time for many more nations to join the easy way out, despite stringent oppositions from narrow-minded cabals that mis-advise the Nigerian government.

Come to think of it, with simple, proven scientific methods many food crops are today multiplied in enriched forms as against previous irksome practices that produces lesser quality and quantity, and without any side-effects.

Against the belief that genetically modified foods are harmful to human health, many food and agricultural scientists have carried out wide-ranging researches and contradicted the claim.

Local and international food experts have said that there is no need whatsoever for Nigeria, the acclaimed giant of Africa, to continue to drag its feet but to join the moving train of modernity.

It is important that Nigerian scientists that engaged in these biotechnology researches should come together and amplify their findings and also encourage President Goodluck Jonathan to give his assent to the Biotech Bill recently passed by the National Assembly.

His continued delay will further spell more dangers to the country now that the nation's food security has been dangerously threatened.

With a population of over 150 million people, the largest in Africa, once the food security situation in the country becomes further compromised, the amount of public disobedience and deaths that would result would be intolerable.

Delay in assenting to the Biotech bill by the president has encouraged the flooding of Nigeria's market with the GM products because many Nigerians have not knowingly or unknowingly imported these products but have surreptitiously gone to neighbouring Burkina Faso to bring them in.

Confirming this to journalists at a Media Fellowship organized by BioSciences for Farming in Africa (B4fa) in Abuja recently, the director of Biotechnology department of the federal ministry of environment, Rufus Ebegba said that there are now many 'GM suspect foods' in the country.

"There are many GM suspect products in Nigeria but we need to regulate, so that Nigerians don't get them through the back door at their health risk. Regulation would enhance a lot of things. It is not that government does not recognize the many benefits of GM technology but we need to know the safety of GM foods. Regulation is key and a safety valve. But we also need to regulate in order to exercise sovereign rights over our own GM foods", he said.

Expressing confidence that Jonathan would soon sign the bill into law, he said "We cannot stop people from going to such countries that have adopted GM to buy these food crops."

Head of Tissue Culture at the National Biotechnology Development Agency (NABDA), an arm of federal ministry of science and technology, Abuja, Mrs Toyin Sholeso said also that the country recognizes the importance of GM products but that they have not yet gone full blast.

"Presently, we are applying the tissue culture where are able to mass produce variety of plantlets and other food crops like banana, plantain, pineapples etc through scientific means. We have the capacity and technology to cross-breed them in large commercial quantities", she said.

At the same B4fa workshop, Dr Chukwuemeka Eke and Osayande Ihase, both senior research officers at National Institute for Oil Palm Research confirmed that the institute has been conducted several researches using modern biotechnology.

Against the backdrop that GM is against nature, Eke said God himself first started the process when He removed a bone from Adam, the first man, when he made him to sleep, and used it to create the woman. "It was God that first introduced the concept of biotechnology or genetically modification – a process of taking of gene from a particular crop or animal into another plant or animal to produce another form of its kind", he explained.

Eke added, "This is how we have produced different species of date palms and other kinds of oil palm fruits, and have screened and produced seedlings that are disease tolerant. Through application of biotech NIFOR is able to mass produce oil palm seedlings for commercial purpose but our constraint is lack of financial support from the government."

To the Nigerians that have been brainwashed to beware of GM foods, it is important to say without them knowing they have been eating these foods. And have they experienced any harmful effects? They had better brace up because the future belongs to GM foods.

Why Nigeria must accept biotechnology, G M food

By Mohammed Kandi

Genetically Modified (GM) foods are only but created from biotechnology using some laboratory technique to change their genetic material. This aims at introducing a method that would bring about high quality yield, virus free and disease resistant crops for farmers and consumers of their products.

Some GM food include maize, soybean, potato, oil seed rape, strawberry, pineapple that may provide greater resistance to pest and virus, higher nutritional value and longer shelf life.

However, much as Nigerian do not really problems biotechnology- a process that could facilitate scientific research for the country, they like some part of the world, have argued over the safety of GM products as potential risks for the people even as constructive debates are still overwhelming the matter.

Although there is no regulation preventing the importation and consumption of GM food in Nigeria yet, no law has been put in place to allow the commercialization of the products at the moment and this has left the country and its people undecided about GM food.

It therefore becomes important for Nigerian government; scientists and farmers to accept, promote and commercialize GM food, which has been proven scientifically safe and more beneficial for all form of users, thereby enabling its farmers compete favourably not only within the shores of the continent but in the global market.

There is also the need for Nigerian government and farmers to proudly join the rest of agricultural communities across the world in achieving global food security, as well as in the quest to be able to feed itself in a sustained manner.

Scientists world over have passed vote of confidence on the myriad of advantages to gain from the application of biotechnology driven agriculture but for some socio-political and religious myths, the progress of adopting what seemingly would liberate our farmer and have them generate more income from their labour had been stalled.

To accomplish this impressive research driven project anywhere in the world, the governments must be truly ready to support the effort. On their part, the scientists must passionately intensify their investigations, and the farmers must learn to accept modernization, especially, one that impart positively on their lives.

There is the need for more advocacy, sensitization campaigns, workshops, lecture and conferences to be organized for farmer, scientists, the media, and members of the public who are potential consumers of the GM product, highlighting the multi-dimensional benefits in the crops, as well as providing evidences that would guarantee safety of their lives and occupation.

Developing virile hybrid crops for sustainable food production

KAYODE OLAITAN, NAN

A farmer's son once told a story--``My father has been growing maize for the past 13 years with unimpressive yields that are even diminishing in quantity over the years; we could not make ends meet and we are economically threatened; then is farming profitable?'

In contrast, neighbouring country's farmer told a success story of his faming activities—``I began cultivation of maize in a low scale farming but now I have quality maize and I even sell in large quantity; farming in interesting and profitable''

The two stories tell draw a line between revolutionized farming and conventional farming. In the case of the farmer's son, it is discovered that the father plants a variety of maize always; after each harvest, he keeps some sees for the next planting season; reason for unimpressive yields.

In the case of the successful farmer, however, he tries to plant varieties and watch the performance. This, he does by natural selection, selecting the seeds that perform well at the end of every planting season—hybrid process.

Call it hybrid, selection or plant breeding; the importance modernized farming is evident in productive yields to fight hunger and improve the economy since the essence of living involves the ability to tame one's environment, plants and animals inclusive.

One of the basic necessities of life that need man's modification is food so as to guarantee his wellbeing.

It is therefore instructive that modern technology in farming is necessary in Africa to fight hunger and enhance nutrition.

Plant breeding has remained an outstanding revolution in agriculture with a prospect of wiping off hunger and poverty across the world.

Nonetheless, plant breeding is impeded by some challenges ranging from misconception created by the critics of genetically modified food and crops.

The critics have raised doubts about the safety of the food and crops, expressing that the GM crops ``contaminate'' organic and conventional crops growing near to them.

But agriculturists have opined ``all agriculture is about is growing different crops and processing different crops without mixing them up''.

In as much as hybridization ensures better way of living, it therefore behoves on mankind to strive to attain an appreciable knowledge about the process of breeding.

Since it is established that living becomes better with this technology of hybridization, efforts should be made to popularize it so much so that the revolution will extend to all stakeholders, even the grassroot farmers.

How could this be achieved?

There should a strong political will from the government to encourage new method of farming involving the introduction of new crops and plants through hybridization.

Pursuant to this, there should be good quarantine service and horticultural specification made law to control what should be encouraged for planting.

The climate, soil and other agricultural factors should be taken into consideration in the event when the authority considers breeding a particular crop for planting.

In this case, it takes a strong desire for the stakeholders to separate politically motivated emotions from the reality of the prevailing challenge.

For instance, pest resistant and high yield tomatoes from a country which has opposing world political view with another should not be discouraged from being bred just because of the political or religious difference.

Awareness campaign will bring rapid revolution in plant breeding especially among the developing nations.

This should be done by the media and other stakeholders in agriculture to expose the economic and health importance of genetically modified foods.

Establishment of crop breeding institutes such as International Institute of Tropical Agriculture and Premier Seeds and more should be encouraged to promote hybridization.

The functions of agricultural extension workers and group formation to advance the course of hybridization, especially in the developing countries will achieve a lot.

However, participants at the B4FA Media Fellowship held in Abuja, have opined that Nigeria had the potential for effective adoption of GM.

Speaking on how best to cultivate maize to feed the Nigerian teeming population, Mr Adeolu Adebayo, a genetics lecturer at Ladoke Akintola University, Ogbomoso, said Nigerian could identify genes that confer resistance to fungi pathogens for breeding.

``Then the inbred lines could be used as parents between 6 and 7 generations, and then we select good ones among the seeds and then cross then to produce F1

``We continue the breeding and evaluation till we get the desired hybrid,'' he said.

On her discussion on breeding process for cocoa, Dr Anna Muyiwa, noted that breeding the crop had engendered viable cultivation of the cash crop.

She pointed out that a new variety of the crop which could mature in nine months is under observation, adding that if successfully inaugurated, it could replace the present variety that required 18 to 24 months to mature.

Another contentious issue at the discussion is the need for the government to sign into law the Bio-Safety Bill to promote GM crops.

Holding out the prospect for its passage into law, Mr Rufus Ebegba, a deputy director at the Federal Ministry of Environment said efforts had been made to ensure that the bill was signed into law very soon.

Interestingly, scientists and researchers at various research institutes visited in Abuja showed an appreciable level of research to ensure that Nigeria is not left behind in plant breeding technology.

All arguments notwithstanding, the participants at the end of the fellowship agreed that Nigeria would be willing to key into GM technology with aggressive awareness campaign, especially in the grassroots.

Institute move to make cocoa mainstay of Nigeria's economy again

By Akinwunmi Kole-Dawodu

NAN-H-

Cocoa

Abuja, March 20, 2012 (NAN) In its effort to make cocoa the mainstay of Nigeria's economy once again, the Cocoa Research Institute of Nigeria (CRIN) has released eight new improved cocoa varieties.

Mrs Anna Muyiwa, Head of Crop Improvement at the Institute, disclosed this on Wednesday in Abuja at a Media Fellowship Training for Journalists organised by the Biosciences for Farming in Africa (B4FA).

The News Agency of Nigeria (NAN) recalls that cocoa, which has always been the mainstay of Nigeria's economy, has had immense contribution in the 1960s and 1970s.

According to Muyiwa, the new varieties which have the capacity to flower in 18 months can help improve farmers yield.

She explained that farmers have been coming to the institute to collect these improved varieties for onward planting.

``It is from these same improved varieties that the Federal Government distributed to farmers free of charge last year.

``And the institute has even gone further by sending extension workers to go check how these seedlings are doing on the farm land.''

She recalled the institute presented 12 improved varieties of cocoa to the National Seed Release Council (NSRC) out of which the council approved eight.

Muyiwa observed that the institute was researching on a latest technique of top crafting that would produce cocoa variety that could flower in 9 months, adding that this was still under observation.

She said that the new technique was as a result of a Federal Government's sponsored trip of a cocoa breeder and an agricultural superintendent to Indonesia to learn the new technique.

She explained that these people came back from that trip and put the knowledge acquired from that trip together.

``The institute now has a top grafted material that will flower in nine months. But right now it is still under observation and it is in its fifth month. We expect hopeful by the ninth month the plant will flower.''

She noted that if by the ninth month, the materials was able to flower, the institute would go further to improve on it in order to make it flower in less than nine months.

She stressed that the main purpose of breeding the crop was simply to improve its quality.

NAN reports that the B4FA's six-month fellowship programme for journalists was launched in 2012.

The programme is aimed at bridging the gap between science and the public by promoting better understanding and dialogue on developments in agriculture and biosciences throughout Africa.

It is also aimed at encouraging dialogue and promoting better understanding of the available options for improving agricultural productivity in Ghana, Tanzania, Nigeria and Uganda.

The intention was also to enhance reportage of science and agriculture-related issues, especially food production challenges. (NAN)

Alternative food production means: dispelling the doubts with facts

By: Ifeanyi Nwoko

(Written for enlightened Nigerians and Policy Makers who are still wondering about this technology or who still have doubts)

Would you rather take a calculated risk than take none at all? Would you rather die of hunger or depend on other nations for food rather explore available means of producing adequate food?

With a constant rise in population estimated to hit 9 billion by 2050 without any increment in land mass coupled with climatic conditions militating against farming, it may seem famine is staring the world in the face if food production is not upped by 70 per cent.

In Nigeria, with a population of over 160 million, and the nations inability to fully utilise the conventional means of agriculture hunger and malnutrition has continued to become a growing concern.

However, such concerns need not arise if only the nation utilised the full potentials of conventional agriculture but the question remains: would this solve the problem given the fast growing populations and other factors such as flood, drought and pests.

To this end, scientists around the World even in Nigeria have continued to clamour on the great potentials of biosciences in the modification of crops, without tampering with its composition for greater yield.

This technology referred to as ``recombinant DNA technology" is used to genetically modified organism organisms especially crops so that they can possess traits that make then have greater yield.

For instance this technology can make crops resistant to drought when rainfall is minimal and resistant to pest thereby providing greater yield for the farmer.

But this initiative has been greeted with wide misconceptions even here in Nigeria thereby leaving many sceptical about this wonderful technology.

However, at a recent fellowship training organised for journalists by Biosciences for farming in Africa (B4FA) experts have doused such misconceptions presenting the facts of genetic modifications.

Prof. Christopher Leaver, Emeritus Professor of Plant Science, University of Oxford said that each plant contains DNA (found in the nucleus) which contains the instruction on how the plant will grow and function.

He said that plants also have the genes (pieces of DNA) which determine the colour of a plant, its tolerance to drought or pest and other inhibitions to growth.

Leaver explains that all that is done in genetic modification is to identify the DNA in one plant that makes it tolerant to drought for instance and transfer such DNA to a new plant so that it possesses such traits as well.

``The scientific basis of all crop improvement is the identification of the genes that encode and regulate specific phenotypic characteristics or traits of benefit to the farmer.

``The current challenge is to identify the genes that underlie the traits and then combine native traits using molecular markers and/or GM to improve the crop," he said.

Leaver stressed that these processes undergo a lot of testing to ascertain its health and environmental safety before it is released for planting and as such there are no known health hazards.

It is pertinent to note however that plant modification began over 1000 years ago when man began to sort plants to eat and plant based on their possession of suitable characteristics.

Dr Bernie Jones, Programme Director B4FA disclosed that many of the crops we know now had gone through years of modification through farmers' discretion to plant only crops that possess the traits they liked.

For instance, who would have known that bananas used to have seeds thousands of years ago or that cabbage did not grow as round as we have it now but like wide leafy vegetables?

This jones explained that it was difficult to eat bananas with the seeds and so farmers continued to select and plant only those with fewer seeds.

``Over time, with the planting of bananas with less seeds, the seeds gradually began to be eliminated until we had the banana we know now," he said.

Also, Dr Claudia Canals of the Oxford University, United Kingdom reiterated that the reason man can eat banana now is because it does not have seeds.

Dr Jones therefore explained that the process of genetic modification is similar to what was done thousands of years ago but this time, with technological assistance.

In Nigeria, there have been many advocates of genetically modified crops and they all assure that it is completely safe.

Prof. Bamidele Solomon, Director General of the National Biotechnology Development Agency also said that genetically modified crops are completely safe for consumption in Nigeria.

He cited an example of the United States of America where GMOs have been consumed for about 16 years without any form of health hazards.

He argues that a country as technologically advanced as the US would not feed to its people what is unhealthy nor will it give to its farmers that which is environmentally unfriendly.

Even the Nigerian Ambassador to the United States Prof. Adefuye also reiterates that genetically modified foods are completely safe for consumption.

In fact, the truth is that at present, the nation has no current law on the regulation of genetically modified food, therefore being a food import dependent nation, who is to say that we have not all been consuming GM food for years now without any health hazards.

One may wonder if Nigeria is ready to go genetic modification or it just wants to import GM food when the time is rife, but Mrs Rose Gidado says that the Nation is technologically ready to modify.

Gidado who is the Head of the Open Forum on Agricultural Biotechnology (OFAB) said that a lot of researches have been going on within the country in the area of genetic modification.

She said that the only restriction is that there are no laws that would allow the researches to come to the open as the President had yet to give assent to the bio safety bill which was passed in 2011 by the National Assembly.

This leaves us wondering if like the era of the green revolution we want to be left out or we just prefer to pursue from behind.

Whatever the case, posterity will not forgive us if we let the nation continue to hunger and starve when we have this very wonderful resource at our disposal: the time to act is now.

Bio-Technology: Enticing The Young, Breaking New Grounds

FEATURE ARTICLE BY MAGDALENE UKUEDOJOR

Cutting grasses in the school's orchard, building yam bridges and planting okro for the house master does not make agriculture a pleasant study subject in secondary schools.

This, an average student would tell you.

Agriculture, a practicable subject has overtime been turned into an all-class thing especially with teachers loading students with lengthy, boring notes on the theories of plants and how they are grown.

In most public schools, large farmlands are lying fallow because lazy teachers have stopped to carry out research on new and exciting farming techniques which can lure students to agriculture.

Being content with awarding marks to the best group of students who can weed farms or build mounds of yams during the planting season, will not solve the food problems of Nigeria.

For a country on the verge of a looming food crisis, according to the Food and Agriculture Organization (FAO), due to climate change and an alarming population explosion in the near future, the youths are the vanguards of the country and they, more than anybody else, need to be involved in the biotechnology struggles of the country.

Simple methods of deliberate cross breeding of common plants like maize can be taught in schools. Students could carrying out these experiments class by class over their years of education in school to see the results of their breeding and have these crops named after them.

While teaching in theories the complicated scientific methods like gene selection (genetics), other simpler methods of breeding like the grafting, hybridization, polydization and mutation, vegetation propagation like budding, grafting and layering could be practiced in senior secondary schools.

Core science students would be very interested in tissue culture also.

Generally, soap making, cocoa wine would be useful topics for students in the Western part of the country.

Instead of sharing the cocoa tea and cocoa drinks and chocolate circulated yearly by the Cocoa Research Institute of Nigeria in Ibadan, for awareness creation, students could actually be taught to make these things.

In the north where drought and desert encouragement especially from the Sahel Region is threatening our land, samples of drought resistant crops are already are being developed by scientists like Mr Moses Adebayo, a researcher in Ibadan and this should be promoted in schools.

While Nigeria missed out on the Green Revolution, another opportunity for the redemption of our sector is given through biotechnology.

Signing the Biotechnology Bill is not enough, training the younger generation and carrying them along through simple practicable methods of seed selection and breeding of common plants in small scales is pertinent.

The DNA Laboratory in the National Biotechnology Development Agency where DNA samples of crops can checked will be open to the public in a week's time in Abuja.

Schools- private and public with the capacity to can carry out small scale scientific experiments should key into this to improve on their students' enhancement.

The whole world is tilting towards biotechnology as it is indeed the future for better seeds, improved yields, and a succor for desertification and droughts.

Sending students and teachers on extension programmes to other countries' institutes to rub minds and exchange ideas is most needful.

Adopting biotechnology in Nigerian schools will encourage self-employment, interest in education, encourage science and technology studies, boost agriculture and improve the economy

Date palm plantation, sure way to curb desertification in Nigeria--- Scientist

(News story)

By Kate Obande

Abuja, March 20, 2013

Date palm plantation is a sure way to control desertification in the northern part of the country and also help boost the agricultural sector of the country a scientist has said.

Dr Chukwuemeka Eke, researcher with the Nigeria Institute for Oil Palm Production said this while giving his presentation during the Biosciences for Farming in Africa training for journalist on Wednesday in Abuja.

Date palm which is one of the species of palm fruits in the family of the palms, it is popularly known as "Dabino" in Hausa language and others call it "Arab Kola". Other palm fruits include: Oil palm, Coconut palm and Rafia palm.

This palm however has passed through a culturing process called "tissue culture" an artificial method of propagation of a plant by using a plant part or single cell or group cell in a test tube under very controlled and hygienic conditions.

The scientist explained that the reason for adopting the tissue culture method was because the seeds derived seedling would be approximately 50 percent female.

This was necessary because only few male are required in plantations for fruit development and to multiply good quality genotypes rapidly.

Eke gave the example of the United Arab Emirates a country where they had transformed their entire desert to into a fruitful place.

"In UAE they have been able to transform almost all their desert into a very fruitful place; they achieved that by planting out the very fruitful tissue cultured date palm trees.

"And then put it in some irrigation measures and then it's a transformed desert".

This could be achieved in Nigeria if the government pays attention to date palm and its benefit; the outcome would be overwhelming as the country's desert areas would be transformed the scientist said.

He added that Nigeria had the potential and could be achieved as date palm was a very good palm fruit.

He said that the plant can be best grown in the northern states of the country between latitude 10 to 12 and the plant has a life span of over 30 to 40 years and reproduction continues.

According to him, the extension services of the institute inform the farmers of these cultured seeds so that they can have access to the seeds for planting.

Eke urged journalist to convey the message to the society and the government asking government to fund the sector, stating that funding was the major challenge researchers and scientist experience in their job as there is no support from the government.

The presence of government in this form of project is imperative because it involves not just planting of the crops on the desert land but needs irrigation facility to water the land and make the place flourish the plant.

Maize Production: Hybrid And Traditional Seeds.

GARBA DANAZUMI SULEMAN

The target audience of my programme are the local Farmers in Northern Nigeria who probably because of their low level of exposure and education tend to be very conservative when it comes to accepting new innovations or inventions.

Is never a gainsaying or exaggeration to state that the 2 types of Maize grown in Africa and Asia requires the use of organic and inorganic Fertilizer, pesticide, favorable climatic conditions, sufficient Rainfall etc for them to grow in good quality and high yields at any given time.

The geometric increase of the Global population today has compelled and necessitate the use of science and Technology to enhance Food production that will take care of the ever increasing population in this World.

The recent effort made by scientist is the concept of the use of Bioscience to come up with seeds that produces high yield, high quality crops, and drought and disease resistance.

In the early part of the 1970s when the inorganic Fertilizer was first introduced in the Northern part of Nigeria has met with a strong resistance from the local Farmers mainly because of their ignorance and the believe that it was made from a chemical that is contrary to their culture and believe, and is likely to make their land in the long run un cultivated.

However, as time goes on as a result of the intensive mobilization and sensitization over the electronic and print media from across the country by all the level of governments, the rural gradually Farmers began to understand the importance of Fertilizer especially when it is properly applied.

Now talking about the use of Traditional seeds over the years which the local Farmers are use to, a local Farmer has the believe that the traditional seed is the only seed that can take care of his domestic and immediate commercial needs and nothing short of that not knowing that the World has gone far into modern science and have came out with new inventions, innovations and Farming techniques that gives high yields in a small portion of land with less stress.

One of the new inventions introduced by scientist is the use of high breed seeds which has been tested and many countries in the globe are moving away from the use of traditional seeds to high breed seeds.

The polygamous culture of the Northern societies in Northern Nigeria is gradually harping on the socio economic lives of the people in the region.

Now for a polygamous community to maintain and retain their culture and also feed and close their families and also take care of their family responsibilities they must have to expand their Farm, put extra effort, and put a lot of things into consideration before he can be able to get sufficient food that can take of his needs.

The facts which scientist are always trying to let the public understand is the issue of the increase In World population, decrease of water for farming activities, climatic change, diseases affecting crops

and many other challenges occurring annually that are affecting food production in many country that now were compelled to use seeds that are resist able to most of these challenges, the outcome of their research was the use of high breed seeds.

There is no doubt that the traditional seeds yields low produce compared to the high breed seeds that was recently introduced by scientist through Bioscience, this is to say as our climate change, our population continue to change, the need for food continue to increase etc, the increase for food production becomes necessary. Hence the use of high breed seeds becomes very imperative.

Am very much sure that the use of high breed seeds is the solution to the problem of food shortage emanating as a result of the increase in population and the climatic change that is militating against sufficient food production.

From Garba Danazumi Suleman, VON North West Zonal Office, Kano

Yes, we are capable....says Nigerian Scientists

By Edith Nwapi (News Agency of Nigeria)

According to the Food and Agricultural Organisation (FAO) food production needs to increase by 70 per cent in order to feed an expected world population of 9 billion by 2050.

``The challenge therefore, is for farmers to increase production, and this will be done through attitudinal change and paradigm shift'

FAO further stated that Biotechnology could lead to higher yields on marginal lands in countries that today cannot grow enough food to feed their people.

For Moses Adebayo, a Lecturer at the Ladoke Akintola University of Technology (LAUTECH), Ogbomosho, Oyo State, believed that Nigerian scientist could face the challenges of taking the country to the path of realizing food security in an interview with him, he narrated how the urge came.

``As a young boy growing in Western Nigeria, I noticed that my father's field was affected by drought and he lost his entire crop.

`` The urge rose in me that someday I will work very hard to solve this problem.

`` Now I am a man and I am working on a project which will ensure that improved maize varieties that are resistant to drought are available for farmers," Adebayo said.

He said that his superiors in the University had development improved maize that can resist weather conditions.

`` With the issue of climate change which is real Nigerian scientist are also working hard to improve on their local crops which will be adapted to the climate condition.

`` I am carrying out my project based on the knowledge I get from them and I am sure other scientist are doing likewise.

`` All we ask for is the enabling environment and the patient to wait for good results but to say if we are going to make it work, the answer is a capital yes','' he affirmed.

About his project, he believed that an improved maize seed would help to solve the problem of drought stress in the sub region.

Another Scientist, Dr. Olagorite Adetola, Assistant Director, National Horticultural Research Institute Ibadan, affirmed also that with biotechnology scientists in Nigeria can go pla

`` Now that we have access to biotechnology the gestation time will not be as long as when we did other breeding without this technology.

`` We have improved tomatoes seed, which is good news to our Northern farmers who import from China at a high rate," she said.

We recur that Plant breeding is the art and science of changing the genetics of plants in order to produce desired characteristics

Plant breeding can be accomplished through many different techniques ranging from simply selecting plants with desirable characteristics for propagation, to more complex molecular techniques

Breeding new crops is important for ensuring food security by developing new varieties that are higher-yielding, resistant to pests and diseases, drought-resistant or regionally adapted to different environments and growing conditions.

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Food and Nutrition Security: why Biotechnology.

BY ,ELIZABETH ACHAGH.

As world population continue to grow in leaps, global food and nutrition security has come under immense pressure.

Nearly one billion people are said to go to bed hungry with a greater percentage dying daily of malnutrition.

Malnutrition among children has remained a major threat to global development with millions of children dying annually all over the world particularly in developing countries.

A recent World Health Organisation report shows that about 1.9 to 2.8 children die annually from Vitamin A deficiency, more than the rate of deaths occasioned by HIV/AIDS, Tuberculosis and malaria.

With world population expected to double by 2050 to an alarming 7 billion people, agriculture production must increase by seventy percent in order to meet the demand for food and nutrition globally says a United Nations Environmental Programme report.

The need to therefore produce enough food to adequately meet the global demand for food and nutrition has been stressed by experts in the agriculture sector.

Speaking at the second phase of the Biosciences for Farming in Africa Media Fellowship Workshop holding in Abuja, an Oxford Professor, Chris Leaver has stated that agriculture biotechnology can help avert food and nutritional crises especially in sub-Saharan Africa where hunger and malnutrition is a major threat to the attainment of food security.

Professor Leaver described biotechnology as a vital tool needed to not only increase agricultural productivity but also check the rising rate of malnutrition among children.

He noted the immense potentials being provided by agriculture biotechnology particularly in genetically modifying crops to suit man's need maintaining that the concept can be adopted to fortify topical crops such as rice, sweet potato , cassava and corn for Vitamin A to help check the high rate of Vitamin A deficiency among children in the continent.

Professor Leaver expressed concern over the negative controversies on the adoption of biotechnology in Africa and urged leaders in the continent to redouble efforts in developing the agricultural sector for optimum productivity.

On his part, a plant breeder with the Biotechnology Advanced Laboratory, Sheda Science and Technology Complex, Mr. Andrew Iloh identified climate change as a major challenge affecting the attainment of food and nutrition security adding that the impact has caused the weakening and depletion of natural resources in the word.

He therefore stressed the need for researchers to develop crop strains than can adapt to the changing climate, fight disease and pest to make the sector more economically viable.

Mr Iloh also urged the Federal Government to create a regulatory framework that would ensure the adoption and regulation of biotechnology in the country adding that Nigeria could not afford to be left behind in the global fight against hunger, poverty ,malnutrition and economic backwardness.

Gmo And Public Awareness In Nigeria

BY JAMILA HAMISU MAI IYALI

Nigeria, a country with a population of more than 160 million and still counting, the largest in population in Africa, with plentiful agricultural resources, yet poverty is wide spread in the country as the population swells and puts pressure on diminishing resource, thereby escalating environmental problems which further threatens food production.

In rural areas, where most of the heads of family are engaged in agriculture as the main source of income therefore agricultural growth is important in the eradication of extreme poverty and hunger in the country.

Nigeria is faced with a loaming food security crisis with a growing population becoming increasingly dependent on imported foods where by at the same time making the once dominant subsistence oriented farm economy is at risk of gradual marginalization.

Another challenge hindering farmers could be seen insecure land tenure, scarcity of funds and credit, labour scarcity despite overall high unemployment and stagnant technology have crippled development.

A wide range of polices, programmes and projects have had limited impact in ameliorating these problems.

Researchers have also be able to find ways to modify plants cells that helps improve an organism resistance towards insects and chemicals that are used to kill weeds, rodents, and bugs which is known as GMO.

Theses GMO helps to grow better food by modifying crops to adjust to different weather conditions crops of plants are able to grow in colder or drier places.

Research have shown that GM crops help agriculture play a vital role in preserving natural environment by reducing number of insects and also drought tolerance which is what farmers are yarning for.

To this end a scientists will shed more lights on advantage of GMO and how it can solve agricultural problems.

In conclusion I so much believed that If the GMO is in place it will tackle the agricultural problem the country is facing.

Biosafety bill is also one of the problems hindering this great project and when pass into law it will go along way in solving food shortage in the country.

In this regard journalist has a great role to play in ensuring a successful sufficient food production through Bioscience project.

Achieving sustainable food production in Africa through Biotechnology.

By Abah Anthony John

Africa as a continent have been struggling to feed her ever growing population with the little food it can produced using her local farmers and old techniques of farming, this old ways has not been able to address the food challenges been faced by African. The world's most vulnerable populations facing food crises lives in Africa, high food prices and lack of access to basic nutrition continue to negatively affect millions of people every day, poor or lack of improve seed for farmers is also a concern, inadequate infrastructures, poor irrigation methods, poor funding for research and poor policy implementation by African leaders has also become a contributory factor to African food crises in recent time. However, hope seems to be on the way for African farmers and the continent at large in the area of food security with the help of biotechnology and genetically modify crops which have proven to have the ability of improving crop yield and food that Africa needs to feed her people. The biosciences for farming in Africa (B4FA) is taking the lead to ensure food security in Africa through biosciences and the use of genetically crops as a sure bet for Africa food prosperity in the shortest possible time. Today Genetically Modified (GM) crop has proven to be a useful alternative to food production than the conventional method used in Africa, elsewhere in developed world biosciences have been performing wonders in improving crop yield, today we have GM Maize, soya beans, and other GM crops in Europe and presently scientist are working on GM cassava which is seen as food security crop that can help Africa fight hunger and starvation. According to Dr. Daniel Otunge of the African Agricultural technology foundation cassava can help to promote food security in Africa if we can turn to GM cassava " GM cassava is actually a cassava that have been improved by inserting a new gene into it to make it resistant to diseases, resistant to weeds, viruses and also to improve it, we also have what is called biofortified cassava which is cassava that have been added some vitamins so that we can have what is called a balanced diet in itself, so biotechnology is able to do that and currently there is research going on in Nigeria , Kenya, Uganda and partly Malawi in Africa" he added that "cassava is a food security crop and the more we add value to cassava the better for our population. As African nations the issue of food security is a major challenge and Africa need to adopt all the necessary technologies or mean to produce food for her people. It is estimated that by 2050 Africa will 1.3 billion people and we need to produces enough food to feed these people and to feed these people we need to increase the productivity of our land and to be able to produce food within the available land that is under cultivation and this is where biotechnology can help, experts believes that biotechnology holds the solution to food security in Africa. He concludes.

Maximizing bioscience potentials in Africa

By Kenneth Azahan

As the population of Africa is projected to rise to an exponential level, (1billion) by 2050, the need to adopt quick fixes approach in the continent's food security drive has become imperative.

Interestingly, maximizing bioscience could promote a better understanding of the available options for improving agricultural productivity in this part of the world.

It is important for African countries to leverage on the opportunities derivable from bioscience with a view to improving agricultural yield that will invariably boost the profit margins of farmers who are largely small-holder farmers.

It is pertinent to point out that action equal outcome. For instance, the current poor state of agriculture in most countries on the continent is a clear manifestation of neglect of the sector. So, promoting maximum application of bioscience in agriculture would provide a soothing relief to the excruciating pains being suffered by farmers. At the moment, most farmers are recording poor yield, disease burden and a host of other factors that make business miserable for them.

Traditionally, in most parts of Africa, farmers rely on rain fed system of farming which is becoming unreliable because of changing weather patterns; this makes the use of draught resistant seeds very crucial to food security as well as making farming more profitable. In any case, bioscience holds the key to unlocking the full potentials of farmers in the continent.

In Nigeria where it is said that over 50 million of her population engaged in one form of agricultural activities, farmers lack inputs to grow their business. This has left the nation plagued with endemic poverty. This situation has made farming very unattractive.

While science has made it possible to have various kinds of variety of seedlings that encourage all year planting, Nigeria and Africa in general was yet to adequately feel the benefits of this scientific feat as most farmers in the continent still rely on their traditional seedlings that often time do not give good commercial yield as well as withstand diseases.

The good news however, is that some Nigerian scientists and government agencies such as the National Institute of Oil Pal Research, (NIFOR) have shown interest and indeed demonstrated the good that bioscience holds for the Nigerian agricultural sector by developing improved varieties such as date palm. Other agencies have also developed other improved varieties of soya beans, maize, cocoa, and sorghum amongst others which are draught and disease resistant and have over the years grown and yielded abundantly under hostile conditions in America and other countries of the world.

It is pertinent to note that technology if fully utilized or made affordable to farmers by their governments, will not only solve the problem of food crisis but also address the issue of unemployment which is one of the nation's most biting social problem.

In countries where there is full utilization of technology in agriculture; their governments plays vital role in subsidizing farm inputs. Unfortunately, this kind of political will is grossly absent in Nigeria and other parts of the world where farmers do not have access to modern inputs because they are completely unaffordable to them.

This is largely due to neglect of the sector by various governments in Africa and ignorance or lack of zeal for some farmers to transit from their traditional to modern or mechanized agriculture and the end effect has been low productivity and crop harvest could not stand competition in the international market. Therefore, farmers in Africa largely do not make much profit as those in the developed world.

The Nigerian agricultural sector has suffered from insufficient financing- funding to the sector stands at around 2% of total bank lending compared to 6% in Kenya. Excessive risk, complex credit assessment procedures and high transaction costs are some of the reasons most commonly responsible for this low funding.

It is important to note at this juncture that all stakeholders- the media, the agricultural ministry and its agencies and parastatals as well as Nigerians Farmers Association amongst others must rise up at this point to do all in their powers to elicit presidential assent to the bioscience bill passed by the National Assembly.

It is common knowledge that some interests are opposed to bioscience for reasons they may have advanced. However, the Nigerian government and her people must know that the benefits derivable from the passage of this bill clearly outweigh whatever concerns that may have been raised by the opponents of bioscience.

The Nigerian government and farmers now conscious of the benefits of bioscience should jump at this opportunity without hesitation as this innovation presents an excellent escape route out of the almost perennial poor state of agriculture in the country as it has heralded an era of GM seeds where farmers have a guarantee for a bumper harvest at each harvest season. This is indeed the most reliable solution to the problem of food security in Nigeria.

Reviving Nigeria's lost palm oil glory through biotechnology

Salimat Garba (News Agency of Nigeria)

The palm tree is among the most exotic and recognizable foliage on the planet.

In Africa, palm is a multipurpose plant; it could be used for wine, oil, food, cooking fire, book, broom and fruits.

The palm tree is one of the maximally used trees in the world and that is why it is usually called ''the princes of the vegetable kingdom."

There is no type of palm that can be under-estimated in the nation's economy.

As the palm has it economical and nutritional value, so does it have its religious and cultural value.

Aside the fact that the palm would boost the economy of any nation, it also stand a strong ground in the celebration of Easter in the Christianity religion.

Now the questions are; why would a nation want to lose a plant that is this important or why would a nation not explore the potential of a crop like this due to climatic condition or environmental problem?

There are countries in the world that plant palm trees a whole lot but yet, have nothing or little to show for it; Nigeria is one of these countries.

Nigeria with 25 existing palm oil plantations in 24 states in Nigeria still imports palm oil.

Nigeria should be feeding other nations and not importing but unfortunately, it is not sufficient in palm oil.

It was recalled that in the early 1950s and 60s Nigeria has maintained a leading position in the global palm oil production but in recent time, it is in the seventh position after losing its place to Indonesia.

Most Nigerian farmers are still planting the conventional palm varieties and are yielding as much as nothing after so much hard works over the years.

Therefore, for Nigeria to revive its lost glory as the largest oil producing country in the world, the Federal Government has mandated the Nigerian Institute for Oil Palm Research (NIFOR) to produce four million hybrid sprouted palm nuts for farmers.

This was done as a requirement under the Agricultural Transformation Agenda, an agenda with the aim to make Nigeria food sufficient by 2015.

Under these agenda, NIFOR has developed hybrid seedlings that would yield bountifully between two to three years and not seven to 15 years as it was in the case of conventional varieties.

Mr Henry Olatujoye, president, National Palm Produce Association of Nigeria (NPPAN) said that just 1.4 million hybrid sprouted palm nuts would increase the country's palm tree plantation by 35,000 hectares.

Mr Adetunji Ibikunle, State Chairman; Osun Palm Produce association of Nigeria stated that the hybrid seedlings that were given to palm oil farmers in 2012 would boost the country's economy and make the country palm oil sufficient.

He said that even though the seedlings would start yielding after three years of planting, they would continue to yield for 50 to 70 years without going into wild goose chain like the conventional varieties.

He added that with the agenda and introduction of hybrid seedlings to farmers, Nigeria would soon revive its place as the largest oil producing country in the world.

Why Nigeria must grow date palm trees in the Sahel Nigeria

By Abdallah el-Kurebe

Date palm, which is called *phoenix dactylifera,* is a tree cultivated for its edible sweet fruit. Known to have originated from the Middle East (which is why it has been a staple food there), the date palm tree grows about a foot each year to a height of 80-100 feet. Dates contain between 20 and 70 calories each depending on the size and species.

For agricultural purposes, date palm could be grown in the Sahel states of Nigeria and exported as major foreign earner. The example of the Middle East and some African countries is important where, according to UN Food and Agriculture Organisation, FAO report of 2009, Egypt is the producer of the product (1,373.57 metric tonnes) followed by Saudi Arabia, 1,122.82 and Iran, 1,016.61 among the top 20 countries. In Africa, Libya produces 165.95 metric tonnes; Mauritania, 21.44 and Chad, 19.50.

For agricultural purpose, being a staple food, date palm is reach in carbohydrates, sugars, dietary fiber, fat, protein, etc. It is also used as livestock supplements, syrups, jam, ice cream, baby foods, alcoholic beverages, soft drinks, etc.

World total production is now put at more than 7.462.51, according to FAO.

Date palms are susceptible to disease called Bayound disease, which is caused by the fungus Fasarium oxysporum, to parasitic nematodes and insects.

If world producers of date trees include Egypt, Iran, Iraq, Israel, Tunisia, Morocco, Algeria and other middle East countries and USA, Angola, South Africa, Swaziland, etc, date palm cultivation could be enhance in Nigeria, especially in Sokoto, Jigawa, Katsina, Maiduguri, Kano, Yobe, Borno, Bauchi, Kaduna, Zamfara, Kebbi, Gombe, Adamawa, Plateau, Niger, Taraba, Benue, FCT, Nassarawa, Kwara and Kogi

According to Dr. Chukwuemeka Eke, a Plant Physiologist with Nigerian Institute for Oil Palm Research, NIFOR, Benin City, “Cultivating this excellent crop is profitable and would alleviate a lot of families from poverty and improve small scale farmers’ livelihood in Nigeria. Nigerian farmers could earn as much as N2,000,000 per hectare per year.”

Through selection, scientists have discovered that date palm trees could mature as early as in two years as against seven to 15 years with outstanding palms in terms of yield put at 60 kg per annum.

Biotechnology is therefore important for the production of date palm tree, especially that researches are ongoing at research centers. This is the faster was that good quality crop genotypes could be developed and yield gains of as much as 15-20% could be obtained, according to Eke.

Since it has been established that “demand for improved materials of date palm already exists, large-scale commercial date palm micropropagation to produce enough for the demand” should be embarked upon.

"Nigeria has a number of favourable factors and it can become a date producer of importance. Beyond direct agriculture, this could be one beautiful means to also check desertification in sahelian Nigeria," Dr. Eke said.

With NIFOR substation in Dutse, Jigawa state, if Nigeria could embark of the production of date palm trees in the sahelian north, apart from agriculture, it would also address the problems of desertification in Nigeria.

However, in other to fully apply biotechnology for agriculture, and particularly the production of date palm trees in the north, the need for accelerated assent to Biosafety, which is aimed at regulating the use of the technology, is not only important but also time-bound.

Date palm production can alleviate poverty in Nigeria- Biotechnologist

By Nura Sani Bello, Radio Jigawa

Date palm, scientists say, possesses some highly economic benefit, which if properly harnessed could create huge employment opportunities for farmers and boost the economy of communities cultivating it.

Historian said date palm originates from a land around the middle-east or around Iraq. It grows 70–75 feet in height, growing singly or forming a clump with several stems from a single root system.

The leaves are 4–6 m long, with spines on the petiole, and pinnate, with about 150 leaflets; the leaflets are 30 cm long and 2 cm wide. The full span of the crown ranges from 6 to 10 m.

Most date palm trees produce suckers (1-6) some don't produce suckers at all.

A biotechnologist, Dr. Chukwuemeka Eke, of Nigerian Institute for Oil Palm Research, NIFOR Benin observed that Date palm tree has been identified as an excellent crop that is profitable and can alleviate a lot of families from poverty and improve small scale farmer's livelihood in Nigeria.

He stated this when presenting a paper titled "GROWING THE DATE PALM INDUSTRY THROUGH BIOTECHNOLOGY IN NIGERIA" at a training organized by Biosciences for Farming in Africa in Abuja.

According to Eke, some varieties of date fruits contained seventy percent of sugar,it is also sources for vitamins and also play important roles in nutrition of human population.

Dr Chukuemeka pointed out that Agronomic package are applicable to date palm studies on pest and disease management as well as screening of date palm seedlings to produced disease tolerant plants.

He noted that the products of the seedlings derived from the seed would be approximately 50% female.

Dr Eke also said in producing date palm only few males are required in plantations for fruit development, and a Offshoots could also be used to obtain planting materials.

He revealed that there are two pathways in propagating the date palm which he said they are Somatic embryogenesis and direct organogenesis.

Dr Chukuemeka further explained that Nigerian farmers could earn as much as two million naira per hectare annually.

This advocacy brings to the importance of the application of biotechnology in Date palm production towards making the crop an economic viable in the country.

Why we need Genetically modified foods in this country

By Ojoma Akor

It is harvest time and Amina Usman goes to her farm to harvest tomatoes. She harvested with despair, for despite all her efforts these past few months, she could only harvest a few baskets because the yield was poor. The drought in her community has affected the output.

The next day she trekked a long distance to the market, her sale was equally poor because of the look and size of the tomatoes. By the third day her tomatoes had gone bad. Those who bought from her had to travel a long from the city to the market village in a bus over a long dusty road. They resold to shops and markets. Within days the tomatoes had gone bad in the shops. In all, Amina has made poor sales and little money for her family's income and has little to eat with her family. Her consumers in the city cannot enjoy the tomatoes nor any durability.

The above scenario is just a tip of the ice berg of problems the country faces with it crops, animals and agricultural practices. For some it has become a routine for each harvest of various common crops in the countries. Drought, weeds, declining land availability, lack of improved seeds and planting material, poor road network and transport system, pests, infertile soil are some of the some problems leading to low yield, food shortage, poor quality crops, reduce in exports , poor nutrition and poverty in many communities.

The time for Nigeria to join the league of nations with Genetically Modified foods (GMOs) is nigh, especially to attain food security in the sub-Sahara in the face of growing population. GMOs are organisms whose genetic material (gene) has been altered, using genetic engineering techniques. They are also referred to as genetically engineered or transgenic organisms. According to the Collins English Dictionary genetic modification is any alteration of genetic material to make an organism capable of producing new substances or performing new functions. Also called genetic engineering, genetic manipulation, gene splicing, gene technology recombinant DNA technology.

Emeritus Professor of Plant Science , Chris Leaver of the University of Oxford , UK said at a training workshop on Plant Breeding, Genetics and Biosciences organized by the Biosciences for Farming in Africa (B4FA) in Abuja on Monday that "Conventional Plant Breeding has been Very successful but yield gains are now slowing. The new molecular technologies allow more precise and rapid crop improvement by marker assisted selection breeding and GM approaches. This requires the identification of the gene(s) (small parts of a plant or animal) that underlie the traits and then combination with naive traits using molecular markers and/or GM to improve the crop.

He said this includes, among others;

- Avoidance of losses from pests---insects, bacteria, fungi, viruses
- More Effective water use---drought tolerance
- Increased tolerance towards temperature stress
- Increased yield
- Time to maturity shortened growing season

- Growth on marginal soils---salinity, pH,
- More effective fertilizer use---nutrient(NPK) eg Nitrogen use efficiency
- Increased flooding tolerance
- Improved nutritional quality

Improvements of crops through this means boost food production, as evident in the better Cotton now in Burkina Faso. With genetic engineering, more than one trait can be incorporated into a plant and are called stacked traits. These are currently corn and cotton crops with both herbicide and insect tolerance traits. Transgenic crops with combined traits are also available commercially such as the herbicide tolerant and insect resistant maize and cotton.

Also with GM crops we can have rice with higher levels of iron and beta carotene (an important micronutrient which is converted to vitamin A in the body); long life banana that ripens faster on the tree and can therefore be harvested earlier; maize with improved feed value; delayed ripening pawpaw; tomatoes with high levels of flavonols, which are powerful antioxidants; drought tolerant maize and wheat; maize with improved phosphorus availability; arsenic-tolerant plants; insect resistant Garden egg and rice; edible vaccines from fruit and vegetables; low lignin trees for paper making among others.

Debunking some allegations that GMOs are harmful , Dr Chukwuemeka Eke of the Nigerian Institute for oil Palm Research (NIFOR) in an interview said they are not harmful, he said it only involves modification of genes of the plants in the laboratory to enhance desired traits such as increased resistance to herbicides or improved nutritional content among others. With GMOs people like Amina in thIS country will have tomatoes that can withstand drought, taste better and even last six months on the shelves and improve her income . Consumers will have more nutritious and tasty tomatoes and other crops, there will be a boost in food production in the country, better economy , reduction in poverty, availability of food and many others .

It is time for Government to pass the Bio-Saftey Bill into law so that GMOs can be produced in the this country, regulated, sponsored and research increased. What more, our scientists are waiting too to see how they can transform even our own indigenous crops into ways that will be better using genetic engineering. Just like the popular maxim “let us make hay while the Sun shines” as many an Amina are out there waiting to be salvaged from their problems.

Agricultural Transformation: One Bill, Too Much Delay

Hassana Salisu Abubakar

Nigeria was agricultural giant in before the oil boom on the 1960s. Agriculture was Nigeria's major source of revenue with reference to the groundnut pyramids, cotton farming and other cash crops. In an ill-fated twist of fortune, the discovery of oil diverted government's attention from that direction and the beginning of an unpleasant story of the agricultural sector began.

Agricultural policies aimed at providing adequate food for the citizens were enrolled. In 1976 on assumption to office, Obasanjo introduced Operation Feed the Nation (OFN) while Shagari introduced the Green Revolution programme to foster the use of mechanical machinery in farming. This favoured large scale farmers in order to produce mass food products.

This was at the time when the nation's population was not near to what we have today. Through to the present administration of Goodluck Jonathan, so much have been put in terms of policy formulation in order to produce food for the people.

However, agricultural mechanization, use of fertilizers, insecticides and pesticides has been the major means of agricultural production.

Now biotechnology has been introduced in Africa and Nigerians are asking for its application so that farmers can produce enough food for the big population. On the other hand, President Jonathan has put the Agricultural Transformation Agenda (ATA), which is aimed at ensuring food security for the nation through mass production of food by use of modern means of farming.

This time around, government has put in place viral institutions in place towards ensuring that Agriculture regained its place of pride in the provision of food for the ever-growing population. These include research institutes across the nation as well as the National Biotechnology Development Agency, NABDA.

In other to regulate the application of biotechnology, The Nigeria National Biosafety framework was developed and the Biosafety Bill was passed by the National Assembly and is still awaiting Presidential assent.

These research institutes have developed certain improved variety of crops in collaboration with the International Crop Research Institute for the Semi-Arid Tropics (ICRISAT). The varieties include millet (seven varieties), wheat, (eight varieties in collaboration with the International Centre for Maize and Wheat (CIMMYT), tomato (7 fresh market, nine processing and four heat tolerant varieties), onions, pepper, grape vine and kenaf varieties.

Prof. Sir Brian Heap, Project Leader of B4FA said Agricultural Research cries foul concerning what it deems as insufficient government support following years of research despite the claims by the federal government that it is in support of transformation in the agricultural sector.

Dr. Moses Adebayo of LAUTECH expressed belief that if the federal government assents to the biotech bill, it would provide a framework to ensure the development and use of Genetically Modified

Organisms (GMOs) which do not negatively affect plants, animals and human health or the environment.

That Nigeria cannot maximise the economic benefits associated with the practise of modern biotechnology without a biosafety law, according to Mr. Rufus Ebegba, Deputy Director, Bio-safety Office, Ministry of Environment, means that Mr. President should hasten the assenting to the Bill.

Nigerians stand the risk of losing the benefits of biotechnology in the absence of biosafety law. “The absence of a law will mean that Nigerian scientists cannot research and bring out their products for use in Nigeria,” Ebegba said.

The Senate passed the Biosafety Bill since June 1, 2011. Mr. President should dust out the bill and signed it into law for the overall benefit of the people of Nigeria.

Gm Crops: Between The Debates And The Future Of A Nation

BASSEY ITA (bbtreasure3@yahoo.com)

Apart from medicals and hygiene, life to a greater extent sustains on food intake. Interestingly and historically of course, most food crops are alien to the environment there are today most useful as staples. Wheat, for instance, evolves from the wild annual grasses found in the Middle East or Asia but is today essential globally.

Plants undergo evolutionary developments as they cross borders. This evolution which commenced over 1000 years ago, more than 9000 years after farming commenced has been the basis for which most of the staples have been preserved.

They were preserved against diseases, climatic factors, pests, and other factors that affect their existence and yield. How great, then the prowling hunger that today roars in the land of Africa, for instance, would have been, but for such evolution?

Incidentally, these evolutions from the traditional gathering of landraces over the ages to the idea of breeding and hybridization are all commendable ventures in themselves especially as there could guarantee fending for a small subsistence population centuries ago.

However, with the increasing global population trend which, according to statistics by the World Health Organisation (WHO) and Food and Agriculture (FAO) establishes that over 800 million people globally are affected by hunger and malnutrition, the challenge of increased food production there becomes a necessity.

The big question then posed by this challenge is whether the same archaic and or obsolete practices can justify our quest today or massive production of food to feed the growing population?

Saying no as an answer may not be difficult and restrictive even to an avowed critic of modern day practices of agricultural production.

Yet, in Africa, where the challenge is much more because of the 'skyrocketed' increase in population (2.4%) as against food production (1.4%), according to statistics by the WHO/FAO.

It becomes expedient to embrace modern day practices to justify global effort to cater for the increasing population of hungry and malnourished people.

Interestingly, researchers and scientists, especially in the field of Agriculture have come up with latest practices of using living organisms to produce more of food, feed, fibre to cater for the growing population. This is called Biotechnology. A term which is gradually gaining currency in some climes in Africa and lack of support for agricultural production over the years have been the bane.

But unfortunately even as scientists attempt to push through this phenomenal, time-tested initiative which has already benefitted massive population in the Americas, Europe and some other developed climes.

Nigerian government has been considering debates on whether or not to accept Biotechnology as a vital, (though not a total) solution to food security in the country.

Critical debates have been raised against the practice which is often believed to be more beneficial in massive agricultural production than any other practice so far evolved. This is the major occupation at the moment that has held back the endorsement of a regulatory framework for GM crops in Nigeria.

Debates such as the unsafe nature of the crops, the environmental and health hazards there convey and the issue of 'contamination' of the conventional crops have continued to agitate the minds of people across religious, ethnic, social fronts.

Incidentally, perhaps, this has also been the reason or the fear that has characterized the delay for the endorsement of the biosafety bill into law.

But the biosafety bill, it is believed would put paid to claims against GM (Genetically Modified) crops in the country.

At a recent Media Fellowship in Abuja organized at the instance of the Bio-Sciences for Farming in Africa (B4fa), an international programme aimed at advancing agricultural production in Africa, Mr Rufus Ebegba of the Nigeria National Biosafety Authority, an agency of the Federal Ministry of Environment, stated that the Biosafety Law will ensure the establishment of regulatory body for GM crops or food items in the country.

He dispelled fear that the crops were harmful to health and environment.

Mr Ebegba who was presenting a paper entitled 'Agricultural Biotechnology and the regulatory environment' also said the endorsement of the bill will help to quell what he call "GM suspects" in the country, a term he implied that GM crops are already being imported into the country but cannot be stopped because the importers have met the import duty conditions.

Also corroborating him, a renowned, Professor at the oxford University, United Kingdom, Prof. Chris Leaver, as much as other experts, agree that GM crops are time-tested and hold the midas for the food security quest of African states.

Prof Leaver while presenting a paper at the Media Fellowship, entitled 'Fundamentals of Genetic Modification', dispelled the doubts and fear thus, "The resulting plants are thoroughly tested to check against health and environmental hazards."

He had averred that claims against GM crops are not healthy for the quest to feed the growing population of human people.

The Oxford University professor explained that GM is simply the transfer of genes which carry certain traits lacking in a plant such as drought tolerance disease resistance among others into that plant to enable it stand the test of time.

Interestingly, other experts have bought into Prof Leaver's 'clarion call' for public endorsement of GM crops in Nigeria, as they state that though there may be perceived risks, but feeding the increasing population of hungry and malnourished people through mass production for which biotechnology's Genetic Modification guarantee was the paramount issue for now, and also a major way to secure the future of the nation.

END

Addressing gaps in biotechnology in the country

By Ojoma Akor

It is no gain saying Biotechnology is the answer to the country's many problems. Agricultural Biotechnology in particular will boost food production, create jobs, better medicine, among other benefits, however, there are factors hampering effective biotechnology practice in the country.

The non-passage or delay in passing the Bio- Safety Bill into law is one of them. This has not only prevented activities in the area of research especially in genetic engineering but also stopped consumers' access to genetically modified crops.

According to Andrew Iloh , a Research Fellow of the BIOTECH Advanced Lab Sheda Science and Technological Complex in Abuja on Tuesday, during a field trip by a delegation of Biosciences for farming in Africa(B4FA)team and journalists, a colleague of his is carrying out research in plant in the area of genetic engineering but has to halt it because the bio-Safety law has not been passed.

If the law is passed things will be a lot better and scientists will be free to work on what will change our lives.

Another reason is that our biotechnology laboratory so far are not well equipped or at par with the those in the developed nations . For instance, at the Tissue Culture Laboratory at the National Biotechnology Agency (NABDA) yesterday there was no light. Dr Toyin Solebo, Head of the Tissue Culture Lab said the irregular light prevents them from carrying out some research or experiments in the lab.

Also at the BIOTECH Advanced Lab Sheda, they only had one Polymerase chain reaction(PCR) machine. PCR is a quick test to determine if the regenerated transgenic cells or plants contain the gene. Scientist in the country also require more training in biotechnology.

Another problem is the poor knowledge about the concept of biotechnology among farmers and the public. There is need for massive campaigns to enlighten them especially those at the grassroots.

Our scientists are also not well supported. There is need for more sponsorship of scientific and biotechnology projects and research by Government and better remuneration for scientists.

The myths and fallacies of those who oppose GMOs is another challenge as they indoctrinate the general public against them. More voice should be given to proponents in different Fora like the mass media, seminars, tours and trips, publications, social media among others.

Unless this gaps are addressed while quest towards effective biotechnology, application will be poor.

Prize winners

Small prizes for the best reporting were awarded to the following media fellows for pieces produced during the workshop:

Magdalene Ukuedgor – Bio-Technology: Enticing The Young, Breaking New Grounds

Ifeanyi Nwoko – Alternative food production means: dispelling the doubts with facts

Ojoma Akor – Why we need Genetically modified foods in this country

Kayode Olaitan – Developing virile hybrid crops for sustainable food production

Kenneth Azahan – Maximizing bioscience potentials in Africa

A prize was also awarded to Nigerian Television Authority TV news journalist Blessing Abu, but for technical reasons we were unable to transfer and archive her audiovisual piece.

A prize was also awarded to the following Alumni media fellow for the quality of his piece produced during the workshop.

Eyo Charles – Time to brace up for GM products

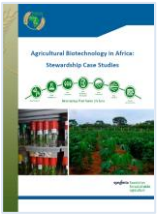
8. Material supplied to Fellows during training courses

Material distributed during courses on USB stick

AGRA: The African Seed Company Toolbox

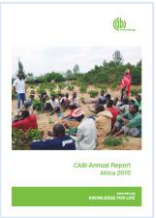
AGRA: Seeds

Academy of Sciences of South Africa: Science-based improvement of rural/subsistence agriculture



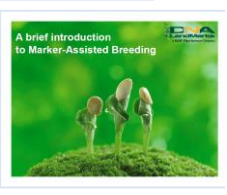
Syngenta/FARA: Agricultural Biotechnology in Africa – Stewardship Case-Studies

ASARECA Newsletter: The Agri-Forum



CABI Annual Report

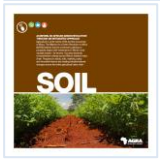
ATPS Policy Study: Why Informal Seed Sector is Important to Food Security



DNA Landmarks: A brief introduction to marker-assisted breeding

Oregon State University: Advanced Plant Breeding course

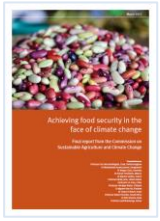
Collard & Mackill; IRRI: Marker-assisted breeding for Rice Improvement



AGRA: Soil brochure

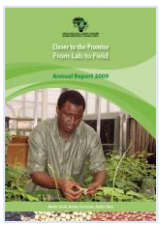
IITA: Annual Report 2011

ATDF Journal: Food Sovereignty edition



UN Commission on Sustainable Agriculture and Climate Change: Achieving Food Security in the face of Climate Change

IFPRI report: Agricultural R&D in the Developing World



AATF annual report 2009

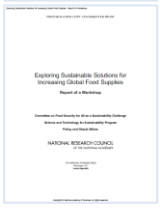
AGRA: Markets brochure

ATDF Journal: Orphan Crops issue

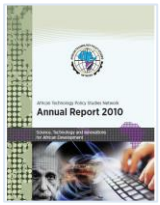
Calestous Juma; Nature, Nov 2011: Preventing Hunger – Biotechnology is key

AGRA brochure: Africa's Green Revolution

Science Africa: Volume 17

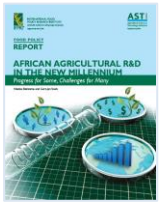


National Academies of Sciences/National Research Council: Exploring sustainable solutions for improving global food supplies



Africa Technology Policy Studies Network: Annual Report 2010

William Kerr: Food Sovereignty – Old Protectionism



IFPRI Report: African Agricultural R&D in the New Millennium

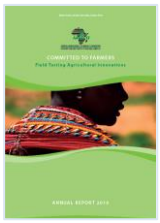
FARA Report: Inventory of Innovative Farmer Advisory Services using ICT

IITA: Research for Development Review

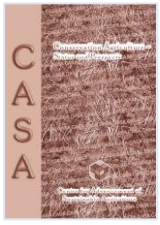
IFPRI Report: Country R&D Facts

Science Africa: Volume 15

AGRA Review 2011



AATF Annual Report 2010

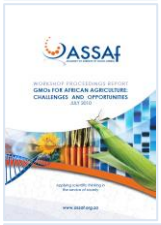


Centre for the Advancement of Sustainable Agriculture: Conservation Agriculture – Status and Prospects

University of Arizona – lecture course on Early Farming

NCERT Course on Genetics and Heredity

Bjorn Lomborg; Project Syndicate: A Golden Rice Opportunity



ASSAf: GMOs for African Agriculture – Challenges & Opportunities

EuropaBio: Pocket Guide to GM Crops and Policies

ISAAA Biotech Crops Country Report 2012: Argentina

ISAAA Biotech Crops Country Report 2012: Bolivia

ISAAA Biotech Crops Country Report 2012: Brazil

ISAAA Biotech Crops Country Report 2012: Burkina Faso

ISAAA Biotech Crops Country Report 2012: Chile

ISAAA Biotech Crops Country Report 2012: China

ISAAA Biotech Crops Country Report 2012: Colombia

ISAAA Biotech Crops Country Report 2012: Honduras

ISAAA Biotech Crops Country Report 2012: India

ISAAA Biotech Crops Country Report 2012: Mexico

ISAAA Biotech Crops Country Report 2012: Myanmar

ISAAA Biotech Crops Country Report 2012: Pakistan

ISAAA Biotech Crops Country Report 2012: Paraguay

ISAAA Biotech Crops Country Report 2012: Philippines

ISAAA Biotech Crops Country Report 2012: South Africa

ISAAA Biotech Crops Country Report 2012: Uruguay

ISAAA Biotech Cotton – Annual update

ISAAA Biotech Maize – Annual update

ISAAA Biotech Canola – Annual update

ISAAA Biotech Soybean – Annual update

ISAAA Report on Global Status of Biotech/GM Crops

EMBO reports: “Stop worrying; start growing – Risk research on GM crops is a dead parrot”

COGEM: Biotech in the news – lessons from a quantitative analysis of news articles on biotech

Morris 2011: Modern Biotech – potential contribution & challenges for sutainable food production in sub-Saharan Africa.

Kikulwe et al 2011: Attitudes, perceptions and trust – insights from a consumer survey regarding GM banana in Uganda.

The Royal Society: Genetically modified plants for food use and human health – an update

The Royal Society: Responses to call for evidence on "Reaping the Benefits – towards sustainable intensification of global agriculture"

The Royal Society: Reaping the Benefits – towards sustainable intensification of global agriculture

Sense About Science: "Making Sense of GM"

Sense About Science: "I don't know what to believe" – making sense of science stories

ACME: A guide for African Science Media Officers

ACME: Handbook of Independent Journalism

In addition we placed copies of around 50 different plant breeding and biotech videos from internet sources onto the same USB drive as the documents, since bandwidth constraints in Africa would make it almost impossible for fellows to download and watch these themselves.

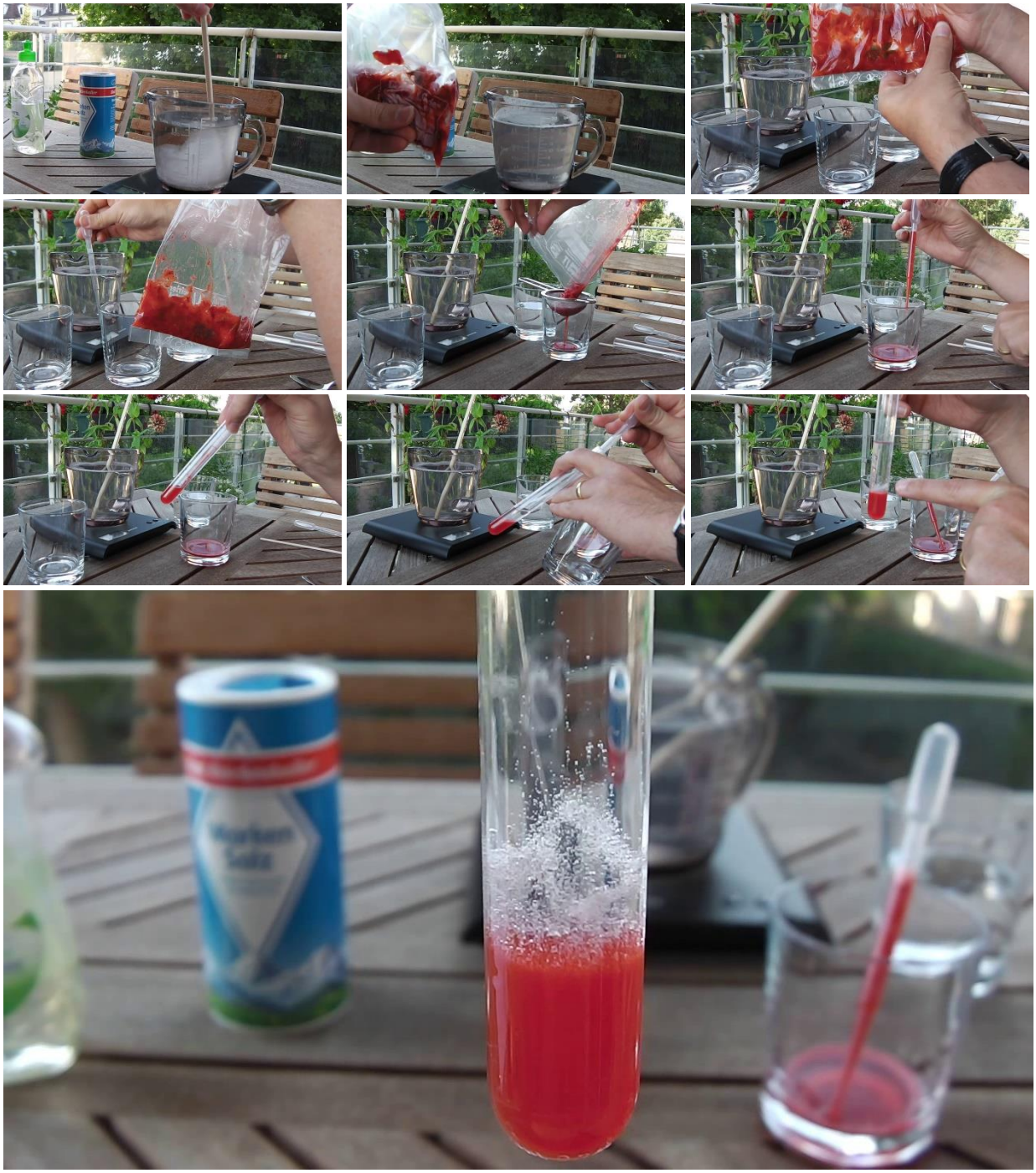
Likewise we included some basic free software (eg Adobe pdf reader, vlc media player) on the USB drive, since not all fellows had these available and would have found it difficult to download them locally.

We also included some general information about the B4FA project as well as about our funder, the John Templeton Foundation.

Games and practical exercises

DNA extraction

To demonstrate what DNA looks like, illustrate the similarity of DNA across different types of organism, and to give a small insight into the scientific process, all media fellows had the opportunity to **extract DNA** from fruit by means of a simple experiment carried out during the training workshop. Fruits selected were largely African (mango, avocado, papaya), though because it gives such clear results we did also use strawberry when the fruit was available.

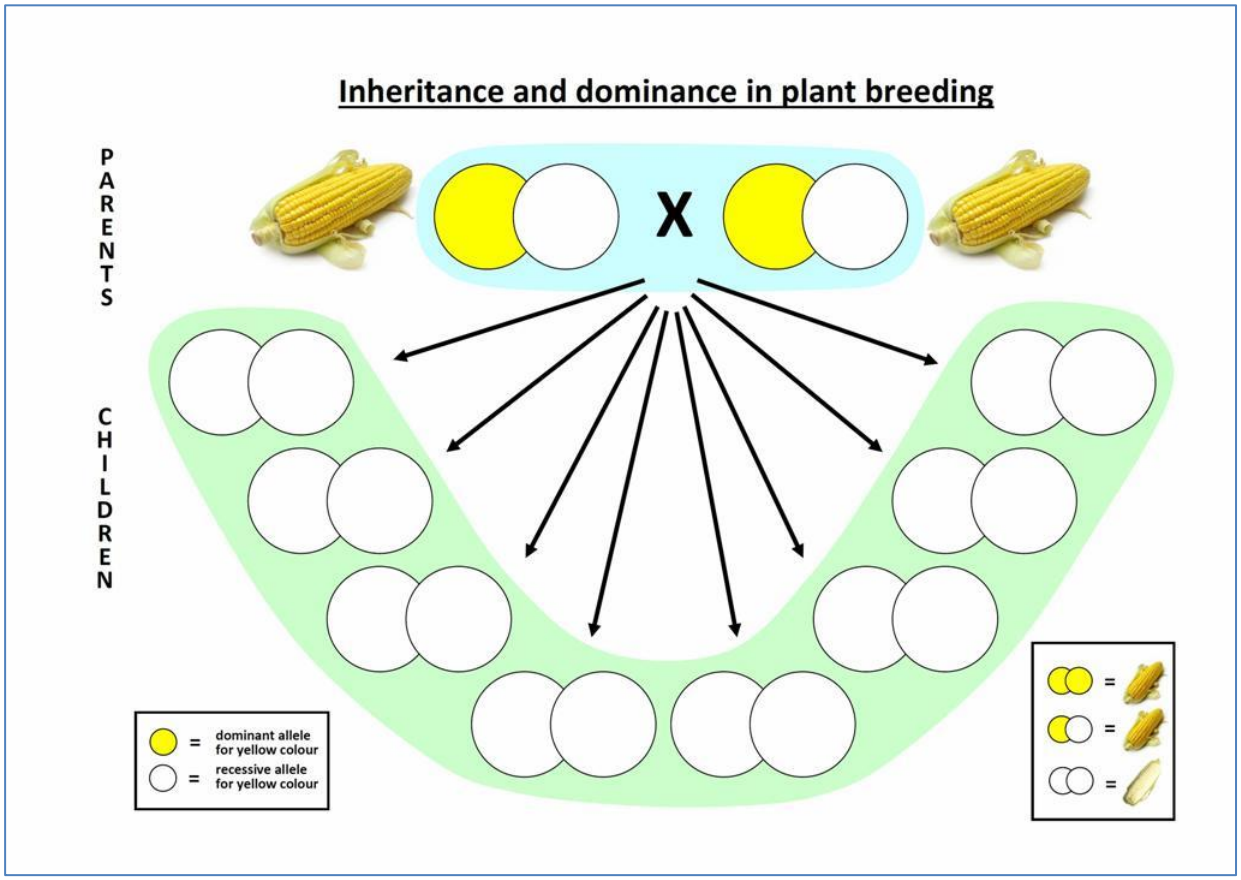


Following a simple experimental procedure (demonstrated beforehand through video – screenshots of which appear above) and mentored by B4FA staff and the research experts present, fellows prepared their chosen fruit, mixed it with the communally-prepared extraction buffer, added the ethanol and finally were able to collect the DNA they had extracted and transfer it into glass vials which they were able to keep.

Inheritance

In order to demonstrate **genetic traits**, and to enable fellows to really understand how traits are **inherited through dominant and recessive** alleles in living organisms, they were given the opportunity to work through the inheritance of a single trait in this worksheet – the trait in this example was colour in corn, which happens to be determined by a single gene, controlling for the expression of beta-carotene.

Beginning with two heterogeneous "parents", fellows were able to simulate the possibility of "offspring" inheriting alleles of either trait from each parent by drawing stickers from a bag and attaching these to the blank circles of the "offspring" generation. The bags contained a large enough sample of equal numbers of **yellow and** white stickers to ensure a near-random chance of either colour being drawn.



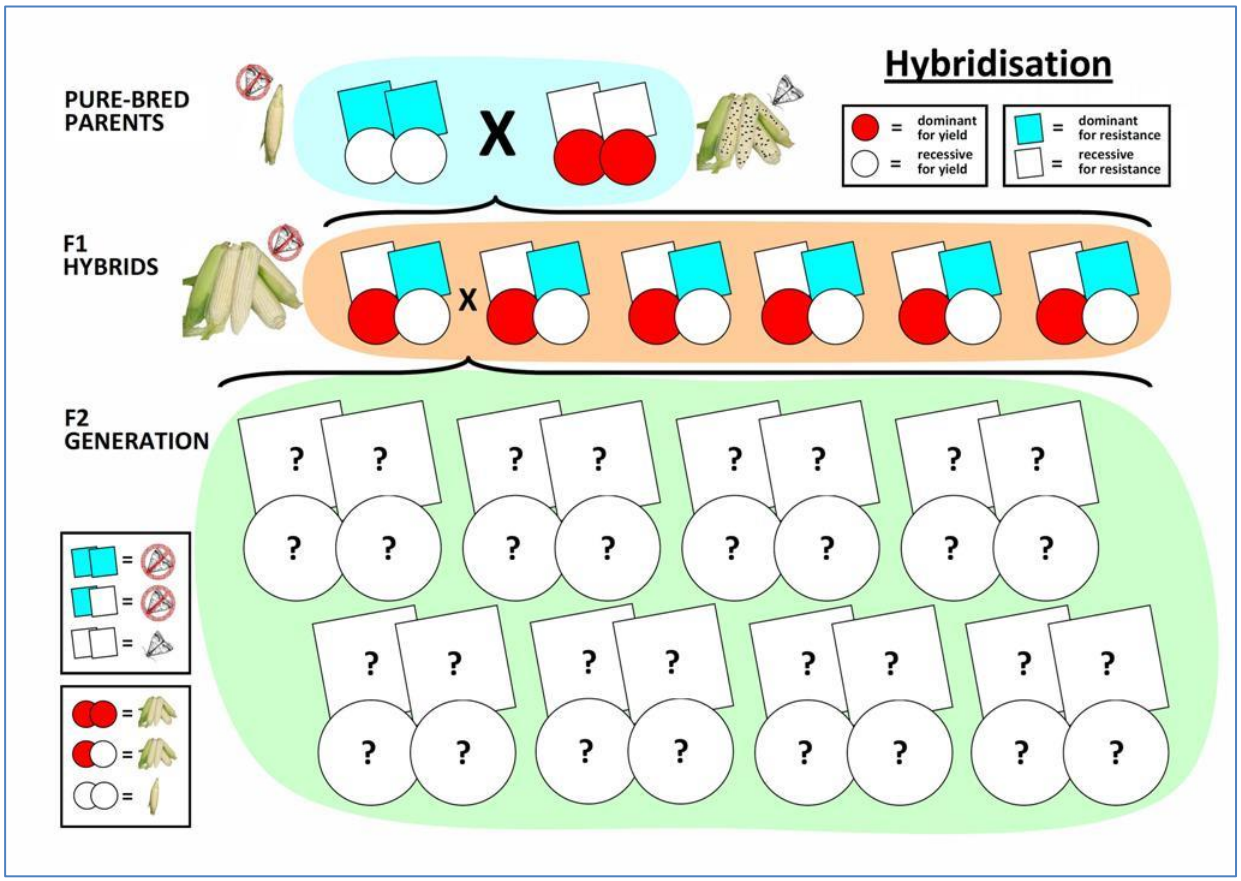
Once the worksheets had been populated with stickers, fellows were asked to identify how the colour trait would be expressed in each of the "offspring" individuals, and tot up how many of each colour there were. With B4FA and local expert mentors, they were then encouraged to compare their results with their neighbours', the expected ratio of 3:1 (and results were also totalled across the whole group to see how this compared to that ratio). Discussion was also encouraged of how these results would

seem to farmers and others who knew nothing of genetics, and might therefore be surprised to see that two yellow maize parents could have a white maize offspring.

F1 hybrid seed

In order to consolidate learning on how **dominant and recessive alleles are inherited**, and to demonstrate the genetic reasons **why saving and replanting seed from F1 hybrid plants** is not a good idea, fellows had the opportunity to work through the following F1 hybrid worksheet. Starting with the two purebred lines which are combined by breeders to produce the F1 hybrid seeds, the worksheets initially demonstrate how – through the genetics of inheritance – the F1 hybrid offspring end up with the dominant traits that breeders are trying to produce. The two traits used in this example were yield and insect-resistance, neither of which in reality is a simple trait controlled by just one gene.

The task for the fellows was then to simulate the characteristics of the F2 generation (the saved seed) that would result from crossing the F1 hybrids. Once again, the equal probability of each allele of the F2 generation inheriting either the dominant or recessive characteristic from the F1 generation was simulated by drawing stickers at random from bags containing equal numbers of each choice (one bag for each trait).

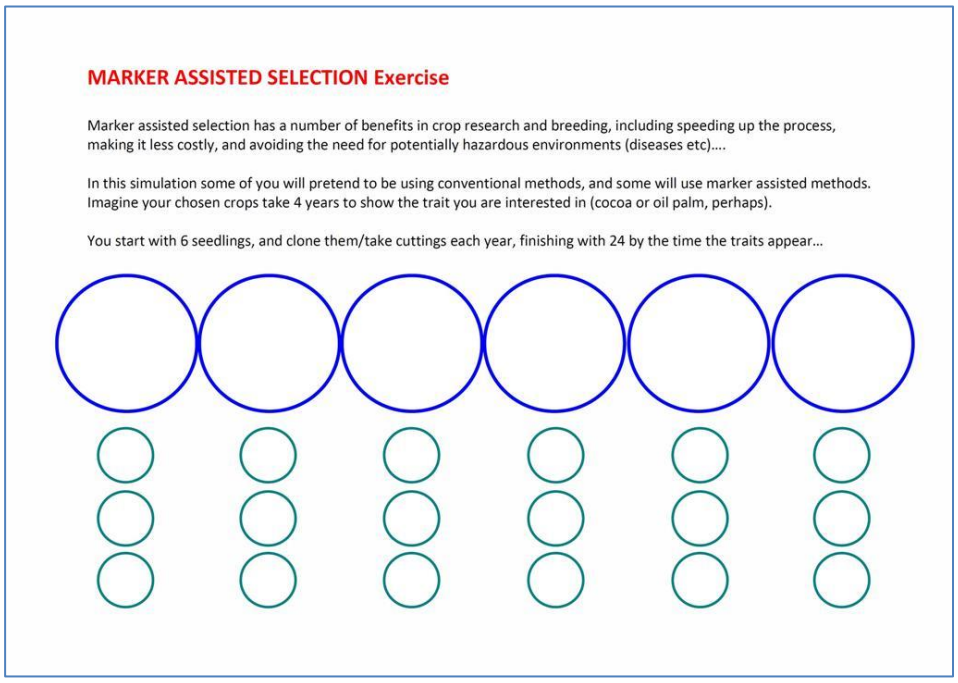


Once the worksheets had been populated with stickers, fellows were asked to identify how the yield and insect-resistance traits would be expressed in each of the F2 individuals, and tot up how many of each there were. With B4FA and local expert mentors, they were then encouraged to compare their results with their neighbours' and to reflect what this would mean to the crop productivity in the second year. Discussion was also encouraged of how these results would seem to farmers and others who knew nothing of genetics, and also to reflect on the fact that by saving seed, some of the resulting

plants will, because of the genetics of inheritance, have neither of the two traits that their F1 parents uniformly possessed.

Marker-assisted breeding

In order to demonstrate the value to plant breeders of **marker assisted selection**, fellows were given the opportunity to work through an interactive exercise to demonstrate the principles, in greatly simplified form. Given a scenario in which a crop takes four years to express the trait breeders are trying to produce (a fruiting tree species, for example), fellows were divided into two groups of "breeders". The seeds/crops were represented by small uninflated balloons containing a small sphere (the "DNA" for our simulation. Half the balloons contained a glass marble (trait missing) and half contained a steel ball bearing of the same size (trait present). One group – the conventional breeders – were asked to choose six specimens (balloons) to breed at random or visually; the other group – the marker assisted breeders – were given a marker test (a card into which a flat magnet had been glued) to help them select their six specimens. Each balloon was placed in a large circle on the worksheet. For each of the three subsequent "years" of the simulation they were asked to represent the effort, cost and time of raising the plants by sticking a small sticker of the same colour as the balloon in the next line below it.



After three repetitions, in the following growth year, fellows were told that the traits were expressed (in the fruit) so it would now become clear to the breeders what their results were. Candidates simulated this by removing the contents of the balloons and noting if they were glass or metal. Fellows were encouraged to share their results with their neighbours, and then publically to share their results with members of the other "team". Supported by B4FA and local expert mentors, they were then encouraged to reflect on how use of the marker techniques gave breeders confidence of productive results (simulated by 100% or near 100% results on the marker-assisted team) compared to the greater variation of results on the conventional breeding side (from 0% to 83%). They were further encouraged to consider what this variation in results meant in the context of the scarce funds and resources that had been used over the four years of the game, and the extent to which these had been wasted.

Public accepatability of GM

In a small group discussion environment, fellows were encouraged to discuss likely **attitudes of their fellow citizens towards GM products** in the context of the results of public opinion research carried out in Uganda in 2011.

The results below are from public opinion research carried out in Uganda in 2011. How would the public react to GM products at the market or supermarket in your country now? Why?

Table 2
Factor analysis loadings for consumers' Answers to perception and attitudinal statements.

No.	Statements were obtained using a five-point Likert scale ranging from strongly disagree to strongly agree	Agree or strongly agree (%)	Factor loadings for perceptions		
			Benefit	Food and envir. risk	Health risk
1	I would buy GM banana bunch if it was sold at the same price as a non-GM banana bunch, but was much more nutritious.	92	**0.73**	−0.16	−0.30
2	I would buy a GM banana bunch if it was sold at the same price as a non-GM banana bunch, but tasted better.	90	**0.70**	−0.17	−0.32
3	I would buy a GM banana bunch if it was sold at the same price as a non-GM banana bunch, but was produced with fewer pesticides.	78	**0.57**	−0.17	−0.29
4	I would buy a GM banana bunch if it was cheaper than a non-GM banana bunch.	79	**0.56**	−0.24	−0.31
5	If the majority of the Ugandan people are in favor of GM food, it should be legalized.	87	**0.49**	0.16	−0.13
6	I would buy a GM banana bunch if it were more expensive than a non-GM banana bunch	39	0.34	−0.21	−0.11
7	Information about food safety and nutrition on food labels can be trusted.	51	0.27	0.14	−0.15
8	The government effectively monitors the correct use of GM in the medical, agricultural, and other sectors.	69	0.24	−0.21	−0.05
9	I think the additives in food are not harmful to my health.	57	0.24	0.12	−0.07
10	The risks associated with GM food (if any) can be avoided.	82	0.18	0.10	−0.08
11	When humans interfere with nature, disastrous consequences result.	25	0.05	**0.61**	0.07
12	Among the risks we presently face, those impacting food safety are very important.	64	−0.03	**0.55**	−0.18
13	If something went wrong with GM food, it would be a global disaster.	92	0.00	**0.51**	0.22
14	The government should spend more money to increase food safety.	83	0.29	**0.50**	0.05
15	Humans are harshly abusing the environment.	54	0.02	**0.50**	0.17
16	Pesticides and fertilizers are dangerous to our environment.	74	−0.11	**0.40**	0.10
17	We can only eradicate the diseases and pests that attack crops using GM technology.	48	0.26	−0.32	0.02
18	Harmful environmental effects of GM crops are likely to appear in the distant future.	36	0.18	0.11	**0.66**
19	Harmful human health effects of GM foods are likely to appear in the distant future.	35	0.15	0.08	**0.62**
20	Even though GM food may have advantages, it is basically against nature.	36	−0.05	0.13	**0.41**
21	Eating GM food would harm me and my family.	26	−0.08	−0.07	**0.41**
22	GM technology should not be used even for medicinal purposes.	27	−0.11	−0.12	0.36
	Percent of variance explained (93 percent)		36	30	27
	Cronbach's alpha (α) coefficient		0.79	0.62	0.60

Note: Loadings in bold are values of 0.4 and above.

9. Conclusions and recommendations

The training workshop was successful.

Retaining the most successful aspects of the first round workshops, and adding in targeted training and engagement activities to meet specific learning needs, has resulted in an effective model that we shall apply to each of the future workshops we run. It was noteworthy how flexible the model proved to be in the face of transport disruptions we faced in Abuja.

There is a good balance now between the formal learning and interactive aspects, and while participants would always like more time, feedback shows that the format is achieving its goals. The new training components, such as the targeted session on hybrids, have proved to be successful at addressing those specific misunderstandings.

Having the alumni fellows participating in a second round of training also demonstrates the value of consolidating their learning through repetition. It was striking the degree to which after just six months the alumni fellows were prepared and equipped to mentor their colleagues in the second round intake, and indeed several of the Nigerian alumni have become real experts and advocates in their own right now for agricultural biotechnology.

Fellows expressed a desire to interact more with their colleagues in other African countries, and this will be built into the follow-up process.

10. Presentations delivered in training course

Introduction

Dr Bernie Jones – B4FA Media Programme Director

Biosciences for Farming in Africa

Media Fellowship Programme
Round 2
Training Course Outline

Welcome

Professor Brian Heap
B4FA Project Leader

B4FA – The Project

- 3 years long
- Encourage dialogue and understanding
  - Biosciences
  - Farming
  - Africa

Funders

- John Templeton Foundation
  - focus on the big questions of human purpose and ultimate reality. The Foundation takes a particular interest in how major advances in genetics might serve to empower individuals, leading to spiritually beneficial social and cultural changes.
- Malaysia Commonwealth Studies Centre
  - focuses on affordable education, affordable healthcare, sustainable development, food security, mitigating climate change, the promotion of electoral democracy and good governance.

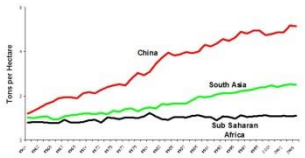
Sir John Templeton 1912 – 2008

- As a pioneer in both financial investment and philanthropy, the late Sir John Templeton spent a lifetime encouraging open-mindedness
- In 1999, *Money* magazine called him - "arguably the greatest global stock picker of the century"
- Sir John's passing was marked by *Nature*: Templeton was a deeply spiritual, although unorthodox, individual. He lived a life firmly rooted in the Christian traditions of modesty and charity. Yet he was also a great admirer of science....which led him to form his foundation in 1987

Project Rationale

- Philanthropic objectives of our funders
- Global factors
  - Population growth, climate change, food security
- National importance of agriculture in Africa
- Opportunity for socioeconomic development
- "Missed" green revolution

What green revolution?



What's happening on the ground?

- Lots of
  - Research Initiatives
  - Development Projects
- But
  - Low/irregular funding
  - Little dialogue and public understanding
  - Disinformation

B4FA

- *Insights*
- Media Development Fellowships
- Series of studies on agricultural extension services and innovation farms
- Finding synergies with others

Course Expectations

- Introduction to plant breeding, genetics, and agricultural biotechnologies
- Networking and dialogue with African experts and practitioners
- Discussion of the regulatory and commercial aspects of biotech and crop improvement
- Practical sessions and field trips
- Reminder of fundamentals of science journalism
- Opportunities to practice journalistic techniques and skills in mentored environment

Follow-up

- After this training course?
  - Fellowship is ongoing!
- Our expectations of you?
  - Engage in discussions, networking and other activities
  - Write/broadcast more about the issues, and let us know about it

Housekeeping

- Format of each day
- PLEASE no mobiles or emails in sessions
- Be on time – we cannot wait
- Attend all sessions
- Expenses settlement on final afternoon
- Prizes awarded at end of course
- Use free time for interviews, discussions etc

Introductions

Over to You!

2013 fellows, 2012 alumni, experts, staff

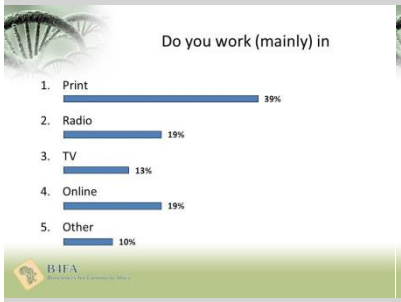
Our interactive system

- Chance to poll our participants
- Get instant feedback
  (don't always show answers)
- Up to 5 options – identified by number

Let's practice...

In which capacity are you here?

1. 2013 Media Fellow — 53%
2. 2012 Media Fellowship alumni — 21%
3. Scientific Expert — 15%
4. Mentor — 9%
5. Workshop staff — 3%


Do you work (mainly) in
1. Print
39%
2. Radio
19%
3. TV
13%
4. Online
19%
5. Other
10%
BIFA


Coffee Break Exercise
• What are the biggest challenges in agriculture in this country
• What do you want to learn/develop from this workshop?
• Write your answers on a post-it and stick it up
BIFA

Plants and Agriculture – a history

Dr Bernie Jones – B4FA Media Programme Director

Plants and Agriculture – a history

Bernie Jones

BIFA

What do you know about farming?

1. I am a farmer — 16%
2. I grew up and/or have lived in a farming community — 36%
3. I am a city person, but members of my family farm — 36%
4. I have no experience of farming — 8%
5. What's a farm? — 4%

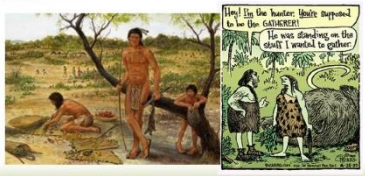
BIFA

When did people start to farm?

1. People have always farmed — 88%
2. Around 10,000 years ago — 12%
3. Around 5,000 years ago — 0%
4. Around 2,000 years ago — 0%
5. Around 500 years ago — 0%

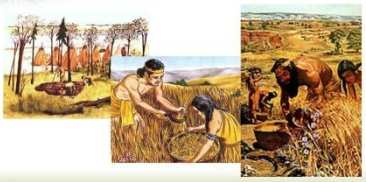
BIFA

How did it start?



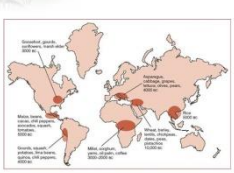
BIFA

Early Farming



BIFA

Domestication



BIFA

When? Why? How?

9000BC Wheat/barley, Fertile Crescent
8000BC Potatoes, South America
7500BC Goats/sheep, Middle East
7000BC Rye, Europe
6000BC Chickens, South Asia
3500BC Horse, West Asia
3000BC Cotton, South America
2700BC Corn, North America

BIFA

Diversity & Traits

Living things are variable

(This is genetics!)

BIFA

Selection

BIFA

Selection

- Early farmers discovered they could select better traits in their crops
- This becomes a continuous process

BIFA

Selection

Crops already "genetically engineered" over 1000's of years…

BIFA

Change: mutation & crossing

- Natural mutations and crosses
- Selection for desirable traits
- Deliberate crossing/hybridisation

BIFA

Deliberate plant breeding

- Realisation that attributes of plants could be deliberately influenced
- Launched plant breeding as necessity (disease) and "pastime"
- Gradual realisation that there must be principles underlying this process
- Constant searches to find new plant material for cross-breeding

BIFA

Breakthrough of "genetics"

- Could observe some underlying principles…
- Led to gradual understanding and discovery of genetics and inheritance. More of this in next session
- But allowed breeding, and breeding process, to become much more focussed and productive

BIFA

Where are we today

- All our crops are "modified" in some way
- Plant breeding and selection have been basic way of life for farmers for millennia
- Techniques have developed over time
- Current technological options just part of this continuum
- Risks from traditional breeding?

BIFA

Agricultural systems

- Crop rotation
- Sustainable agriculture
- Sustainable intensification
- Organic

But these are all potentially complementary techniques, not alternatives

BIFA

Colonisation, migration and agriculture

- Centres of origin vs most productive zones now

- Why are Africa's staple crops what they are?

BIFA

Which of these are "African" crops?

1. Cassava 23%
2. Maize 0%
3. Sorghum 9%
4. Cocoa 14%
5. Oil palm 54%

BIFA

Which of these are "African" crops?

1. Pearl Millet 49%
2. Mango 9%
3. Rice 0%
4. Sugarcane 11%
5. Cotton 31%

BIFA

Modern-day crops/foods

- Are often not indigenous
- Have (in the main) been significantly altered by humans over 1000s of years
- And are therefore "genetically modified" (but are NOT GMO's)

BIFA

Genetics/Breeding recap

- Natural (genetic) variety/diversity in crops
- Selection (natural, accidental, deliberate)
- Mutation (environmental, genetic)
- Crossing & hybridisation (natural, deliberate)

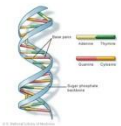
GENETICS!

BIFA

Recap

- Agric practices and environments complex
- Planting material/crops complex
  - "natural breeding"
  - deliberate and accidental breeding
  - constant process
- No silver bullets

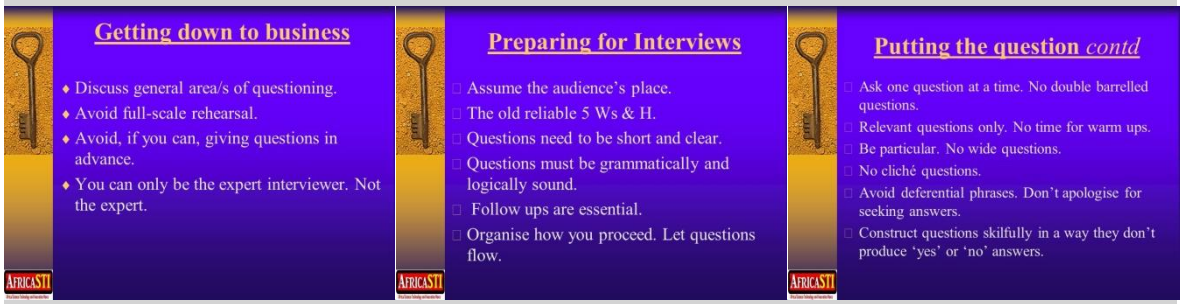
BIFA

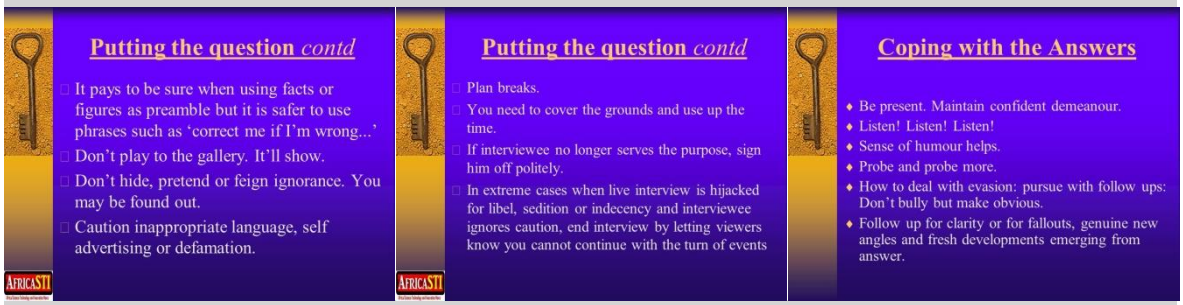


BIFA

Interviewing and science journalism

Diran Onifade – African Federation of Science Journalists





Coping with the Answers

- Rephrase and repeat question if you have to.
- Let the expert be the expert. That is your own expertise!
- Do not argue. Do not debate.
- Show respect but be in charge of the proceedings.
- Do not respond to personal insults or slights in kind. At least not on camera.
- Let interviewee land.
- Politely but firmly cut off long-winding or rambling answers.

AFRICASTI

Why engage in discussions on biotechnology?

- Huge benefits
- Perceived risks
- Choices must be made from informed points of view
- Hence, importance of Communication with Society from a balanced perspective

Coming soon…

Thank You

Introduction to Genetics

Prof Chris Leaver – University of Oxford

Today we'll be talking about...

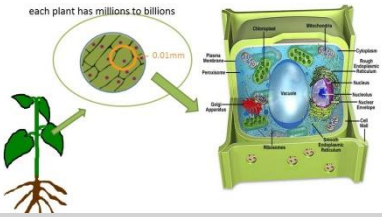
- Plant breeding

- DNA

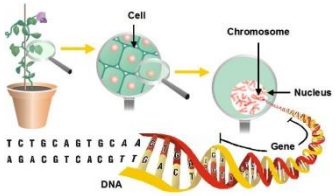
... and you'll be extracting DNA!!! ...

The Plant Cell

each plant has millions to billions



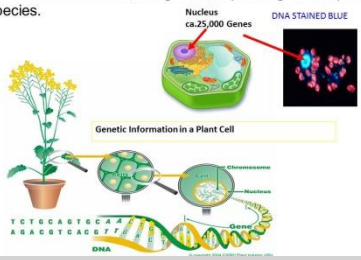
This morning you will extract DNA: the language of life



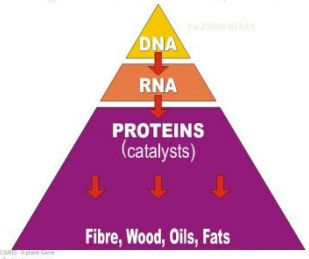
What does DNA do?

- DNA contains all the instructions an organism needs to grow and function.

DNA is found in the nucleus of each plant cell which contains about 25-30,000 genes, depending on the plant species.

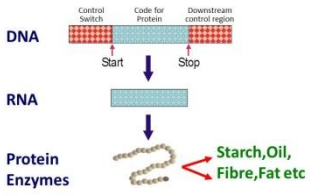


A gene is a code for a protein



The set of genes is the master plan which controls all aspects of the growth and development of a plant throughout its life cycle

What is a gene? -A gene is an inherited segment of DNA that contains the code/information for an individual protein molecule



DNA is a made up of a code

The **building blocks** of DNA have the initials

A T C G

T A G C

which forms a code

What do genes do?

- Genes are pieces of DNA that code for a particular function or trait
- E.g. eye colour, drought tolerance.

Humans have around 25,000 genes
Barley has 30,000 genes
Wheat has 100,000 genes

Genes are part of our diet

On an average day you would eat

20 000 000 000 000 000 Genes

Gene Isolation by standard techniques of molecular biology

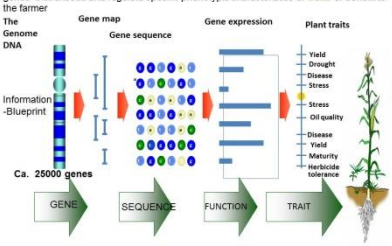
The first step is to isolate DNA like you did today.
Then cut the DNA into gene size pieces with special enzymes and separate them from each other and identify the genes and what they do.
The trait or characteristic which they contain the information for which will be of use to the farmer..

The scientific basis of all crop improvement is the identification of the genes that encode and regulate specific phenotypic characteristics or **traits** of benefit to the farmer

Yield
Tolerance to drought and heat
Flowering time?

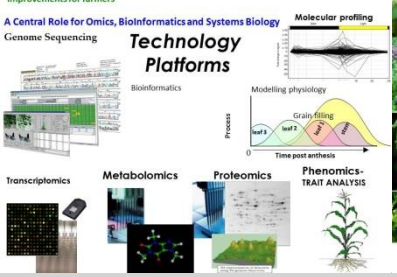
Nutrition
Taste
Tolerance to Pests and Diseases

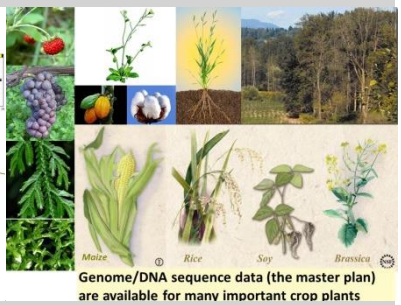
Conventional Plant Breeding has been very successful but historically it has been an imprecise art.The new molecular technologies including genome sequencing are changing this.The scientific basis of all crop improvement is the identification of the genes that encode and regulate specific phenotypic characteristics or traits of benefit to the farmer



The Challenge: Finding the genes that provide the foundation of new traits and crop improvements for farmers

A Central Role for Omics, BioInformatics and Systems Biology





Genome/DNA sequence data (the master plan) are available for many important crop plants

The current challenge is to identify the genes that underlie the traits and then combine native traits using molecular markers and/or GM to improve the crop.

Increased genetic variability is needed in crop plants to allow *(inter alia)*

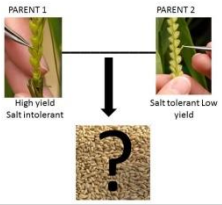
- More effective water use (drought tolerance) — Abiotic
- Growth on marginal soils (salinity, pH, metal toxicity) — Abiotic
- More effective fertilizer use
- Increased tolerance towards temperature stress
- Increased flooding tolerance
- Cope with weeds
- Avoidance of losses through pests (insect, bacterial fungal, viral) — Biotic
- Improve nutritional quality — Health

Building Increased Productivity and Sustainability into the Seed by Plant Breeding and Biotechnology

The scientific basis of all crop improvement is identification of the genes that encode and regulate specific phenotypic characteristics or traits of use to the farmer:

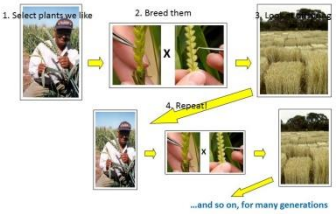
Genetic modification by marker assisted breeding (MAB) and GM technology where appropriate:

Conventional plant breeding



Put the offspring in the field!

How do we make new varieties?

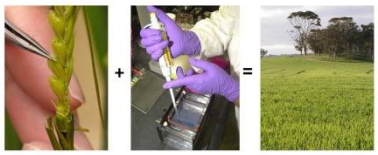


Plant breeding process

1st cross — Commercial production

Approx. 14 years

Plant breeding process



1st cross — Commercial production

Approx. 8 years

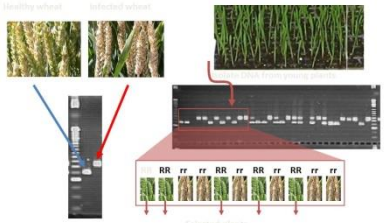
Limitations of classical plant breeding

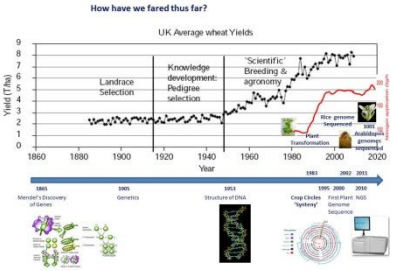
- **SLOW!**
- **Limited by genetic variability that is present within sexually compatible plant species**

Molecular markers

Like 'signposts' or 'flags' in the DNA that tell us what the phenotype will be.

Using molecular-gene markers

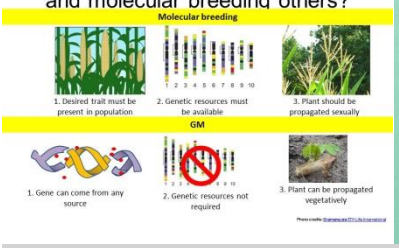




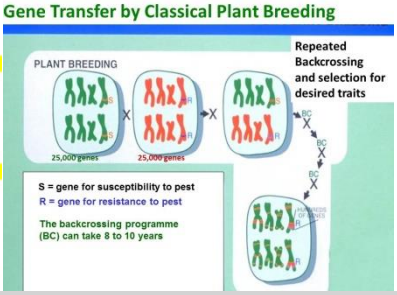
The science behind gene technology

- A gene is a code for a protein
- We can purify and reconstruct genes
- We can transfer genes to plants to introduce a useful characteristic, eg insect protection or weed control
- The resulting plants are thoroughly tested

Why are GM methods used sometimes and molecular breeding others?

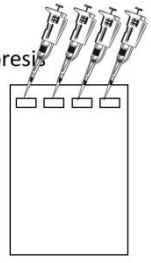


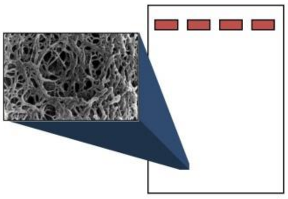
Gene Transfer by Classical Plant Breeding



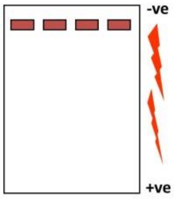
Gel Electrophoresis

» DNA samples are put in a gel – which acts as a sieve

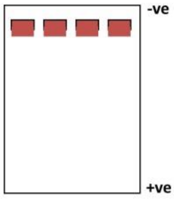




- DNA samples are put in a gel – which acts as a sieve
- The fragments are "pulled" through a gel by electric current



- DNA samples are put in a gel – which acts as a sieve
- The fragments are "pulled" through a gel by electric current
- Smaller fragments move fastest



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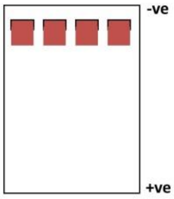

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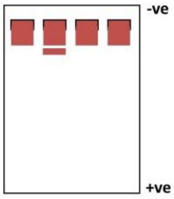

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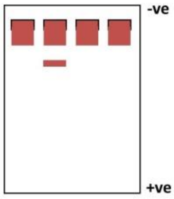

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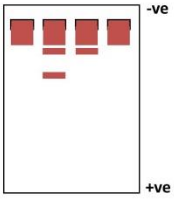

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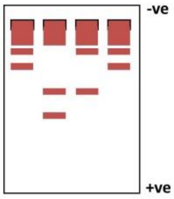

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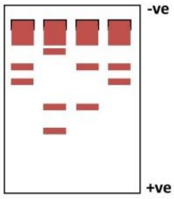

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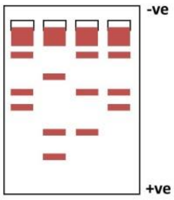

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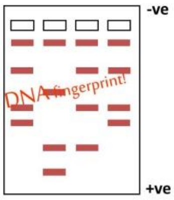


Practical – DNA extraction

Dr Bernie Jones – B4FA Media Programme Director

DNA Extraction

What you will do

- Some real science!
- Perform an experiment yourself right here to extract the DNA from fruit
  - You could use the same method on almost anything alive (including yourself) – but it works nicely with fruit, and hurts less!

Experimental Steps

- First, make the extraction solution ("buffer")
- Second, prepare (mash) the fruit
- Third, add the buffer to the fruit
- Fourth, extract the DNA with alcohol
- Fifth, try to pick up some DNA to keep!

What you will need

a plastic cup
a test tube
a pipette
some fruit
a plastic bag
a strainer (to share)

a glass phial to keep the DNA in

All clear?

Let's watch me trying it at home...

Making up the extraction solution (buffer)

Preparing the fruit

Adding the extraction buffer

Straining the solution

Extracting the DNA

Final result

Now
It's
Your
Turn!

Well done!

- You've performed an experiment
- You have extracted DNA
- You have seen how DNA from different plants looks the same

...and now:

- Some quick feedback please
- We'll do this at the end of every session
- Results will NOT be displayed on screen, so please be honest and forthright
- Chance for written feedback at end of course
- We'll ask you about the History, Genetics and DNA Extraction sessions

F1 Hybrid seeds

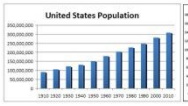
Dr Claudia Canales Holzeis – B4FA Technical Expert

F1 Hybrids

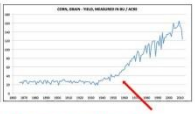
Claudia Canales

The need for more food

U.S. population growth in the last 100 years



U.S. maize yields in the last 100 years

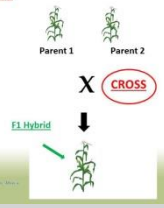


8-fold increase in maize yield thanks to:

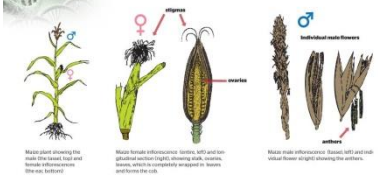
- F1 hybrids
- Fertilisers
- Mechanisation (tractors)

What is a maize F1 hybrid?

The first generation (F1) of a cross between from two uniform parent inbred lines



Maize reproduction



Controlled crosses

- Each kernel in a cob is a genetically unique individual
- Kernels in a cob have the same mother, but can different fathers

A maize cross protected by a bag.

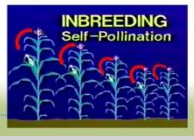
How do you make an F1 hybrid?

How do you make an F1 hybrid?

3 steps

1: Development of parental inbred lines

By self-pollinations until a good degree of uniformity is achieved. Selection for type and good parent potential is done as the lines are inbred.



Inbreeding depression

How do you make an F1 hybrid? Cont.

2: Test crossing: sets of two inbred lines are crossed (uniformly, with no selfing allowed)

Hybrid vigour

How do you make an F1 hybrid? Cont.

3: Production crossing: commercial production of F1 hybrid seed. Expensive and labour-intensive.

What are the advantages of F1 hybrids?

- It is uniform in appearance and behaviour:
  - enables farmer to treat and harvest crop at the same time uniformity
  - has marketing advantages when sold to buyers with strict quality standards)
- It has hybrid vigour (makes them more competitive with weeds)
- It is high yielding
- It is selected for improved grain quality
- A particular hybrid can be selected for specific pest and disease resistance or drought tolerance

What is hybrid vigour?

- F1 hybrids tend to have greater biomass, speed of development, and fertility than both parents
- Hybrid vigour is positively correlated with the degree of dissimilarity between the parents
- Why? Hypotheses:
  - masking of expression of undesirable (deleterious) recessive alleles (alternate forms of genes) from one parent
  - some combinations of alleles are especially advantageous when paired in a heterozygous individual.

Maize F1 hybrids

Game introduction

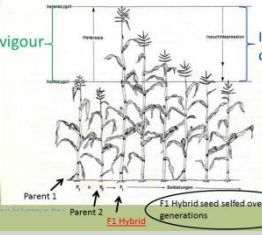
- F2 generation of hybrid seed – variability and consequences

What are the disadvantages of F1 hybrids?

- Hybrid seed is more expensive than open-pollinated maize seed
- Farmers situated in a low potential environment and who cannot afford extra inputs such as fertilizers may not recover the costs of the hybrid seed
- Fresh hybrid seed needs to be bought every planting season (farmers cannot replant grain as seed without major reductions in yield, which might be a decrease of 30 % or more)

What are the disadvantages of F1 hybrids? Cont.

Hybrid vigour



Inbreeding depression

F1 hybrid seeds vs landraces

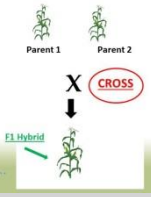
- Genetic uniformity can be a problem if the conditions are bad (such as extreme weather conditions, new pest or disease)
- Traditional landraces are genetically very variable, and hence more resilient, although yields are lower
- Landraces are invaluable sources of genetic diversity

Consequences of hybridisation

- Bought seed vs seed saving
- (Lack of) ability of individuals or government research institutions to produce in desired quantity and quality
- F1 hybrid production closely linked to the creation of private seed companies for commercial seed production (public versus private investment in plant breeding)

F1 hybrid seeds are not GM!!

Why? Because they are produced by crossing two non-GM plants.



F1 Hybrid Quiz!

- Three quick questions for you!

History of Breeding: Overall value of the session

1. Hybrid seeds are GM (genetically modified) 25%
2. You cannot save seed for replanting because it is sterile 25%
3. Hybrid seeds are always better than common farmers varieties (landraces) 25%
4. Hybrid seeds are produced by crossing two conventionally bred maize lines 25%

20 / 50
Cross-tab label

You cannot save seed of F1 hybrids for replanting because you lose the hybrid vigour, the uniformity of the crop, and potentially important characteristics

1. Yes 50%
2. No 50%

0 / 50
Cross-tab label

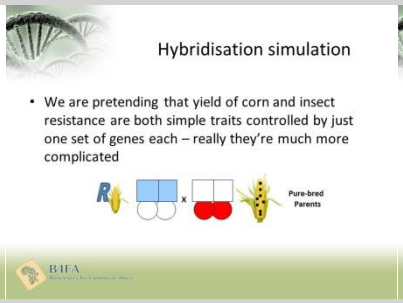
F1 hybrids are not GM plants because they have been generated by crossing

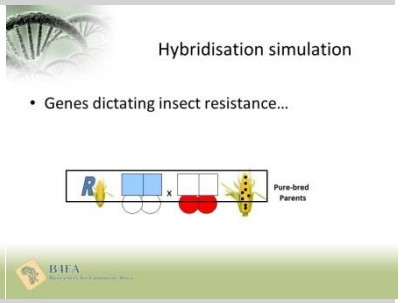
1. Yes 50%
2. No 50%

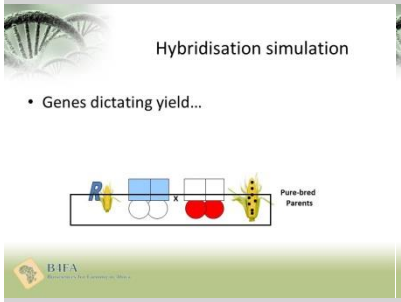
0 / 50
Cross-tab label

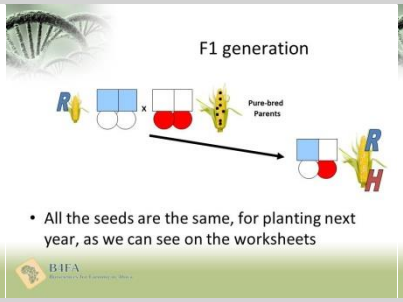
F1 Hybrid saving seed gane

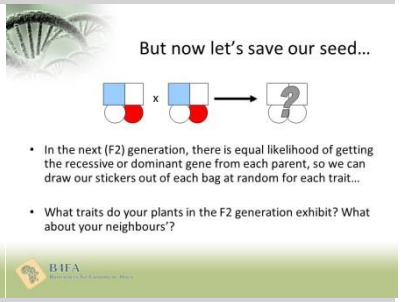
Dr Bernie Jones – B4FA Media Programme Director











Genetic Modification

Prof Chris Leaver – University of Oxford

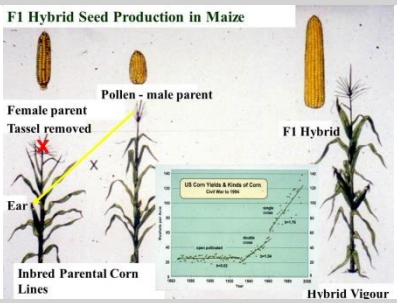
Genetic Engineering and Crop Improvement

Chris Leaver
chris.leaver@plants.ox.ac.uk

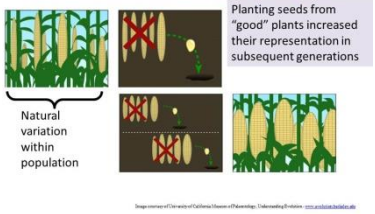
Old Byzantine Proverb:

'He who has bread may have troubles
He who lacks it has only one'

F1 Hybrid Seed Production in Maize



In Conventional Plant Breeding
Genetic modification arose as a consequence of cultivation and selection of the best plants



Planting seeds from "good" plants increased their representation in subsequent generations

World Food Supply Crisis

7.0 billion people now, 9.2 billion by 2050

•More than 850 million go hungry daily

•We don't have that much more land to grow crops on...

BREED BETTER CROPS

The Challenge :

- ***World population will grow from 7bn 2011 to >9bn by 2050***
- ***More than 50% of the worlds population already live in urban areas and it will rise to 70%***
- ***The largest increases in population will occur in megacities in Africa and Asia***
- ***Increasing affluence in Asia drives demand for meat, cereals, edible oils-the nutritional transition***
- ***Over 1bn people chronically hungry. 3 billion in poverty***
- ***Land available for agriculture will stay ~ constant or decrease***
- ***Decreasing water supplies limit crop yields***

and.....

•Climate warming is broadly neutral on global yields but will have significant negative impact on those countries with the greatest need. Leading to changes in the distribution and severity of plant pests and disease,rising sea levels,flooding,severe drought, decline in soil quality (eg erosion,salinity)

•Increase in yields of major staple crops is plateauing

•Diversion of resources into growing energy crops for biofuels rather than food crops

70- 100% more food required on same land area, with improved sustainability, fairer distribution and adaption to climate change

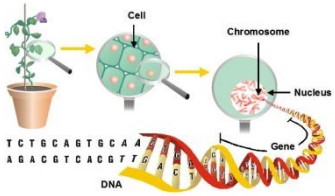
You will know that the challenges to food production in Africa are immense

- Lack of infrastructure, especially irrigation and access to transportation networks
- High incidence of plant diseases and insect pests
- Lack of available fertilizers
- Dependence on rain for irrigation
- Lack of government and industry support for research and translation into the field
- Lack of education and support for farmers
- Lack of economic supports and market stability
- Agricultural subsidies in other countries affect market value
- **Lack of improved seeds and planting material**

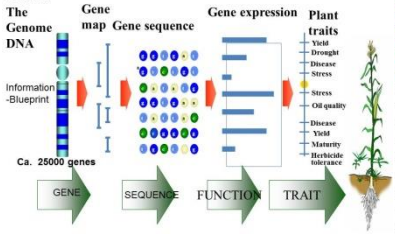
We have to increase PRODUCTIVITY

- Increasing productivity provides a livelihood for people, allowing them the opportunity to stay in their communities. This leads to local economic growth, better education, health, political stability and food stability. Implicit with increases in agricultural productivity is the more efficient use and distribution of scarce resources such as fuel and fertiliser.
- Critically, today per capita food production in rich countries is twice that of the poor nations. We must increase productivity in these countries to feed the estimated 9 billion people.

This morning you extracted DNA: the language of life



Conventional Plant Breeding has been very successful but historically it has been an imprecise art.The new molecular technologies including genome sequencing are changing this.The scientific basis of all crop improvement is the identification of the genes that encode and regulate specific phenotypic characteristics or traits of benefit to the farmer

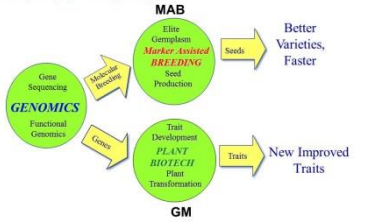


Conventional Plant Breeding has been very successful but yield gains are now slowing. The new molecular technologies allow more precise and rapid crop improvement by marker assisted selection breeding and GM approaches. This requires the identification of the gene(s) that underlie the traits and then combination with native traits using molecular markers and/or GM to improve the crop– these include:

- **Avoidance of losses from pests-insects,bacteria,fungi,viruses**
- **More effective water use-drought tolerance**
- Increased tolerance towards temperature stress
- Increased yield
- Time to maturity – shortened growing season
- Growth on marginal soils-salinity, pH, metal toxicity
- More effective fertiliser use-nutrient(NPK) eg Nitrogen use efficiency
- Increased flooding tolerance
- Competing with weeds
- Improved nutritional quality-biofortification (eg.Vitamins,Iron)
- Sustainable production with a low carbon footprint

Two routes for the delivery of new traits and crop improvement for the farmer

Genes can now be transferred more easily via marker assisted breeding (**MAB**) - **Non GM** or directly through genetic engineering - **GM**



The science behind gene technology

- A gene is a code for a protein
- We can purify and reconstruct genes
- We can transfer genes to plants to introduce a useful characteristic or trait, eg insect protection or weed control so as to prevent losses of crops due to pests and disease and increase yield
- The resulting plants are thoroughly tested

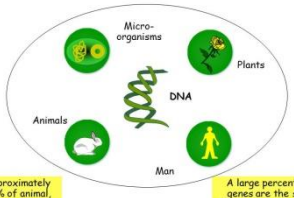
Collins English Dictionary

genetic modification — *n*

Definition: any alteration of genetic material to make an organism capable of producing new substances or performing new functions.

Also called genetic engineering, genetic manipulation, gene splicing, gene technology recombinant DNA technology

Genetic modification is the addition, alteration or removal of genetic material usually single genes, in order to alter an organism's characteristics ('traits'). The genes can be from any donor organisms



Approximately 30% of animal, plant and fungus genes are similar

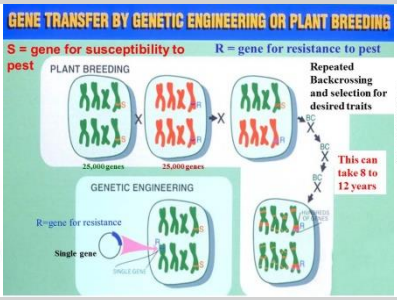
A large percent of our genes are the same as those of simple organisms such as bacteria and viruses

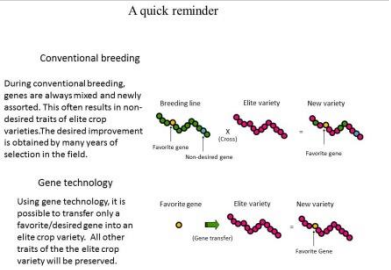
REASONS FOR UNDERTAKING ANY GENETIC MODIFICATION

1 To improve the efficiency of a plants metabolism so as to improve the "efficiency" of the plant as a whole in terms of its yield, nutritional quality or agronomic characteristics(eg height, seed size

2 To bypass some limiting stress such as intolerance to heat or cold, drought, flooding, or to improve resistance to pests and diseases

3 To change the nature of the harvested product – as a human foodstuff; to provide a product of therapeutic value; to provide industrial feed-stocks (e.g. the production of biodegradable polymers) and biofuels.





Genetic transformation of plants

The production of GM crops

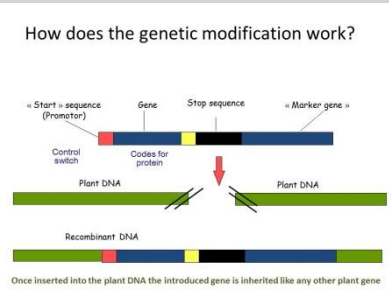
Isolate the Gene by standard techniques of molecular biology

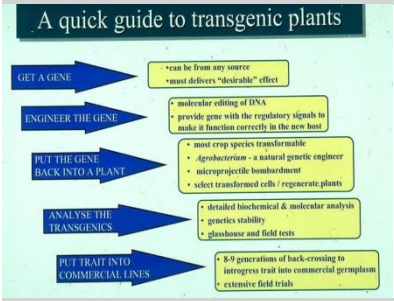
The first step is to isolate DNA like you did today.

Then cut the DNA into gene size pieces with special enzymes- 'molecular scissors'.

Separate the genes from each other and identify the genes and what they code for- ie. the protein which controls the **trait** or characteristic which you may be interested in.

Combine the gene with control sequences and make many copies of the gene by cloning.





Specificity of Genetic Modification

Identification and isolation of specific genes with defined and understood function

Insertion of specific genes into a crop species to promote desirable characters

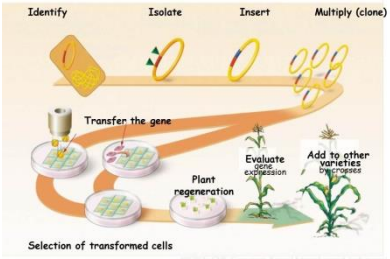
GM progeny/plants can be selected for the product or activity of specific genes with a defined function

There are no "surprises" from unknown genes transferred along with the planned cross as is the case with conventional plant breeding

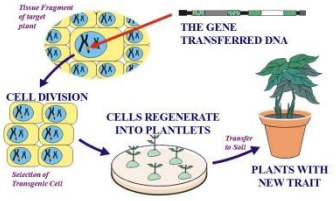
Ideal Gene Transformation Method

- Can be applied to any plant
- Produces fertile plants
- Has high efficiency
- Introduces a single copy of the gene
- Gene is stable and expressed over time /generations:that is inherited in a Mendelian manner
- No background genetic changes

The steps involved in genetic modification



Getting genes into plants



Two main methods

Agrobacterium

Bacteria that naturally infects plant cells

Biolistics

Shoot the genes into the plants!!

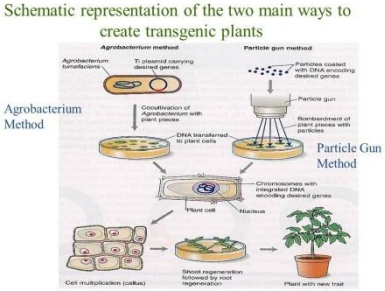
How is a gene transferred to a plant?

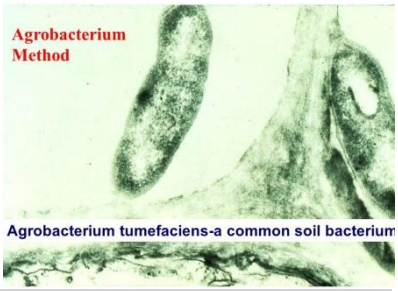
Two major methods:

1. *Agrobacterium tumefaciens*; a bacterium that acts as a "natural" genetic engineer

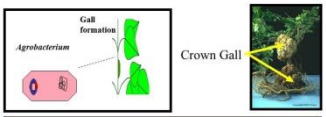
2. Biolistics; using DNA-coated metal particles

Schematic representation of the two main ways to create transgenic plants



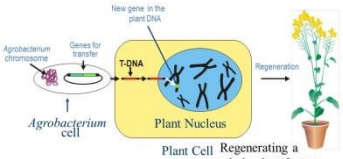


Nature's original genetic engineer

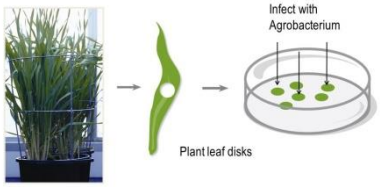


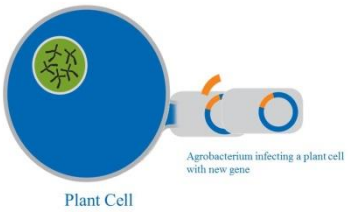
The soil bacterium *Agrobacterium* is able to infect plants and make them produce the food it needs to live on. The bacterium does this by inserting a small piece of its own DNA into the genome (DNA) of the plant. Scientist have modified this naturally occur process to make genetically modified plants.

DNA delivery to plant cells: *Agrobacterium*



Regenerating a whole plant from a single transformed cell with a new gene in it.



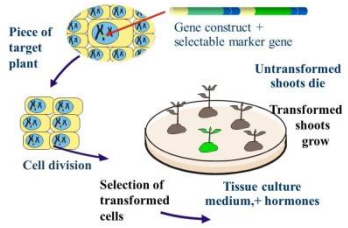


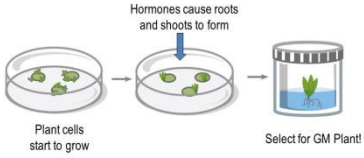
The next step

What happens after the cell has taken up the DNA?

1. Whole plants must be regenerated from that cell
2. Cells that take up DNA (transformed cells) must be differentiated from those that did not take up DNA
   - use of selectable marker gene
   - usually antibiotic resistance

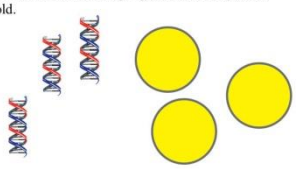
Selection of transformed plants



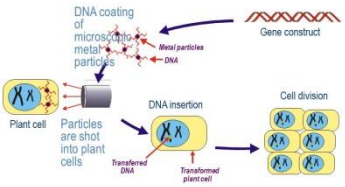


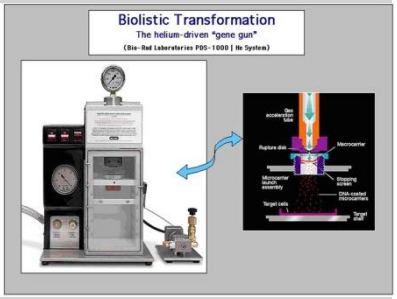
2. Biolistic Transformation

Stick DNA onto microscopic particles of tungsten or gold.



DNA delivery to plant cells: Particle Bombardment (also called Biolistics)





Advantages of Particle Bombardment

- Simple procedure
- Broad application range (relies on physical rather than genetic parameters; thus often genotype-independent)
- Transformation restricted only by competence of plant tissue to take up DNA and regenerate
- Can be used to transform organized tissues e.g. plant embryos
- Multiple genes can be introduced simultaneously
- No plasmid backbone sequences are required (clean transgene integration)

Crop Transformation

- **High efficiency transformation protocol**
- **Output > 25,000 transformed plants per year**

From laboratory to commercialisation

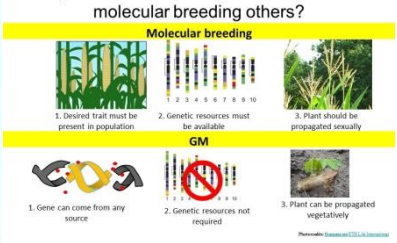
specific gene transfer in the lab. followed by subsequent testing in the field

this is the only plant breeding technology which costly regulatory approval-10-100 millions of $ (and, in some countries, labelling of all the food products derived from modified plants):

- testing for food toxicity, nutritional value, composition and allergenicity – includes animal feeding trials
- characterisation of the transferred gene as well as its effects on the host genome (DNA)
- an environmental audit as well

Development of Products of Gene Technology

Why are GM methods used sometimes and molecular breeding others?



TEN CROPS THAT FEED THE WORLD

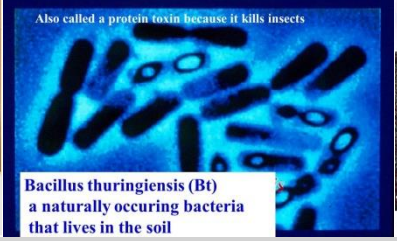
Crop (Source: www.businessinsider.com 2008 data)	Annual Production million tonnes	Average yield tonnes/ hectare	GM status	Commercial GM Products
1. Corn	822.7	5.1	Yes	Yes
2. Wheat	689.9	3.1	Yes	No
3. Rice	685.0	4.3	Yes	Yes?
4. Potato	314.1	17.2	Yes	No
5. Cassava	232.9	12.5	Yes	No
6. Soybean	231.0	2.4	Yes	Yes
7. Sweet potato	110.1	13.5	Yes	No
8. Sorghum	65.5	1.5	Yes	No
9. Yams	51.7	10.5	Yes	No
10. Plantain	34.3	6.3	Yes	No

Genetically Modified Crops in Agriculture Today

- **Input traits** of obvious benefits to producers (agrochemical companies and farmers) but not yet obvious to the consumer
- Including resistance to **herbicides, insects** and viral disease

Mature cotton boll at left was protected by a gene taken from *Bacillus thuringiensis*, whereas other bolls show damage from cotton pests.

BT CONTAINS A PROTEIN THAT KILL INSECTS



Bacillus thuringiensis (Bt) a naturally occuring bacteria that lives in the soil

ROUNDUP

Glyphosate –the most widely used weed-killer (herbicide) in the world

N-(Phosphonomethyl) - glycine

HERBICIDE RESISTANCE conferred by a single amino acid mutation in the active site of the target enzyme (EPSPS) and insertion of the gene into crops.CP4 gene derived from Agrobacterium sp.

Introduction of a bacterial gene from Agrobacterium for EPSPS with an amino acid mutation in the active site which renders the enzyme resistant to glyphosate

Genetically Modified Crops in Agriculture Today

The first generation of GM traits were designed to complement the use of agrichemicals and provide better insect and weed control

These input traits were of obvious benefits to producers (agrochemical companies and farmers) but not obvious to the consumer. These traits are now being introduced together (stacked) in Corn ,Soybean,Cotton,Canola and now Rice and other crops-----

Input traits

Corn
Glyphosate tolerance
- Foliar insect control
- Corn root worm

Cotton and Soybean:
- Insect resistance
- Glyphosate tolerance

How many more traits in one crop?

Virus control

Papaya

Canola (Oil Seed Rape)
Sugar Beet
- Glyphosate tolerance

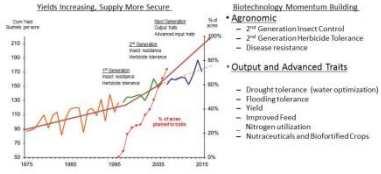
The first generation of GM traits were designed to complement the use of agrichemicals and provide better pest and weed control and involved the transfer of a single gene from a bacterium. One conferred resistance to a herbicide (**ESPS**-Glyphosate-Roundup) the other to specific classes of boring insect pests(**Bt**-Bacillus thuriniengsis).

Now being introduced into a wider range of crops including rice, sugarcane

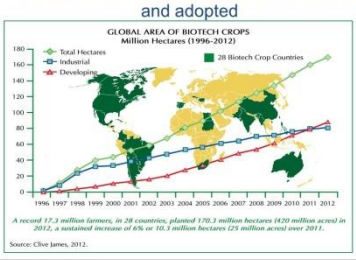
Stacked GM traits in the Field
- Triple Stacked traits protection against:
  - Corn borer-above ground
  - Glyphosate tolerance
  - Root worm-below ground

Stacked traits are becoming the norm and introduced into range of crops including rice

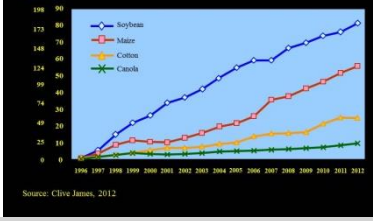
Traits benefit growers & value chain

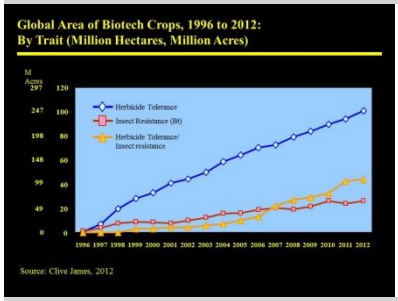


Transgenic crops continue to be developed and adopted



Global Area of Biotech Crops, 1996 to 2012: By Crop (Million Hectares, Million Acres)





Food production must increase, here and overseas

GM has the potential to help increase:

- food quantity
- food quality
- environmental sustainability

Traits of interest in the pipeline

- **Farmer-oriented traits** (pest resistance - insects, diseases, weeds;nutrient use efficiency)
- **Stress resistance-** (frost, drought, salinity; and growth/performance-earliness, yield);
- **Consumer-oriented traits** (flavour, nutritional quality –vitamin A, vitamin E and protein and postharvest storage).
- **Processing traits** (altered oil, carbohydrates, protein).

African Orphan Crops: Their Significance and Prospects for Improvement

The seeds of the future

'Defined as a group of crops that are vital to the economy of developing countries due to their suitability to the agro-ecology and socio-economic conditions, but remain largely unimproved'.

Africa Technology Development Forum 2009,6: 3&4.

Molecular Approaches have the potential to Speed Up Plant Breeding and domestication of orphan crops including:

Cassava
Sweet Potato
Banana
Cowpea
Sorghum
Tef
Sugarcane
And also Industrial/Medicinal Crops such as Artemesia

Many of these crops cannot be improved by conventional breeding because they are produced vegetatively-not by seeds

Agricultural biotechnology enables breeding systems to be more efficient in producing improved **local crop** varieties.

.....**adapted to local soil and environmental conditions and need**

Building Productivity and Sustainability into the Seed. What' s under Development?

- Counter existing and new pest and disease outbreaks
- Increase water ('more crop per drop') and nitrogen use efficiency
- Increase drought and flooding tolerance
- Increase nutrient (fertilisers) uptake efficiency
- Improve nutritive value

Traits of Interest with particular relevance to Africa

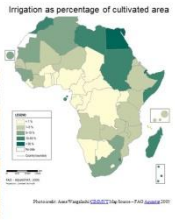
- *Drought Tolerance Crops*
- *Nutrient Enhanced Crops* (***Bio-fortified sorghum*** **with enhanced vitamin A and lysine content;** ***Biocassava Plus*** **- cassava plants with 30 X beta-carotene, 4X iron, and4 X protein as traditional cassava).**
- *Cassava Mosaic Disease*
- *Maruca-resistant Cowpea*
- *Insect and Virus Resistant Sweet Potato*
- *Insect Resistant Bt Potato*
- *Disease and Insect Resistant Banana.*

Plant breeding can support African agriculture

African farmers need access to high yielding, drought tolerant, disease resistant plants. Most food is grown by small-scale farmers with little mechanization. Cassava, cowpea and banana are important crops and the focus of intensive breeding programs.

Maize is a staple crop in Africa but very sensitive to drought damage

Less than 10% of crop land in sub-Saharan Africa is irrigated, making agriculture production highly susceptible to drought



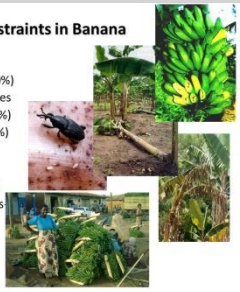
Water Efficient Maize for Africa was developed through a public-private partnership

Water-efficient maize optimized for growth in sub-Saharan Africa has been developed through a combination of breeding and GM methods

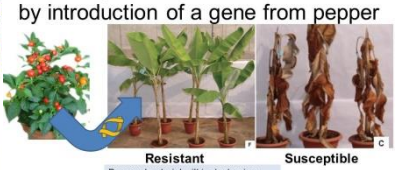
WEMA is being developed as a public-private partnership that includes international and regional plant breeding institutes, philanthropic groups and Monsanto

Productivity Constraints in Banana

- Pest and disease
  - Banana weevil (40%)
  - Parasitic nematodes
  - Black sigatoka (50%)
  - Bacterial Wilt (90%)
  - Fusarium Wilt
- Plant architecture
  - Long growth cycle
  - Post harvest losses ripening



GM Example: Disease resistant banana by introduction of a gene from pepper



Banana bacterial wilt is destroying plants in eastern Africa. Transgenic plants carrying a resistance gene from pepper are resistant to the disease

The Link Between Diet and Health

Developing World (Poor) | Developed World (Rich)

Vit. A	zinc	iron	under weight	low fruit and vegetable intake	over weight	high cholesterol	high blood pressure

Millions of deaths due to under nutrition

Millions of deaths

GM Nutraceuticals: Biofortified Crops-

Many of our common food crops are not perfect with respect to the nutritional requirements of humans or animals.

Protein, starch, and oil composition and content as well as vitamin and micronutrient content can all be improved to make foods more

Vitamin A deficiency is a leading cause of blindness

Breeding plants for β-carotene (pro-vitamin A) enrichment

100 million children are Vitamin A deficient

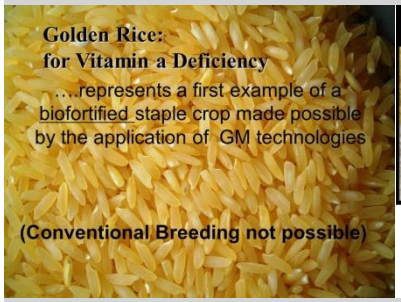
Up to 500,000 children become blind every year and half of these die within 12 months of losing their sight

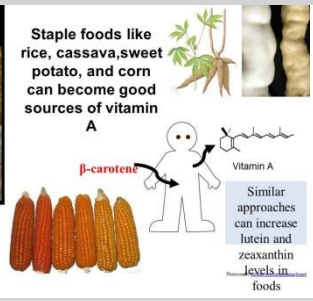
2 million deaths from complications due to vitamin A deficiency

Improving dietary intake of carotenes can reduce child mortality by 25 %

Global population mortality 2010

Cause	Annual mortality (millions)
Vitamin A deficiency	1.9 – 2.8
HIV/Aids	1.8
Tuberculosis	1.4
Malaria	0.7





Key Messages

- Global food and nutrition security is under immense pressure
- Technology has vast potential to meet not only global demands for food and nutrition but also address emerging issues of sustainable energy and environment
- Cost of bringing new technologies to the market continues to escalate
- Genetics is expanding the paradigm of crop nutrition and pest protection to include stress alleviation, land and natural resource use efficiency, consistency and crop quality
- A science-based, transparent, globally harmonized regulatory and trade policies are central for realizing the potential of the sector

Environmental benefits of gene technology already include

- reduced need for pesticides, especially insecticides – so far, after 10 years of use, no resistant insects have appeared in the field; this means enormous benefits for non-pest insects and for farmers in poor countries using back-pack spraying equipment with inadequate protection
- a move to more benign, non-persistent weedkillers – but, the incidence of weeds resistant to the weedkillers is increasing
- major opportunities exist for increasing no-till farming, reducing both the damage to soil caused by ploughing as well as wear and tear on machinery, and tractor fuel
- MOVING FROM CHEMICAL SOLUTIONS TO BIOLOGICAL SOLUTIONS

Genes are part of our diet

On an average day you consume
2×10^{16} genes
or
20 000 000 000 000 000
If you ate a transgenic tomato on that day, you would consume
3×10^{13} copies of the transgene
- the transgene therefore accounts for about
1 millionth
of the genes you consumed on that day

Can Genetic Improvement of Crops Help Feed the world?

- No single solution will solve this problem but the new genetic technologies of plant breeding developed during the last few years can help- **they are but one tool in the toolbox.**
- They can increase agricultural efficiencies in a sustainable manner. Genomics, marker-assisted screening, phenotype analysis, computer modeling, and genetic modification (GM) when required, have greatly improved and accelerated the breeding process.

GM is not a Silver Bullet!

Techniques of Modern Plant Breeding

We have a tool kit, including:

Non-GM approach:

Plant breeding using Molecular Markers

GM approaches:

Gene introduction, or affecting how genes already present in the plant are used.

Thank you for listening

I hope I have given you some food for thought

Swift's dictum:

'And he gave it for his opinion that whoever could make two ears of corn or two blades of grass to grow upon a spot of ground where only one grew before, would deserve better of mankind, and do more essential service to his country than the whole race of politicians put together'

Johnathan Swift, Gulliver's Travels,1726

Fundamentals of Genetics

Moses Adebayo – Ladoke Akintola University of Science and Technology

Genetics – what's it all about?

Moses Adebayo
(adebayovam@yahoo.com)

RESEMBLANCE

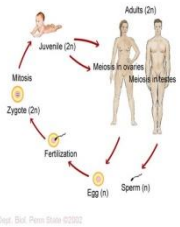
Did the son resemble the father?

Son Father

My son got "something" from me

INHERITANCE

- "Something" transmitted from me to son through sperm during sex
- Son equally received "something" from mother through egg
- Son mainly a product of "genetic" contributions from mother and father



Genetics

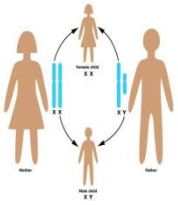
- Gene - unit of heredity (the "something").
- Genetics - the science of heredity (genes).
- Term coined at beginning of twentieth century (replaced previous studies of "generation", "inheritance", "heredity").
- In 1920's classical genetics was often referred to as "Mendelism" and was a relatively new (and controversial) area of biology.
- By 1950's genetics recognized as unifying principle at core of the life sciences.

Why study genetics?

- Understanding genetic processes is fundamental to comprehension of life itself. Genetic function - cellular function, external appearance, linkage between generations.
- Modern society depends on genetics. Breeding programs led to crops, livestock, Biotechnology produces drugs, etc.
- Genetics is a key component in medicine. Estimated at least 30% of pediatric hospital admissions have direct genetic component.

Girl children!!! Who to blame???

- Many marriages have collapsed -"all girls, no boy"
- Wives often unjustly blamed, but never guilty
- Blame the husband, if not, blame genetics!!!
- The man's sex "contribution", either X or Y, determines the baby's sex



Genetics of gender in humans

Genetic Basis of Crop Evolution

Prehistoric farmers selected the genetic changes/characters that domesticated certain wild plants. Modern plant breeders have selected additional genetic improvements to produce the crop plants that we enjoy today.

teosinte / **corn** – cob size

wild tomato / **modern** tomato – Fruit size

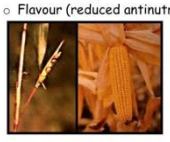
Teosinte/corn photo compliments of J Doebley, Univ. Wisconsin — Tomato photo by Bruce Thomas, UC Davis

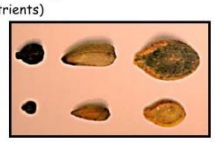
Variability, Traits, and Genes

- Variability/variation simply means difference – conditioned by genetics, environment, and their interaction
- Trait - any characteristic that can be passed from parent to offspring. Transmissible/heritable if genetic
- Genes acting singly or jointly are expressed as traits in organisms

Traits associated with domestication:

- Seed size
- Seed abundance
- No shattering
- Thinner seed coats
- Uniformity (germination, ripening)
- Flavour (reduced antinutrients)





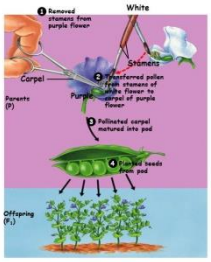
Genetics – How It All Started!

- Gregor Johann Mendel (Austrian Monk)
- Was the first person to analyze patterns of inheritance
- Deduced the fundamental principles of genetics
- Used physical appearances to deduce the genetic make-up

Gregor Mendel (1822-1884)

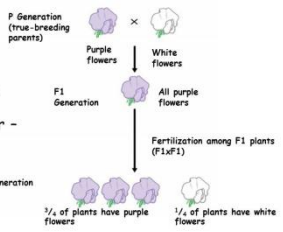
MENDELIAN GENETICS – LAWS OF INHERITANCE

- Mendel worked with Pea
- Carried out some **cross-fertilizations**
- Called heritable properties "**particles**"
- Refuted **blending inheritance**
- Created **hybrids**

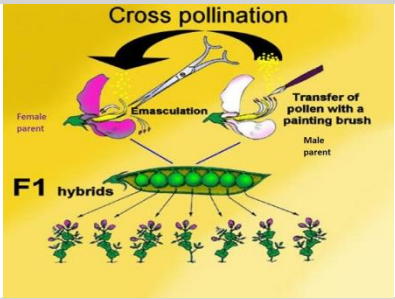


INHERITANCE OF ONE CHARACTER/TRAIT

- Parents differ in one character – flower color

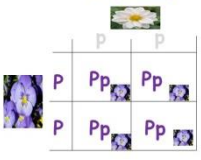


Cross pollination



Parental Cross

Trait: Flower color
Alleles: P – Purple, p – White
Cross: Purple flower x White flower
PP (female) x pp (male)



Genotype: Pp
Phenotype: Purple
Genotypic Ratio: All alike
Phenotypic Ratio: All alike

Genotype and Phenotype

- **Genotype (genetic make-up)** - gene combination for a trait (e.g. PP, Pp, pp)
- **Phenotype (physical appearance)** - the physical feature or appearance resulting from a genotype

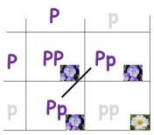
purple flower

white flower

Where is the white flower???

Trait: Flower color
Alleles: P- Purple p- White
Cross: Purple flower x Purple flower (F1xF1)

Pp × Pp

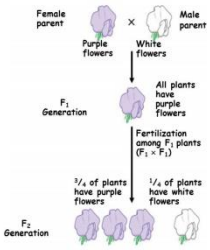


Genotypes: PP, Pp, pp
Phenotypes: Purple & white
G.Ratio: 1:2:1
P.Ratio: 3:1

- **Alleles** (from allelomorphs) - two contrasting forms of a gene (dominant & recessive)
- **Dominant** - stronger of two genes that masks the other, expressed in the hybrid; represented by a capital letter (P)
- **Recessive** - gene that shows up less often in a cross; represented by a lowercase letter (p)

CONCEPTS OF DOMINANCE AND RECESSIVE ALLELES

- Two allelic genes for a trait, e.g. flower color
- Female parent carries purple allele
- Male parent carries white allele
- Purple allele masks or dominates (dominant) the white allele (recessive)



KINDS OF GENOTYPES

- Homozygous genotype: individual carrying similar alleles for a trait e.g. PP = homozygous dominant; pp = homozygous recessive
- Heterozygous genotype: individual carrying contrasting alleles for a trait e.g. Pp
- *Both PP and Pp have purple phenotype while pp has white phenotype*

CONCLUSIONS - Mendel's Laws of Inheritance

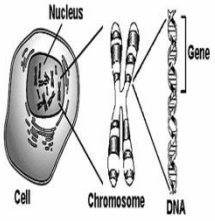
- Mendel's Law of Segregation: the two alleles of the gene controlling a character separate during formation of egg and sperm
- Mendel's Law of Independent Assortment: Each allele in a pair behaves independently

So far!!!!!

- Ample evidence that "genes" exist
- Genes are expressed in the physical appearances of individual organisms as "traits"
- Vital to locate the part of the living cell that "houses" the genes

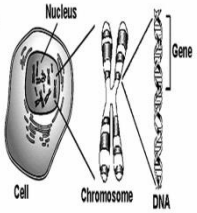
Where are the genes????

- The rediscovery of Mendel's work in early 20th century revealed what he didn't know – Chromosomes and DNA
- In 1842, Karl Wilhelm von Nageli detected Chromosomes under the microscope in plant cells
- Morgan's work of 1908 led to the discovery of chromosomal location of genes



Cell, Chromosome, DNA, Gene

- "A healthy plant is a community of cells built in a fortress-like fashion".....G. Agrios
- "Cells" to the body are "blocks" to a house
- Chromosome = DNA (deoxyribonucleic acid) + protein
- Genes form parts of the DNA

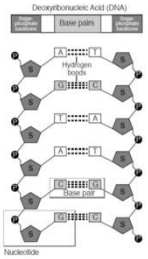


The Amazing Work - DNA!

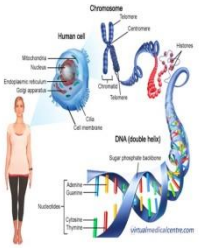
- Each cell has about 2 m long DNA.
- The average human has 75 trillion cells.
- The average human has enough DNA to go from the earth to the sun more than 400 times.
- *DNA is highly coiled (diameter=0.000000002 m).*

The earth is 150 billion m or 93 million miles from the sun.

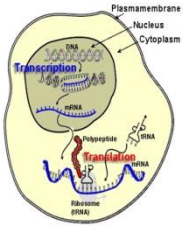
- DNA composed of four chemicals ⇒ Adenine (A), Guanine (G), Cytosine (C), and Thymine (T).
- Different arrangements of the chemicals make up the genes
- Genes that determine traits are parts of the genetic "codes"



- A. thaliana has 119 million bp; 26,300 genes – fully sequenced
- Maize has 250 million bp; ≈ 30,000 genes – fully sequenced
- A human cell has 6 billion bp, 20,000-25,000 genes
- Only 2% of human genome is genes, the rest is *junk DNA*



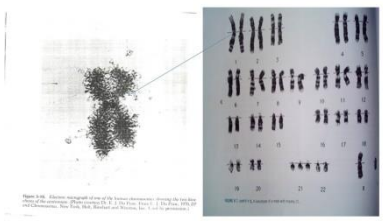
- Genes are genetic codes for active proteins that result in a phenotype or a biological process
- Gene codes from the DNA are made into active proteins
- Proteins guide all life processes – growth, reproduction, development, health, etc.



Gene Functions

- Genes determine the various characters transmitted from parent to offspring
- Genetic variations are being exploited for improvements of crops and other organisms
- Simple traits (flower or seed color) conditioned by one or a few genes – oligogenic inheritance
- Complex traits (grain yield, drought tolerance) determined by many minor genes – polygenic inheritance

Human genome



Recap

- Chromosomes composed of DNA and proteins
- DNA composed of four chemicals that form genes in different unique orders
- Differences in genes or genetic variation exploited by breeders for crop and animal improvements
- Various activities conditioned by genes add up to all life processes
- Life is DNA and Genetics is the study of life !!!

Do they share very many genes or just by chance???
THANK YOU FOR YOUR ATTENTION!!!

Date Palm Case Study

Dr C R Eke – Nigerian Institute for Oil Palm Research

GROWING THE DATE PALM INDUSTRY THROUGH BIOTECHNOLOGY IN NIGERIA

Eke, C.R, Emoghene, B, and Asemota, O.
Nigerian Institute for Oil Palm Research, P.M.B. 1030, Benin City

Introduction

- Date palm belongs to the family of palms
- Is a tree of life, beautiful, elegant and tall
- Grows slowly, a foot yearly to a height of 80-100 feet
- Trunk covered with the bases of old fronds which makes it rough

Date Palm Tree

Introduction (Cont.)

- Most date palm trees produce suckers (1-6)
- Some don't produce suckers at all

Introduction (Cont.)

- In early Dec-Jan, date palm tree starts to produce flowers
- Female and male flowers grow on different trees (dioecious)

Introduction (Cont.)

- From Feb., female date palm starts to produce fruits till Apr.
- Initially, the fruits are greenish in colour and later yellowish when ripe

A young fruiting date palm

Harvesting date fruits

Introduction (Cont.)

- Date fruits are high in sugar, about 70% in most varieties
- Good sources of Fe, K, Ca, Mg, S, Cu, P, etc.
- Good sources of vitamins
- Play important roles in nutrition of human population
- Also used as livestock supplements
- Secondary products: syrups, jam, ice cream, baby foods, alcoholic beverages, soft drinks, etc.

Introduction (Cont.)

- Small scale industries can arise from these secondary products.
- The enterprises generated by date palm, oil palm, coconut, Raphia and Shea are significant to the Nigerian economy
- These crops provide food and raw materials for domestic use and the confectionery, personal care products industry.
- The sector also provides employment for a large section of the country.

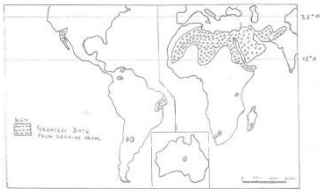
World trade in date fruits

- 1 Hectare can produce as much as N6,048,000 (farmgate price of N560,000/tonne, 10.8tonnes/ha)
- World production is 5.4million tonnes/yr
- Largest producer is Iran (18%)
- Largest exporter is UAE (37%)
- Largest importer is India (38%)

Source: Botes and Zaid (2002)

Some producer countries

Iran, Iraq, Israel, Tunisia, Egypt, Morocco, Algeria, Other middle East countries, USA, Angola, South Africa, Swaziland, etc



Date Palm Cultivation in Nigeria

NIGERIA INSTITUTE FOR OIL PALM RESEARCH (NIFOR)

2.0 NIFOR's Mandate

- Principally to conduct research into the production and products of date palm, oil palm, coconut, *Raphia*, shea and other palms of economic importance and transfer these research findings to farmers.
- Yield improvement of the crops, and production of quality planting materials (seeds & seedlings)
- Provide effective extension services/public enlightenment including trainings to transfer technologies to farmers

2.0 NIFOR's Mandate (Cont.)

- This is where the media come in as they partner with us to take this message to the farmers
- What is the message?
- That cultivating this excellent crop is profitable and would alleviate a lot of families from poverty and improve small scale farmers livelihood in Nigeria
- Nigerian farmers could earn as much as N2,000,000/ha/yr

NIFOR's Intervention Programme

- NIFOR has a substation in Dutse, Jigawa State
- Through selection, early maturing palms (2 yrs as against 7-15yrs) have been identified
- Identified outstanding palms in terms of yield (>60 kg /annum)
- Selected palms with fruit traits of economic importance (size, thickness, sweetness, etc.)

NIFOR's Intervention Programme

- These are the breeding stock for varietal development and seed multiplication in Nigeria
- Agronomic packages as applicable to date palm
- Studies on pest and disease management
- Screening of date palm seedlings to produced disease tolerant plants

Methods of Propagation

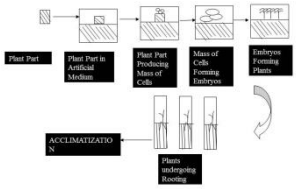
Seed propagation

Methods of Propagation (cont.)

Offshoot

Methods of Propagation (cont.)

Tissue culture



Why Tissue Culture Multiplication?

- Seed derived seedlings would be approximately 50% female. Identification only possible at flowering
- Only few males are required in plantations for fruit development.
- Offshoots could be used to obtain planting materials but average sucker production per palm is low and suckers root with difficulty. Some genotypes don't sucker.
- Therefore, tissue culture multiplication is useful as it overcomes these limitations and produces large numbers of relatively homogenous female date seedlings.

Objectives

- Multiply good quality genotypes/individuals fairly rapidly
- Obtain yield gains of as much as 15-20%
- Multiply and distribute female fruit bearing plants to growers

Methods

Two pathways are known;

- Somatic embryogenesis:
  explant→callus⟶somatic embryos→ plantlets→rooting
- Direct organogenesis:
  explants→ plantlets → rooting

Sections of Tissue Culture Laboratory

Somatic Embryogenesis

New Plantlets

Plantlet in polybag Tissue culture palm in the field

What next?

- Large-scale commercial date palm micropropagation to produce enough for the demand.
- The demand for improved materials already exists
- Nigeria can become a date producer of importance
- Nigeria has a number of favourable factors
- Beyond direct agriculture, this could be one beautiful means to also check desertification in sahelian Nigeria

Thank You

Hybrid Maize Case Study

Moses Adebayo – International Institute for Tropical Agriculture (and LAUTECH)

Improvement of hybrid maize for grain yield and tolerance to drought stress

M.A. Adebayo[1,2], A. Menkir[1], E. Blay[2], V. Gracen[2,3], C. The[2], and E. Danquah[2]

1. International Institute of Tropical Agriculture (IITA), Ibadan, Nigeria.
2. West Africa Centre for Crop Improvement (WACCI), Univ. of Ghana, Legon.
3. Cornell University, Ithaca, USA.

Outline of Presentation

- Introduction
- Objectives
- Materials and Methods
- Results
- Research Findings

INTRODUCTION

- Drought limits maize productivity in sub-Saharan Africa (SSA)
- Drought at flowering could reduce maize yield by 80% or cause total devastation (Edmeades *et al.*, 1997)
- Breeding for drought tolerant hybrid maize can guarantee farmers' investments in SSA

Fig. 1: Effects of drought stress on maize at flowering and grain filling

Objectives

- To study the genetic variation existing among a set of drought-tolerant (DT) maize inbred lines developed at CIMMYT and IITA
- To develop and identify high-yielding hybrids under drought and non-drought conditions
- To identify "good" CIMMYT lines for improvement of IITA maize

Materials and Methods
A. Laboratory Analyses

- 48 DT maize inbred lines, 24 each from CIMMYT and IITA, were assayed with 81 SSR markers at Biosciences Lab, IITA
- *Maize inbred lines are the parents used in developing hybrid maize varieties, e.g. Obasuper 1 & 2*
- *Simple sequence repeats (SSRs) are parts of the genetic codes (DNA) that appear in tandem repeats in throughout the entire maize genome*

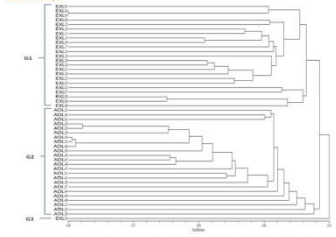
A. LABORATORY ANALYSES

Table 1

48 DIFFERENT MAIZE INBRED LINES USED

EXOTIC (CIMMYT)		ADAPTED (IITA)	
EXL01	EXL13	ADL25	ADL37
EXL02	EXL14	ADL26	ADL38
EXL03	EXL15	ADL27	ADL39
EXL04	EXL16	ADL28	ADL40
EXL05	EXL17	ADL29	ADL41
EXL06	EXL18	ADL30	ADL42
EXL07	EXL19	ADL31	ADL43
EXL08	EXL20	ADL32	ADL44
EXL09	EXL21	ADL33	ADL45
EXL10	EXL22	ADL34	ADL46
EXL11	EXL23	ADL35	ADL47
EXL12	EXL24	ADL36	ADL48

A. Results



A. Results

- The molecular markers clearly delineated the inbred lines into 2 main groups – CIMMYT and IITA
- Sufficient genetic diversity exists among the germplasm
- Inter- and intra-group crosses may produce high-yielding hybrids

B. Field experiments

- 24 inbred lines, 12 each from IITA and CIMMYT, selected for making hybrid crosses
- 96 single-cross hybrids developed from 24 IITA and CIMMYT DT inbreds using NCD 2 mating scheme
- 96 hybrids plus 4 checks evaluated under two irrigation treatments in dry seasons of 2010 and 2011 at Ikenne, Nigeria
  - Block 1 – Watered throughout crop's life cycle (Well-watered or WW)
  - Block 2 – Water was shut off 28DAP (Drought stress or DS)

Maize Inbreds/Hybrids Development

Maize female and male flowers | Male flower or "tassel" | Tassel covered with bag

Female flower or "shoot" with receptive silks | Shoot covered with bag | Pollinated maize field

Maize Inbreds/Hybrids Development

Collection of pollen grains in bag | Pollination – dusting pollen grains on receptive silks

Pollinated shoot covered with bag | Paper bag stapled to hold in place

B. Field Experiments

Table 2: 24 SELECTED LINES

EXOTIC (CIMMYT)	ADAPTED (IITA)
EXL01	ADL34
EXL04	ADL35
EXL05	ADL36
EXL24	ADL39
EXL10	ADL31
EXL15	ADL41
EXL16	ADL33
EXL17	ADL47
EXL02	ADL27
EXL03	ADL32
EXL06	ADL37
EXL07	ADL38

B. Field Experiments

- Agronomic data: days to 50% anthesis (**DTA**), days to 50% silking (**DTS**), anthesis-silking-interval (**ASI**), number of ears per plant (**EPP**), grain yield (**GY**), etc
- Physiological data: normalized difference vegetation index (**NDVI**) recorded at 2 and 4 WAP with Greenseeker

Fig. 2: NDVI captured with Greenseeker 4WAP.

B. Field Experiments

- ANOVAs computed with PROC GLM in SAS using RANDOM statement with TEST option (*SAS Institute, 2009*)
- Pearson's correlation coefficients of GY with other traits calculated with PROC CORR in SAS (*SAS Institute, 2009*)
- Drought Tolerance Index

$DTI\ (\%) = [(GY_{WW} - GY_{DS})/GY_{WW}]*100$

B. Results

- DTI (for GY) was ≈ 70%
- Mean grain yield under DS (1.9 t/ha) was 23% of yield under WW (6.1 t/ha)
- Drought stress increased ASI by 211% and reduced EPP by 30%
- Stress intensity sufficient for differential reactions of hybrids

B. Results

Drought stress | Well-watered

Biosciences for Farming in Africa Workshop, 18-21 March, 2013, Abuja, Nigeria.

B. Results

Effect of Drought Stress on Maize Yield

Drought-tolerant (Left) and drought-susceptible (Right) maize hybrids under drought-stress conditions

Biosciences for Farming in Africa Workshop, 18-21 March, 2013, Abuja, Nigeria.

Table 3: Lines having positive and significant GCA effects

Line	Grain yield (Kg ha^{-1}) DS GCA_i	DS GCA_m	WW GCA_i	WW GCA_m
EXL04	136.82	-129.37	602.9*	654.7*
EXL05	16.8	236.0	706.2*	267
SE	*131.44*	*138.22*	*121.02*	*204.74*
EXL15	128.38	205.3*	324.2	319.7
SE	*138.22*	*103.63*	*204.74*	*168.41*
EXL02	228.9*	129.6	-565.62	-355.1
EXL03	177.6*	29.2	-73.07	128.7
EXL06	-487.3	-285.1	947.1*	931.3*
SE	*79.71*	*104*	*184.61*	*176.83*
ADL36	120.91	-68.1	171.4	446.0*
SE	*95.1*	*131.44*	*140.45*	*171.02*
ADL41	325.3*	-34.1	185.3	-358.3
ADL47	121.68	243.7*	332.23	797.0*
SE	*103.63*	*79.71*	*168.41*	*164.61*
ADL32	303.6*	82.5	912.2*	-211.5
ADL37	225.7*	71.01	-473.85	336.8*
ADL38	-37.0	457.6*	-484.8	802.8*
SE	*104*	*95.1*	*176.83*	*140.45*

Biosciences for Farming in Africa Workshop, 18-21 March, 2013, Abuja, Nigeria.

Table 4: Means of GY (t/ha), DTI (%), ASI, and EPP of top 10 hybrids under drought and well-watered conditions

Drought stress Hybrid	GY_DS	GY_WW	DTI	ASI	EPP	Well-watered Hybrid	GY_WW	GY_DS	DTI	ASI	EPP
EXL10xEXL04	3.0	6.8	55.2	0.7	0.8	EXL06xADL47	8.9	1.1	87.3	1.7	1.0
ADL47xEXL10	3.0	6.9	57.5	3.0	0.8	ADL32xEXL06	8.2	2.2	72.9	1.0	1.0
ADL37xEXL03	2.8	6.0	54.0	1.5	0.8	ADL47xEXL16	8.1	2.0	75.3	0.2	1.0
ADL41xEXL17	2.7	6.1	54.7	0.8	0.8	ADL41xEXL15	7.9	2.6	66.5	0.5	1.1
EXL03xADL47	2.7	7.1	61.7	2.8	0.8	ADL33xEXL15	7.7	2.6	66.5	0.0	1.1
ADL47xEXL15	2.7	7.4	63.4	2.7	0.8	ADL47xEXL17	7.6	2.3	69.8	0.3	1.1
ADL41xEXL15	2.6	7.9	66.5	1.2	0.9	ADL41xEXL16	7.6	2.1	72.0	0.0	1.0
EXL17xEXL05	2.6	6.2	57.4	0.5	0.9	EXL15xEXL05	7.6	2.1	71.9	-1.0	1.0
EXL10xEXL01	2.6	5.6	53.9	1.2	0.8	EXL02xADL47	7.5	2.6	65.5	1.5	0.9
EXL02xADL47	2.6	7.5	65.5	2.7	0.8	ADL47xEXL15	7.5	2.7	63.4	1.2	1.1
Top 2 checks						*Top 2 checks*					
M1026-8	2.1	6.3	66.9	4.3	0.8	M1026-8	7.0	1.7	75.7	1.3	0.9
M1026-7	1.7	7.0	75.7	4.8	0.7	M1026-7	6.3	2.1	66.9	1.7	0.9
Statistics						*Statistics*					
Mean	1.9	6.1	69.5	2.8	0.7	Mean	6.1	1.9	69.5	0.9	1.0
$LSD_{0.05}$	0.9	1.4		2.3	0.2	$LSD_{0.05}$	1.4	0.9		0.1	0.1
P level	***	***		***	***	P level	***	***		***	***

Biosciences for Farming in Africa Workshop, 18-21 March, 2013, Abuja, Nigeria.

Research Findings

- Additive genetic effects more important in controlling yield and drought tolerance
- Six CIMMYT lines, EXL02, EXL03, EXL04, EXL05, EXL06, EXL15 identified for improvement of adapted germplasm
- Three lines, EXL05, EXL15, and ADL47 combined attributes for high productivity and drought tolerance
- Three hybrids, ADL47xEXL15, ADL41xEXL15, and EXL02xADL47 identified as high-yielding and drought tolerant

Biosciences for Farming in Africa Workshop, 18-21 March, 2013, Abuja, Nigeria.

Acknowledgements

AGRA Growing Africa's Agriculture

IITA Research to Nourish Africa

B4FA

Biosciences for Farming in Africa Workshop, 18-21 March, 2013, Abuja, Nigeria.

Good harvest in season of drought!!!!!

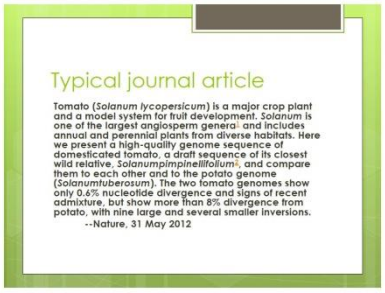
Biosciences for Farming in Africa Workshop, 18-21 March, 2013, Abuja, Nigeria.

Thank you

Biosciences for Farming in Africa Workshop, 18-21 March, 2013, Abuja, Nigeria.

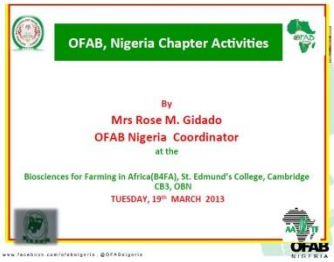
Crafting a "Top"

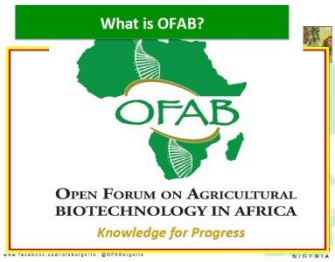
Sharon Schmickle – B4FA journalist mentor

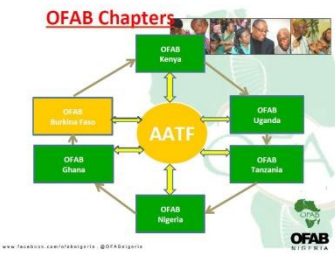


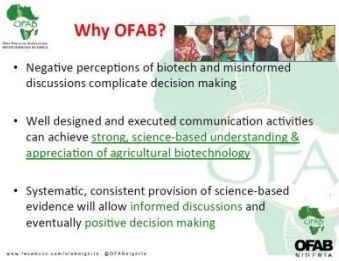
Open Forum for Agricultural Biotechnology – Nigeria

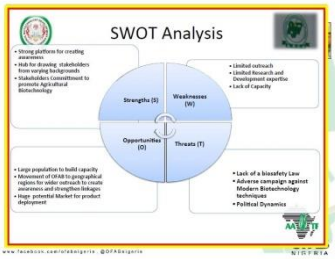
Rose Gidado – OFAB










SWOT Analysis
Strengths (S)
Weaknesses (W)
Opportunities (O)
Threats (T)

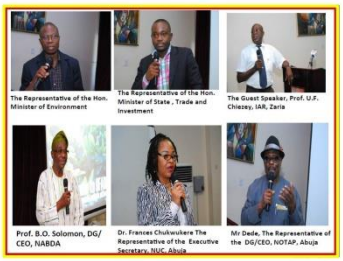

Lessons Learnt so far.....
OFAB has the strong potential to publicize Agricultural Biotechnology through its strong media affiliation and being the only consultative forum of its kind in Nigeria
The Interactive session(s) addresses fear and perception of participants
Strengthens and Builds Linkages among various Institutions and bodies
Management of limited Resources to effectively meet goals and targets.


March Edition Gombe Jewel Hotel, Abuja, 29th March, 2012
Topic: The Potentials of Bt-Cotton in Revamping the Textile Industry.
Guest Speaker: Prof. Echekwu


DG/CEO, NABDA
Committee on Agric
Hon. Minister of State for Agric
Prof. Magaji, Rep. ES, ARCN
Chairman, Senate Committee on Agric.


Guest Speaker, Prof. Echekwu
Exhibition of Cotton Product


MAY 2012 EDITION
Topic: Biotechnology for Improved Soybean Production in Nigeria
Guest Speaker: Prof. Chiezey, IAR Zaria


The Representative of the Hon. Minister of Environment
The Representative of the Hon. Minister of State , Trade and Investment
The Guest Speaker, Prof. U.F. Chiezey, IAR, Zaria
Prof. B.O. Solomon, DG/ CEO, NABDA
Dr. Frances Chukwukere The Representative of the Executive Secretary, NUC, Abuja
Mr Dede, The Representative of the DG/CEO, NOTAP, Abuja


OFAB NIGERIA RECEIVES AWARD


OFAB Nigeria Coordinator receiving an Award in honour of NABDA's performance from the Minister of Science & Technology Ghana, Mrs Ayeti, while the ED, AATF looks on...


OFAB NIGERIA COORDINATOR RECEIVING OFAB AWARD FOR HERSELF FROM MS RIN OF BILLGATES FOUNDATION


JUNE 2012 EDITION
Topic: "Biotechnology for Improved Cocoa Production in Nigeria"
Guest Speaker: Dr. (Mrs) F. A. Okelana
Ag. Executive Director-Cocoa Research Institute of Nigeria (CRIN)


OFAB AFRICA GROUP PHOTOGRAPH

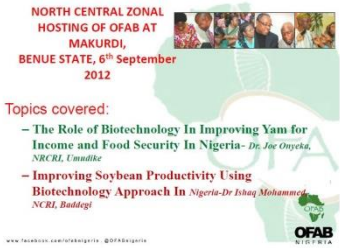

Senator Ayoade Ademola Adeseun
Deputy Governor, Chief Moses Alake Adeyemo
The House Committee chairman on science and technology- Honourable Abiodun Akinlade granting a press interview


Cross section of Farmers
USDA Rep. Marcela A.
Group Photograph


JULY 2012 EDITION
Topic: "Integrating biotechnology and conventional approaches towards improving cassava production in Nigeria"
Guest Speaker: Dr. Chiedozie Egesi
Assistant Director (Biotechnology) and Product Development Manager BioCassava Plus
National Root Crops Research Institute (NRCRI), Umudike, Abia State, Nigeria


Cross section of the high table
Exhibition stand of Cassava Products
Guest Speaker


Special OFAB Session for the Seed Sub-Subsector, 6th August 2012
Aim: to sensitize and enlighten stakeholders in the Seed Industry of the Agricultural Sector on the eminent adoption of biotechnology and the use of genetically enhanced seeds and seedlings to increase agricultural productivity in the country


NORTH CENTRAL ZONAL HOSTING OF OFAB AT MAKURDI, BENUE STATE, 6th September 2012
Topics covered:
– The Role of Biotechnology In Improving Yam for Income and Food Security In Nigeria- Dr. Joe Onyeka, NRCRI, Umudike
– Improving Soybean Productivity Using Biotechnology Approach In Nigeria-Dr Ishaq Mohammed NCRI, Baddegi


MEDIA TRAINING OFAB, 13TH SEPTEMBER 2012 AT GOMBE JEWEL, ABUJA WUSE 2, ABUJA.
OPEN FORUM ON AGRICULTURAL BIOTECHNOLOGY
USAID


Group Photograph of participants
DG/CEO, NABDA, PROF. B.O. SOLOMON IN A MEDIA IN A MEDIA INTERVIEW


Ag. DG/CEO, NASC, Rev Anthony Olatokun in a Media
Members of the High Table


Media Interaction


Biotechnology Study Tour to US undertaken by OFAB Nigeria Team and the Media, 15th-23RD September 2012


L-R: Ifeanyi Okafor(NTA), Uche Nzeka(USDA Lagos), A Nigerian In US, Emeka Okole(Script Writer), Ifeanyi Nwoko(NAN)
The Group Interacting with a Farmer at the Stemme Farm, Chesterfield, in Missouri


GM Maize and Non GM


The Round-up Ready Soy bean at the Stemme Farms at Chesterfield in Missouri.


Group Photograph with the Farmers


Biotech Study Tour to US
Group photograph of Africans at the USDA Building in Washington DC


SOUTH-SOUTH ZONAL HOSTING OF OFAB,CALABAR, CROSS RIVER STATE, 8TH NOVEMBER, 2012
Topic: Biotechnology in Aqua Culture
Guest Speaker: Dr. Samuel Olufeagba, NFFRI, New Bussa, Niger State.


Dignitaries at the High Table

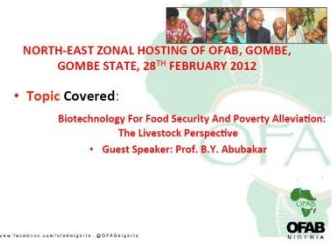

Cross section of participants


Exhibition Stand


NORTH-WEST ZONAL HOSTING OF OFAB, KATSINA, KATSINA STATE, 6TH DECEMBER 2012
Topics covered:
i. The prospect of improved cotton production using biotechnology in Katsina State- Prof. C.A. Echekwu, IAR, Zaria
ii. Enhancing Sorghum production, processing and utilization using Biotechnology technique.- Prof. D.A. Aba, IAR, Zaria

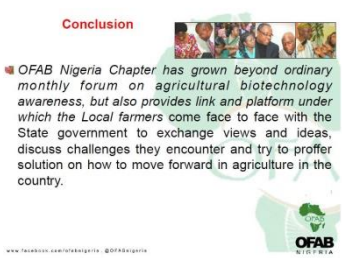

OFAB KATSINA PHOTO GALLERY
Deputy Governor, Katsi


The Deputy Governor at the Exhibition Stand
• Sorghum Products
Cotton Products


NORTH-EAST ZONAL HOSTING OF OFAB, GOMBE, GOMBE STATE, 28TH FEBRUARY 2012
• Topic Covered:
Biotechnology For Food Security And Poverty Alleviation: The Livestock Perspective
• Guest Speaker: Prof. B.Y. Abubakar


Rabbit
FORAGE
Welcome To
NATIONAL ANIMAL PRODUCTION RESEARCH INSTITU


Challenges
Lack of a Biosafety Law
Frequent changes of key Political actors(Ministers, Permanent Secretaries and the Legislators).
Lack of Adequate funds for the Movement of OFAB to Geopolitical zones of the Country where it is also needed
Lack of Centres of excellence to promote research and development
Eminent need to build capacity
Development of strong outreach linkages and Network to rural Nigeria (Local Farmers)
Reaching out to the policy makers and the law makers to g
to attend OFAB.


Conclusion
OFAB Nigeria Chapter has grown beyond ordinary monthly forum on agricultural biotechnology awareness, but also provides link and platform under which the Local farmers come face to face with the State government to exchange views and ideas, discuss challenges they encounter and try to proffer solution on how to move forward in agriculture in the country.


THANK YOU FOR YOUR ATTENTION


Contact:
National Biotechnology Development Agency
Along Airport Road, Lugbe, P.M.B.5118, wuse, Abuja.
Phone : 09-6715691, 09-3145473
Website: www.nabda.gov.ng
Email: nabdamails@yahoo.co.uk,
info@nabda.gov.ng
Twitter: OFABNigeria
Facebook: Open Forum on Agricultural
Biotechnology
OFAB

Marker-based Oil Palm Breeding Case Study

Mr L O Ihase – Nigerian Institute for Oil Palm Research

APPLICATION OF MOLECULAR MARKERS TO OIL PALM (*Elaeis guineensis* Jacq.) BREEDING PROGRAMME AT NIFOR

BY

Ihase, L. O; Eke, C. R; Okwuagwu, C. O, and Asemota, O.

The Oil Palm

- Kingdom : Plantae
- Division : Magnoliophyta
- Class : Liliopsida
- Superorder : Arecidae
- Order : Arecales
- Family : Arecaceae
- Subfamily : Cocoideae
- Genus : *Elaeis* (derived from elaion)
- Species : ?

➢ There are currently 3 acceptable species of *Elaeis*, the first two: *E. guineensis* (a) and *E. oleifera* (b) are Africa and American oil palm. The third species *E. odora* (formerly *Barcella odora*) is not cultivated and little is known about it.

The Oil Palm (Cont.)

➢ A major economic crop of long standing importance

➢ Oil Palm has 3 fruit forms; *Dura*, *Tenera* and *Pisifera*

➢ It takes an average of four years after field planting to identify these fruit forms

➢ Fruit form classification is based on the shell thickness gene

➢ It has the distinction of producing two different kinds of oils: palm oil and palm kernel oil from two different tissues within the fruits

Uses

➢ These oils have a variety of important dietary and industrial uses.

➢ Palm oil is a common cooking ingredient (rich vitamins A and E)

➢ Use for making butter (solid fat)

➢ Non-edible uses of palm oil include: soaps and detergents, candles, cosmetics, lubricating greases, glue, printing inks, biodiesel, etc.

Palm Oil Production

Bunch separation/stripping

↓

Bunch weighing

↓

Bunch sterilization

↓

Fruit digestion

↓

Clarification (separation of water, oil and sludge)

Oil Palm breeding

➢ Breeding method: Reciprocal recurrent selection (RRS)

➢ genetic studies have shown that the thin-shelled form with a fibre ring, the *Tenera*, is a hybrid between the shell-less *Pisifera* and the common thick-shelled *Dura* which has no fibre ring

➢ In Nigeria, oil palm plantations and farms are established with the extension work seeds (EWS) and seedlings distributed by the Nigerian Institute for Oil Palm Research (NIFOR).

➢ *Teneras* typically have about 30 % more mesocarp and hence 30 % greater oil content in bunches than *duras*

➢ In Nigeria, average yields from the second cycle planting materials currently being distributed is 20-25 tonnes fresh fruit bunches per hectare per year in well-managed plantations but small scale holders, who very often do not apply inputs such as fertilizer have yields of about 8 tonnesffb/ha

Oil Palm in Nigeria Some NIFOR Inputs

➢ NIFOR is working hard through breeding and other interventions to increase yields for our farmers

➢ It is doing this through breeding, for higher yielding disease resistant varieties

➢ The development of agronomic packages that will provide maximum productivity (fertilizer regimes, field maintenance packages, processing machines and training

➢ Extensive training programmes for operatives on different aspects of the value chain e.g. nursery operators, farmers, mill operators etc

Some diseases of the Oil Palm

➢ *Fusarium* wilt

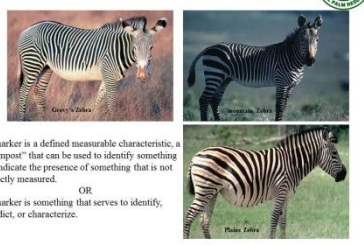
➢ Dry basal rot

➢ Leaf miner (coelaenomenodera lameensis)

➢ Etc.

Fusarium wilt

What are markers?



A marker is a defined measurable characteristic, a "signpost" that can be used to identify something or indicate the presence of something that is not directly measured.

OR

A marker is something that serves to identify, predict, or characterize.

What is a Molecular marker?

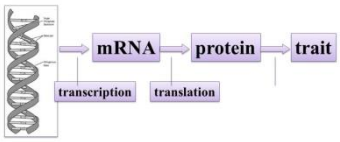
➢ a gene or DNA sequence that can be used to identify an organism, species, or strain or phenotypic trait(s) associated with it.

➢ a modern diagnostic tools, which may help breeders to solve practical problems

➢ variant allele that is used to label a biological structure or process through the course of an experiment

➢ it is a signature in the DNA that allows diagnostic detection of DNA sequence variation existing between species and/or varieties

What is a gene?



A gene is a DNA segment that encodes a specific protein that contributes to expression of a trait.

What is Marker-Assisted Selection?

The use of DNA markers or molecular markers to assist in plant breeding is called Marker-Assisted Selection (MAS).

Advantages of MAS

➢ **Simpler method compared to phenotyping**
Especially for traits with laborious screening
May save time and resources

➢ **Selection at seedling stage**
Important for traits such as shell thickness

➢ **Increased reliability**
No environmental effects

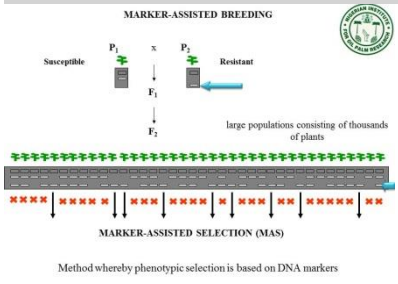
Why Apply MAS to Oil Palm Breeding Programme?

➢ Plant breeding has made remarkable progress in increasing crop yields for over a century. However, plant breeders must constantly respond to changes such as agricultural practices which creates the need for developing genotypes with specific agronomic characteristics

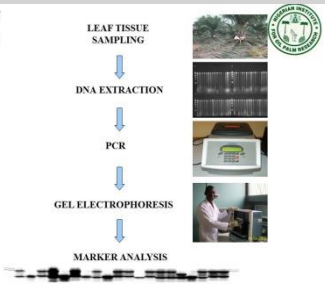
➢ Changes are neccessitated because target environments and the organisms within them are constantly changing

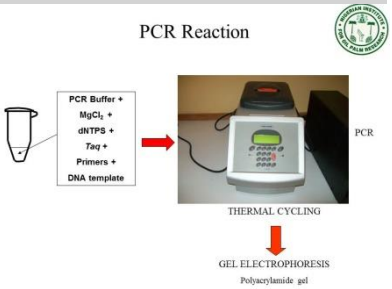
➢ Fungal and insert pests continually evolve and overcome host-plant resistance

➢ New land areas are regularly being used for farming, exposing plants to altered growing conditions

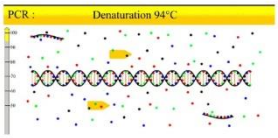


Overview of 'marker genotyping'





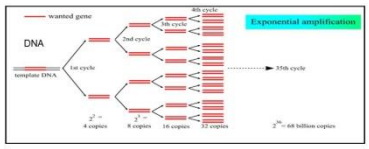
How does the PCR Machine works?



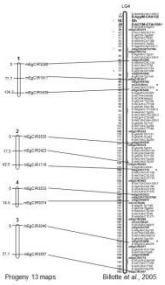
Denaturation: DNA melts
Annealing: Primers bind
Extension: DNA is replicated

How does the PCR Machine works? (cont.)

Amplification of DNA



Gel Electrophoresis



Benefit to Farmers

- Cultivating oil palm is very profitable to rural farmers
- Processing rather than selling the fruits can greatly increase income
- In Ghana, an income of $1,600 was derived from selling the fruits from 2-acre in 2 years
- In Malaysia, farmers ride cars to their farms
- Between Jan–Aug, 2012, Malaysia export revenue from oil palm-based products was Rm47.4 billion (N2.417 trillion)

Network of researchers NIFOR is working with

Includes

- Department of Plant Biology and Biotechnology, University of Benin
- Institute of Plant Genetics, University of Rostock
- etc.

How does the media come in?

- Public enlightenment
- Help the scientist and the nation to reach the farmers concerning efforts that are being made to make them more productive, the benefits they could derive, on-going policy initiatives etc
- They can bridge the gap between farmers and NIFOR through the dissemination of the appropriate information

Plate 2: Host at the Institute for Plant Genetics, Germany

Plate 3: Hosts at the Institute for Plant Genetics, Germany

Thank you for your audience

Cocoa Breeding Case Study

Dr Anna Muyiwa – Cocoa Research Institute of Nigeria

COCOA RESEARCH INSTITUTE OF NIGERIA, IBADAN, OYO STATE

RECENT ADVANCES OF COCOA RESEARCH THROUGH BREEDING AND BIOTECHNOLOGY IN NIGERIA

MUYIWA ANNA ABIMBOLA(PhD)
Crop Improvement Division,
Cocoa Research Institute of Nigeria, Ibadan

CACAO (*Theobroma cacao, L.*)

- Cocoa is a commodity crop that contributes about 38% to Nigeria's GDP.
- It is the single largest non-oil foreign exchange earning commodity for Nigeria.
- Nigeria is rated the fourth largest cocoa producer of the world.

❑**Production of cocoa is below the potential capacity in Nigeria with an annual production of 250,000 MT (ICCO, 2010).**

❑**Indicating that cocoa production in Nigeria is:**

- ➢Low
- ➢Inefficient
- ➢Poorly commercialized
- ➢Unsustainable

Factors responsible for low cocoa productivity in Nigeria

- ➢Ageing cocoa trees (>40 yrs old)
- ➢Low-yielding varieties (250-350kg/ha)
- ➢Ravage of diseases
- ➢Myriad of insect pest complex
- ➢Poor access to and use of inputs
- ➢Ageing farmers
- ➢Poor knowledge of use and culture of intensive agriculture
- ➢Poor access to land by willing cocoa farmers

Methods Used in Cocoa Breeding

Harnessing of existing cocoa diversity

- ❑Screening/evaluation of genotypes for economic traits
- ❑Selection

Creation of further diversity through:

- ❑Hybridization
- ❑Polyplodization
- ❑Mutation

Generation of clones through:

- ❑Vegetative Propagation (Budding, Grafting, Layering etc.)
- ❑Tissue culture protocols

EFFORTS OF CRIN TO IMPROVE COCOA PRODUCTION IN NIGERIA

- ➢Improvement of the crop genetic potential through intensive breeding activities
- ➢Improvement of the cocoa environment (i.e. agronomic and husbandry practices) for optimum productivity
- ➢Identification of the major biotic limitations (Pests and diseases) and further research to prevent/control them
- ➢Research to understand the economic/market aspect of the value chain

TECHNIQUES OF VEGETATIVE PROPAGATION

A. BUDDING

B. GRAFTING

GRAFTING CONTD

GRAFTING CONTD

HARDENING IN THE GREENHOUSE

SORTING OUT

HAND POLLINATION

CRIN ACHIEVEMENTS IN COCOA BREEDING

- Development of improved cocoa varieties
  F3 Amazon
  WACRI series
  Hybrid cocoa
- Selection of 12 individual progenies that produced flower at 18-24 months and 1-19 pods per tree within the two years of establishment.
- Official release of 8 new high yielding and early maturing hybrids in 2011.
- Introduction of cocoa genetic resources to enhance the germplasm for effective breeding programme development

Challenges of Cocoa Breeding

- Long gestation Period – Tree crop
- Poor attraction to research scientists
- Poor research facilities
- Non availability or scarcity of consistent funding for many attempted breeding programmes

Agricultural Biotechnology

- Conventional breeding programmes have serious constraints
- Research for development and higher productivity for income and food security can only continue by the applications of biotechnological methods.

Current Application of Biotechnology for Cocoa Improvement in Nigeria

- Markers Assisted Selection (MAS)
- Tissue culture (micropropagation)
- In-vitro conservation

CRIN ACHIEVEMENTS IN BIOTECHNOLOGY

- Determination of the genetic diversity of cocoa collection in Nigeria using SSR markers
- Plantlet regeneration from cocoa flowers through tissue culture (micropropagation)
- Development of non toxic nutrient medium for cocoa

Ongoing

- Temporary Immersion Bioreactor System(TIBS) to scale up cocoa plantlet regeneration
- Clonal mass propagation of the newly released CRIN Tc1 – 8 and invitro conservation

TISSUE CULTURE

Farmers and other stakeholder's benefit from cocoa research and improvement

BENEFITS TO FARMERS

- Economic benefits to cocoa farmers
- Distribution of hybrid pods to farmers
- Training on Skill acquisition and hand pollination
- Simple Soil Testing techniques
- Training on various mixed cropping systems
- In vitro plantlets(not yet).

BENEFITS TO THE NATION

- Availability of planting materials for larger cocoa hectarage in Nigeria
- Making cocoa farming attractive to Nigerian youths
- Increase in foreign exchange through export
- Promotion of employment opportunities

CONCLUSION

CRIN has contributed meaningfully to the agricultural advancement of the Nigerian society through cocoa breeding and improvement

THANKS FOR LISTENING

Biotechnology and Biosafety Regulation in Nigeria

Rufus Ebegba – Federal Ministry of Environment

Status of Biosafety in Nigeria

BY
RUFUS EBEGBA
Federal Ministry of Environment,
rebegba@hotmail.com
21 March 2013

Content

- over view,
- Global challenges
- Modern biotechnology,
- Biosafety,
- Level of Nigeria's Biosafety preparedness,
- NBF Implementation Project(2011-2015),
- Why should Nigeria regulate GMOs,
- Impact of regulated modern biotechnology on Nigeria's economy,
- Biosafety regulation in Africa,
- Conclusion

1.0 Over view

- There are about 7,895 plant species identified in 338 families and 2,215 genera in Nigeria.
- There are 22,000 vertebrates and invertebrates species.
- These species include about 20,000 insects, about 1,000 birds, about 1,000 fishes, 247 mammals and 123 reptiles.
- Of these animals about 0.14% is threatened while 0.22% is endangered. About 1,489 species of micro-organisms have also been identified.

1.0 Over view

- All of these animal and plant species occur in abundance within the country's vegetation that range from the mangrove along the coast in the south to the Sahel in the north which, Nigeria cherishes and does not wish advancement in modern biotechnology to adversely affect these species.
- Nigeria has adopted biotechnology, modern biotechnology inclusive as one of the approaches in the attainment of various sustainable development in all sectors of the economy particularly to address challenges that have been difficult to resolve using conventional approaches.

1.0 Over view

1.0 Over view

- Nigeria signed and ratified the Cartagena Protocol on Biosafety in 2000 and 2003 respectively.
- Nigeria has also signed the Nagoya-Kuala Lumpur supplementary Protocol on Liability and Redress to the Cartagena Protocol on Biosafety in 2012.
- The Federal Ministry of Environment is the National Focal Point and the Competent National Authority(CNA) on Biosafety in Nigeria. it has the mandate for the safe management of modern biotechnology activities, and the handling, use of the products of modern biotechnology –genetically modified organisms(GMOs).

1.0 Over view

- Not minding the great potentials of Modern Biotechnology, there are perceived risks
- To address the perceived risks that modern biotechnology might pose to the environment and human health, biosafety is being used as major safety measure.

2.0 Global challenges

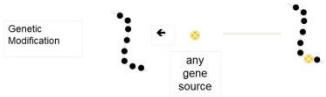
2.0 Global challenges

Growing global challenges:

- Growing world population
- Increased consumption of food, feed, fibre and fuel
- Loss of agricultural land
- Shostage of water for irrigation.
- Cclimate change
- Increasing demand for renewable fuels.
- Reduced agro biodiversity
- Loss of natural habitats and biodiversity
- Diseases and health concerns,
- Unemployment

3.0 Modern Biotechnology

- Modern biotechnology is an alternative tool to address global challenges,



3.0 Modern Biotechnology

It entails:

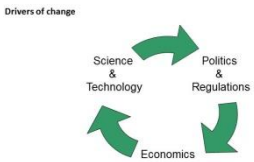
a) In-vitro nucleic acid techniques, including recombinant deoxyribonucleic acid (DNA) and direct injection of nucleic acid into the **cells** or organelles: or

b) Fusion of cells beyond the taxonomic family that overcomes natural physiological reproductive or combination barriers and that are not techniques used in traditional breeding and selection

b) It is gene specific

c) Its highly regulated because of its perceived risks on the environment and human health.

3.0 Modern Biotechnology



3.0 Modern Biotechnology

- The regulation of modern biotechnology seeks to harness the potentials it has to offer in the field of improved food production, medicine/health, Industrial growth and environmental protection,
- without it compromising the environment and human health.
- Biosafety ensures that hazards do not arise and affect biodiversity, environment, taking into account safety of human health, when GMOs are transported, handled and used

4.0 Biosafety

- The practice of the technology, handling and use of GMOs and products thereof are perceived to possess some adverse impacts on the environment and human health,
- Biosafety is therefore, to reduce and eliminate the potential risks resulting from modern biotechnology activities and its products and to minimise or eliminate the Possible harm/effects to the environment, Biodiversity and human health by the use of policies and regulations.

4.0 Biosafety

4.0 Biosafety

Mission of Biosafety in Nigeria:
To promote the basic tenets of biosafety as enunciated in the Cartagena Protocol on Biosafety and enforce Nigeria National Biosafety Regulatory Regimes to ensure the safe application and use of products of biotechnology.
Vision of Biosafety in Nigeria
To ensure that the practice, process and procedures of modern biotechnology are undertaken within the limits of a regulatory systems that guarantees its safe use, protection of Nigeria's biodiversity and With minimal risks to human health and environment

4.0 Biosafety

The Goals of Biosafety are to:

- determine in advance when hazards to human health and natural systems will result if any particular GMO is released into the environment;
- anticipate when a given GMO or its product(s) will be harmful if it becomes part of human food.
- discern whether a GMO will actually yield the benefits it was designed to provide;
- make sure that hazards do not arise when GMOs are transported (intentionally or otherwise) among different ecosystems and nations,
- Socio-economic and ethical concerns

4.0 Biosafety

The main issues in biosafety:

- .. a, **Environmental safety**
- . gene flow (of GMOs will contaminate our indigenous crops)
- . invasiveness (of GMOs might become predominant)
- . non-target organisms
- . other effects on ecology and dynamics
- b.**Food/feed safety/Human health**
- . Nutrition
- . Allergy
- . Toxicity
- . Substantial equivalence
- c. **Agricultural sustainability**
- . Weediness
- . pest resistance development
- . chemical inputs
- . Higher Costs
- . Others (Socio-Cultural , acceptability etc)

4.0 Biosafety

Approaches to addressing biosafety concerns:

- **Risk Assessment** : Risk assessment is a major aspect of GMOs release . Its the scientific identification and evaluation of potential adverse effects of GMO on Environment and human health
- **Risk management:** management, control of any risks that may be identified by risk assessment, it entails monitoring, inspection
- **Substantial equivalence:** Are the products the same as their conventional counterparts?
- **Precautionary principle/approach:** conclusive proof of safety before approval,

4.0 Biosafety

- **Benefit analysis:** is the impact on the environment greater than the benefit of the technology?
- **Cost and impact of regulation:** will regulating GMOs increase food prices and affect food security?
- **Products labeling** : for consumer choice and easy identification

5.0 Level of Nigeria's Biosafety preparedness

- Biosafety Unit established under the Federal Ministry of Environment,
- Biosafety Policy,
- Biosafety Bill passed by the NASS awaiting presidential assent
- Cartagena Protocol on Biosafety signed and ratified in 2000 and 2003 respectively,
- Nigeria has also signed the Nagoya-Kuala Lumpur supplementary Protocol on Liability and Redress to the Cartagena Protocol on Biosafety in 2012,
- Biosafety application form,
- Biosafety Containment Facilities Guidelines,
- Accreditation and certification forms,
- Decision document

5.0 Level of Nigeria's Biosafety preparedness

- Any Institute that intends to practice modern biotechnology or deal on GMOs must seek accreditation of the Institute and certification of its Biosafety containment t Facilities, Review of biosafety application by National Biosafety Committee,
- Guidelines for Confined Field Trials Monitoring and Inspection Manuals
- GMOs import/shipment form,
- Nigeria Biosaefty Risk Analysis Framework,
- Confined field trials on going
- http://ng.biosafetyclearinghouse.net

- Nigeria National Biosafety Application Administration Guidelines,
- Nigeria National Biosafety Socio-economic Considerations Guidelines

5.0 Level of Nigeria's Biosafety preparedness

6.0 NBF Implementation Project(2011-2015)

The objective of the project is to assist Nigeria to establish and consolidate:

- A. a fully functional and responsive regulatory regime in line with Cartagena Protocol and national needs and priorities;
- B. a functional national system for handling request, perform risk assessment, detect GMOs, decision-making, perform administrative tasks;
- C. a functional national system for "follow-up", namely monitoring of environmental effects and enforcement; and
- D. a functional national system for public awareness, education, participation and access to information

7.0 Why Should Nigeria Regulate GMOs

- To exercise the sovereign right over all her natural resources and authority to regulate access to such resources
- To harness the potentials modern technology has to offer in the field of improved food production, medicine/health, Industrial growth and environmental protection in a safe manner.

7.0 Why Should Nigeria Regulate GMOs

- There are equally concerns on the environmental consequences of the release of GMOs into the environment, in particular the effects on biological diversity
- To reaffirm Nigeria's commitment to the goals and objectives of the convention on Biological Diversity (CBD), and the Cartagena Protocol on Biosafety which Nigeria has signed and ratified and other related treaties .
- To prevent Nigeria serving as a dumping ground for unregulated Genetically Modified Organisms which may have adverse impact on our Environment and human health.

7.0 Why Should Nigeria Regulate GMOs

- To protect the populace from the socio-economic consequences of modern biotechnology products, especially among the small scale farming systems that are prevalent in Nigeria.
- To guaranty the purity of grains/seeds,
- There is currently a lot of concern regarding the possible toxicity and allerginicity of food products derived from GMOs. There is, therefore, the need to minimize risks to human health,
- Availability of plants that can reduce Green House Gases thereby reducing effect of Climate Change,
- It will encourage green economy,
- Precise trait will be used,

8.0 Importance of regulated modern biotechnology on Nigeria's economy

- Develop plants that have greater tolerance to stress in marginal environment
- Improve growth and productivity of plants and animals,
- Improve food quantity, nutritional improvement and consistency for healthy living
- Production of new breeds of animals and plants
- Reduced use of pesticides and herbicides,
- Reduced farming land area with higher yields thereby ensuring food security,
- Job and wealth creation,
- Better health facilities
- Industrial growth and
- Sustainable environment,

9.0 Biosafety Regulation in Africa

- The issue of biosafety regulation in Africa is rapidly gaining momentum as more African countries are embracing GMOs.
- Nearly all African countries have signed and ratified the Cartagena Protocol on Biosafety and also developed their bills and some are already passed into Laws.
- South Africa already has a biosafety law and is currently growing and consuming GM Corn and cotton . ,
- Kenya and Mali also recently passed a biosafety law and is currently carrying out GM Potato and cotton field trials respectively.
- Egypt also has Biosafety law and Agency

9.0 Biosafety Regulation in Africa

- Mali, Ghana and Burkina Faso, in West Africa, also have Biosafety laws and Agencies to manage Biosafety .
- Burkina Faso and Mali are presently carrying out GM cotton Confined field trials/Commercial release
- The African Union has developed a model biosafety law to assist member states develop their biosafety laws,
- As a follow up, the AU- NEPAD African Biosafety Net work of Expertise project has been put in place to develop the capacity of member states in biotechnology and Biosafety.

9.0 Biosafety Regulation in Africa

- In addition the ECOWAS Commission is currently developing a common Biosafety regulation in line with National Biosafety laws/regulations for the sub-region.

- This is due to the fact that Africa has embraced modern biotechnology.

-More also West Africa states have common boarders and free trade that may be very difficult to monitor.

10.0 Conclusion

- Modern Biotechnology under a regulated system will enhance economic growth, food security and Job/wealth creation, while protecting our environment and ensuring safety of human health,
- The Presence of a biosafety law will serve as a key that will open the door to Nigeria's safe modern biotechnology activities for national development in all sectors.
- It will also enable Nigeria to ascertain the safety of GMOs before consumption and for other purposes.

THANK YOU

ATPS and Biotechnology in Africa

Dr Kevin Urama – Africa Technology Policy Studies Network

Biosciences for Farming in Africa

Prof. Kevin Chika[1] Urama & Prof. Turner Isoun2

[1]Executive Director,
African Technology Policy Studies Network (ATPS)

[2]Prof. Turner Isoun, Former Minister for S&T, Nigeria

Presented at B4FA Workshop, Hilton Hotels, Abuja, Nigeria

What is ATPS?

A **trans-disciplinary** network of **researchers**, **private sector actors**, **policy makers** and **civil society actors** promoting the generation, dissemination, use and mastery of science, technology and innovation (STI) for African development, environmental sustainability and global inclusion.

ATPS Vision

To become **the leading international centre of excellence and reference** in science, technology and innovation **systems research, training and capacity building, communication and sensitization, knowledge brokerage, policy advocacy and outreach** in Africa.

ATPS Mission

To improve the quality of science, technology and innovation systems research and policy making in Africa by **strengthening capacity for science and technology knowledge generation, communication and dissemination, use and mastery for sustainable development** in Africa.

ATPS Overall Objective

To develop Africa's STI capacity **(knowledge basis & infrastructure, knowledge circulation & networks, knowledge conditions & policies)** today for sustainable African development tomorrow.

ATPS Motto

Building Africa's Science, Technology and Innovation (STI) Capacity Today for Sustainable African Development Tomorrow.

A Call to Immediate Action

ATPS National Chapters & Focal Points

What we do

Core Functions:

- **Knowledge Generation** (*Research Capacity Strengthening & Training*);
- **Knowledge Brokerage** (*Stakeholder Dialogue, Knowledge Circulation and Networking*);
- **Knowledge Dissemination & Outreach** – (*Publications, STI Journalism, Policy Advocacy*);
- **Knowledge Valorization** – *(Entreprenureship Development, Innovation Incubation and Challenge Programs).*

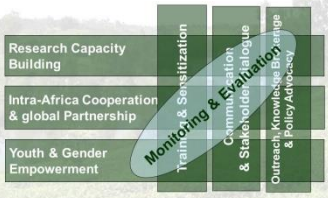
ATPS Programs

All ATPS programs target the **quadruple helix,** i.e., the **Policy makers**, the **Private sector actors**, the **Civil society actors,** and **the Science experts**, and aim at improving their capacity to put STI into use for development

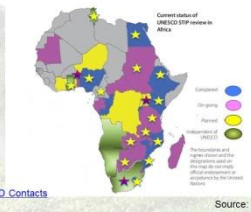
Urama, 2009

Politics is superior to Science & Technology

ATPS Strategic Priorities



Current status of STI Policies in Africa

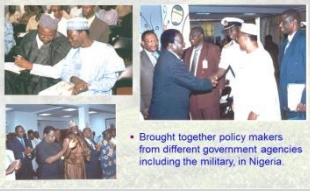


NEPAD Contacts

Source: UNESCO Report 2009

Training of Policymakers on Emerging STI Policy Issues (Biotechnology)

- A four-day training workshop held in Abuja and co-funded by the Raw Materials Research and Development Council (RMRDC), Nigeria



- Brought together policy makers from different government agencies including the military, in Nigeria.

Knowledge Networking on Emerging Challenges

Participation in global dialogues – the voice of Africa on STI (IPCC, UN Panels including UNEP, UNESCO, etc).

10th Biennial Conference if the ISEE, "Applying Ecological Economics for Social and Environmental Sustainability" Hosted by ISEE, ASEE, UNEP & Coordinated by the ATPS, 7 – 11 August 2008.

Empowering the Champions in Science Communication

Training on Communicating Science to Parliamentary staff, Kampala, Uganda. 22 – 26 September 2008

UK Parliamentary Office of Science and Technology (UKPOST), the African Technology Policy Studies Network (ATPS), and Science and Development Network (SciDev.Net) brought together 22 Parliamentary Staff from 13 African countries for a five-day course on "Communicating Science to Policymakers", to help bridge the science – policy gaps through improved skills in communicating science to Parliamentarians by Parliamentary staff in the continent.

Engage Policymakers in Policymaking Processes

S&T Policy Round Table with Legislators

- Organised by the ATPS Lesotho Chapter, this meeting brought together over 100 of the 180 members of the Lesotho parliament including 8 ministers, the deputy prime minister, leader of the opposition, president of the senate and the speaker

- The meeting was followed by a one-day S&T research sensitization workshop with university and polytechnic researchers

Engage the QH in Research Agenda Setting

2007 Annual Conference and Workshop: "Science, Technology and Climate Change Adaptation in Africa, Johannesburg 19 – 21 Nov. 2007"

- 64 participants from 20 countries comprising mainly African researchers and policy makers to identify and prioritise response options
- Done annually with themes defined by stakeholders

R&P Prioritization, Cairo, Egypt Nov. 2010

Sensitisation & Outreach Activities

Scientific Revival Day of Africa: 30th June annually
2003 Theme: Science and Technology for Wealth Creation

- Organised together with AAS, ACTS, AU-IBAR, ICIPE, ICRISAT, IPGRI, ITDG and the Ministry of Planning and JKUAT
- Included panel discussions, a science exhibition, seminar for members of parliament and the presentation of high school science awards

- Also commemorated by chapters in Ethiopia, Ghana, Nigeria, Tanzania and Uganda

Northern Voices in African Policy Prioritization & Development

Pan-African Stakeholder Policy Forum: Towards an Integrated Trans-boundary River Management Policy Development in Semi-Arid River Basins, Arusha, Tanzania, 11-14 March 2008

EC Commission Specific Support Action Project Contract N0 FP6 – INCO-CT-2007-043784 INTRE
Brought together 50 delegates (policymakers, researchers and practitioners) from 13 countries to
the nexus between integrated water management, biodiversity conservation and livelihoods and p
Roadmap to an integrated management framework

Genetically Modified Crops

❑Genetically modified (GM) foods are foods derived from organisms whose genetic material (DNA) has been modified in a way that does not occur naturally, e.g. through the introduction of a gene from a different organism.

❑Most existing genetically modified crops have been developed to improve yields, through the introduction of resistance to plant diseases or of increased tolerance of herbicides (WHO, 2012).

❑The first significant commercial sowings of GM crops (2.6 Million Hectares) took place in 1996, almost exclusively in the US. Since 1996, the areas have rapidly expanded to reach 41.5 Million Hectares in 1999.

❑GM crops are mainly grown on the American continent: the USA accounts for 70% of worldwide sowings of GM crops, Argentina for 14% and Canada for 9%. Of the 41.5 Million Hectares sown in 1999, 53% were soybeans, 27% corn, 9% cotton, 8% rapeseed and 0.1% potatoes.

❑Research on GM crops for uses in agriculture started in the eighties but sales of first commodity seeds began only in the mid-nineties (European Community, 2001).

❑UNDP observes that the key advantage of genetic modification is that it makes the process of crop improvement more efficient. In comparison to conventional plant breeding methods that take years to develop or eliminate traits by selection, genetic modification techniques allow scientists to manipulate genetic material with precision, and expand the scope of breeding new varieties and achieve results in less time (UNDP, 2012).

❑Food security is having sufficient physical, social and economic access to safe, nutritious and culturally acceptable food at the household level, without having to resort to emergency supplies.

Economics of GMC-A Bird's Eye View

❑GM technology has had a significant positive impact on farm **income** derived from a combination of **enhanced productivity** and **efficiency** gains.

❑In 2010, the direct global farm income benefit from biotech crops was $14 billion.

❑Over the fifteen years, 1996-2010, the cumulative farm income gain derived by developing country farmers was 50% ($39.24 billion) (Brookes and Barfoot, 2012).

The Controversy

❑Considerable uncertainty about:

- ❑ the potential to human health through ingestion of toxic substances;
- ❑ the potential risk to the environment through gene flows and to human health through ingestion of toxic substances;
- ❑and also whether these products will provide a sustainable solution to food problems.

The controversy is not over the existence of environmental and health risks – **all living organisms have an impact on the environment and all new technologies carry risks**....The debate is therefore about **whether the risks are great enough to require banning of the technology altogether**.

❑'Thus far, in those countries where transgenic crops have been grown, there have been no verifiable reports of them causing any significant health or environmental harm'. (FAO, 2004)

❑Because GM crops are a relatively new technology, Greenpeace and other groups argue that there has not been enough time to be able to tell whether GM crops do not have negative impacts on human and animal health (Greenpeace, 2011).

❑On the other hand, others point out that GM crops have been commercialized for nearly 20 years with no reported incidents of real damage, a very clean record considering that most technological innovations result in 'recalls' from the market when widespread consumption reveals risks that were not apparent in the testing process (Paarlberg, 2008).

GM crops in Africa

- Shiva (2006) emphasizes the longer term implications of GM crops; that their introduction would shape the ecological landscape and lead to loss of diversity, thus harming the environment (UNDP, 2012).
- The use of genetically modified organisms (GMOs) to boost agricultural productivity is often touted in Washington policy circles as a potentially powerful tool for boosting agricultural productivity and reducing food insecurity in Africa
- Many African governments remain skeptical of transgenic technologies
- While in Asia and Latin America the introduction of improved crop varieties and the application of scientific farming methods enabled food production to outstrip population growth, in Africa agricultural productivity actually declined.

- On a per capita basis, Africa's farms produced almost **a fifth less in 2005 than they did in 1970**. Africa currently imports a quarter of its food, even though about 70% of its people are engaged in agriculture.
- Many factors explain Africa's chronic food insecurity.
  - infrastructural deficits,
  - soil quality and water scarcity,
  - the predominance of small-scale over large-scale production,
  - a shortage of inputs,
  - climate variability and the effects of climate change,
  - national agricultural policies & inadequate incentive systems;
  - international trade barriers (Cooke and Downie, 2010).
- The use of GMO technology and its products is still in its infancy in most of Africa. **South Africa** and **Burkina Faso** are the only two African countries to have formally approved transgenic crops for commercial production. **South Africa** is the only African country that is commercially producing GM crops.

Traffic Lights!

- Private contractual relations between farmers and seed companies;
- The potential environmental impacts of the technology;
- The potential impacts of consumer concerns (both domestic and international) on the market for GM products;
- Underlying institutions and regulatory support systems

Global Challenge

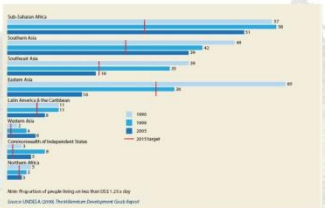
"… we will need the equivalent of two planets by 2030 to meet our annual demands…" (WWF Living Planet Report 2012)

… but this is based on 'business as usual' production systems and land use patterns…

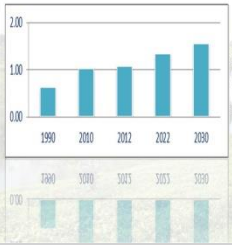
World Share of GDP & GERD for the G20, 2002 & 2007 (%)

Source: UNESCO Science Report, 2010

Poverty Levels in SSA, 1990, 1999 & 2005 (%)



Source: Urama et al. (2010), in: UNESCO Science Report, 2010



Africa's total population is projected to increase from 1 billion to about 1.6 billion by 2030. The trend is accompanied by an increase in working-age and urban populations.

Source: AfDB, Adapted from United Nations Economic & Social Affairs, Population Division

Conclusions

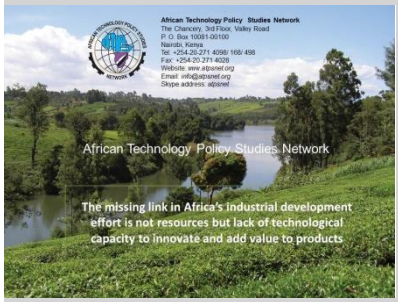
- The performance and impact should be **considered on a case by case basis in terms** of crop and trait combinations (Brookes and Barfoot, 2012).
- The evidence behind the controversy over the potential impact of GMOs on human health and the environment are not as conclusive as the evidence on food insecurity in Africa, neither are they comparable to the evidence on its farm productivity improvement effects.

Change is all around us whether we like it or not, even in the everyday things we do.

The way ahead

Failing to change and act now, carries the risk …

Real scientists welcome new ideas and advances as they open the door to more new ideas and further advances in knowledge.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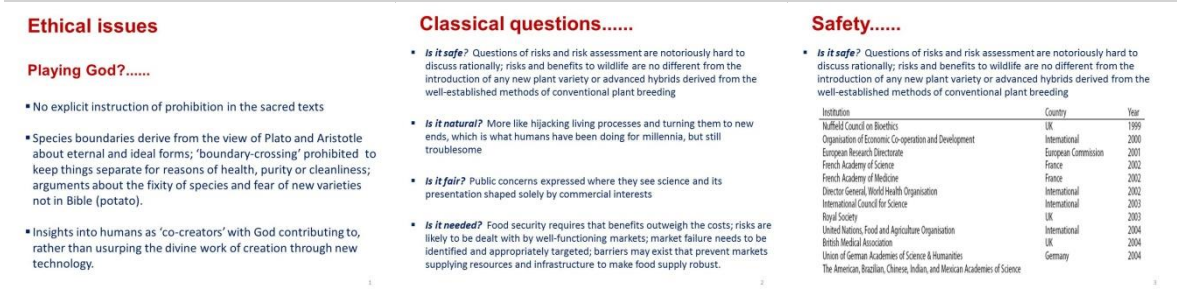
African Technology Policy Studies Network
The missing link in Africa's industrial development effort is not resources but lack of technological capacity to innovate and add value to products

Ethical Issues in Biotechnology

Prof Brian Heap – B4FA Project Leader



Ethical issues

Playing God?.....

- No explicit instruction of prohibition in the sacred texts
- Species boundaries derive from the view of Plato and Aristotle about eternal and ideal forms; 'boundary-crossing' prohibited to keep things separate for reasons of health, purity or cleanliness; arguments about the fixity of species and fear of new varieties not in Bible (potato).
- Insights into humans as 'co-creators' with God contributing to, rather than usurping the divine work of creation through new technology.

Classical questions.....

- ***Is it safe?*** Questions of risks and risk assessment are notoriously hard to discuss rationally; risks and benefits to wildlife are no different from the introduction of any new plant variety or advanced hybrids derived from the well-established methods of conventional plant breeding
- ***Is it natural?*** More like hijacking living processes and turning them to new ends, which is what humans have been doing for millennia, but still troublesome
- ***Is it fair?*** Public concerns expressed where they see science and its presentation shaped solely by commercial interests
- ***Is it needed?*** Food security requires that benefits outweigh the costs; risks are likely to be dealt with by well-functioning markets; market failure needs to be identified and appropriately targeted; barriers may exist that prevent markets supplying resources and infrastructure to make food supply robust.

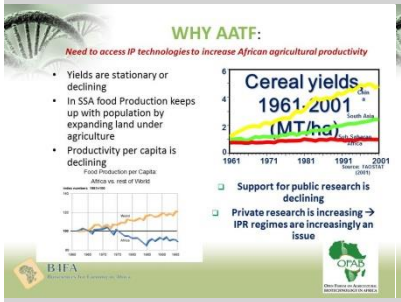
Safety.....

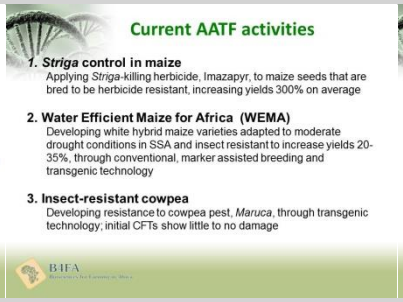
- ***Is it safe?*** Questions of risks and risk assessment are notoriously hard to discuss rationally; risks and benefits to wildlife are no different from the introduction of any new plant variety or advanced hybrids derived from the well-established methods of conventional plant breeding

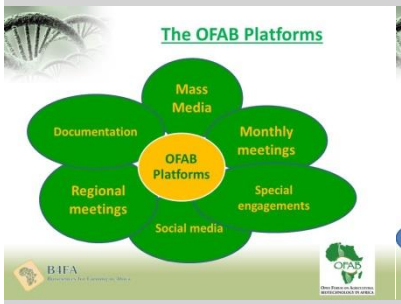
Institution	Country	Year
Nuffield Council on Bioethics	UK	1999
Organisation of Economic Co-operation and Development	International	2000
European Research Directorate	European Commission	2001
French Academy of Science	France	2002
French Academy of Medicine	France	2002
Director General, World Health Organisation	International	2002
International Council for Science	International	2003
Royal Society	UK	2003
United Nations, Food and Agriculture Organisation	International	2004
British Medical Association	UK	2004
Union of German Academies of Science & Humanities	Germany	2004
The American, Brazilian, Chinese, Indian, and Mexican Academies of Science		

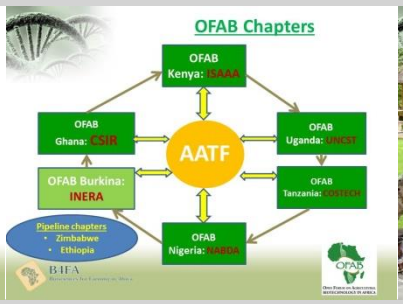
Seed Trade Environment in Nigeria

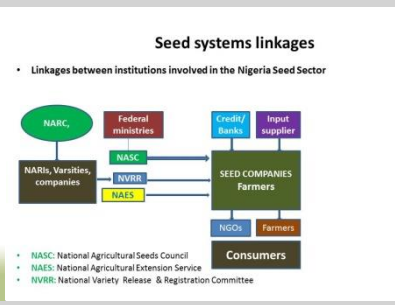
Daniel Otunge – African Agricultural Technology Foundation











The Role of farmers

- Informal seed sector dominates seed industry in Ghana
- About 85% of planted materials are grains
- Some Farmers dislike 'Agric' seeds
- Registered individual seed growers/merchants
- Distorted market system


ROLE OF RESEARCH INSTITUTES

Role of national institutes

Nigeria has 36 Institutions under the Agricultural Research Council of Nigeria (ARCN) that produce most of the pre-basic and basic seeds.

Four of these are vital:

- ✓ Institute for Agricultural Research (IAR) (maize, cotton, cowpea, sorghum, sunflower, etc)
- ✓ National Cereals Research Institute (NCRI) (Rice, Soybean, Sugarcane)
- ✓ Lake Chad Agricultural Research Institute (LCARI) (millet, wheat, barley, chickpeas etc.)
- ✓ National Root Crops Research Institute (Cassava, yam etc.)

Seed Schemes

Role of national institutes

National Biotechnology Development Agency

NABDA is a specialized agency established by the federal government in 2001 to coordinate, promote and regulate the development of biotechnology in the country

It is currently working on 5 crops:

- ❑ Bt. cowpea,
- ❑ Cassava
- ❑ Bt-maize,
- ❑ Bt-cotton,
- ❑ Bio-fortified sorghum

Role of research institutes

Key challenges include:

- Inadequate funding: Research unfunded
- Brain drain: Poor pay
- Poor infrastructure: Human and institutional
- Poor project planning: Deployment often left out
- Donor dependency: Incomplete projects
- Bad governance: Graft

Role of Seed Companies

Role of Universities

- Nigeria has a number of specialized universities that play significant roles in development and production of seeds.
- Examples include:
- ✓ University of Agriculture, Makurdi
- ✓ University of Agriculture, Abeokuta
- ✓ Michael Okpara University of Agriculture, Umudike

Role of Seed Companies

- Nigeria has about local 100 registered seed that play a significant role in supply of quality seeds to farmers
- Serious ones like Premier Seed are controlled by powerful individuals
- There is low presence of multinationals like in Nigeria
- There is fear of multinationals

Role of CGIAR

The CG centers also play significant roles in crop breeding and production of breeder or pre-basic seeds. Most relevant ones include:

- ✓ International Institute for Tropical Agriculture (IITA): CASSAVA
- ✓ International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)
- ✓ International Maize and Wheat Research Center (CIMMYT):
- ✓ International Rice Research Institute (IRRI): GOLDEN RICE
- ✓ Africa Rice Center (WARDA): NERICA RICE
- ✓ International Potato Center (CIP) : ORANGE FLESHED SWEET POTATOES
- ✓ World Vegetable Center (AVDRC): VEGETABLE SEEDS

Role of regional organizations

These provide funding for research, technology transfer and also facilitate better regulatory environment

- NEPAD centers of excellence
- CORAF/WECARD (West & Central African Council for Agricultural Research & Development)
- ECOWAS (Economic Community of West African States)
- AGRA (Alliance for the Green Revolution in Africa)
- AATF (African Agricultural Technology Foundation)
- FARA (Forum for Agricultural Research in Africa)

SEED REGULATORY ENVIRONMENT

Overregulation

Seed regulation in Nigeria

- Nigeria has policies, rules, regulations and laws, which govern seed breeding standards, seed variety testing, variety release, seed promotion, dissemination, marketing, quality control, conflict resolution, import and export.
- Varieties are release through the **National Variety Registration and Release Committee.**
- The committee should assist in promotion of newly released varieties

Seed regulation in Nigeria

The following are the key regulatory documents journalists should read to understand the regulatory situation:

- ✓ National Agricultural Seeds Decree (No 72 of 1992): obsolete
- ✓ National Agricultural Seeds Act (new)
- ✓ National Harmonized Seed Rules and Regulations
- ✓ Nigerian Minimum Seed Certification Standards
- ✓ Seed Certification Manual
- ✓ Seed Testing manual
- ✓ Seed Law Enforcement Manual
- ✓ **Biosafety Law: *Still awaiting presidential assent!***

The new body to implement the act is:

- ➢ **National Agricultural Seeds Council of Nigeria** (NASC) under the Federal Ministry of Agriculture and Rural Development

NEED TO PROTECT BREEDERS' RIGHTS AND FOLLOW INTERNATIONAL SEED STANDARDS

Intellectual Property Rights

- How countries in the sub-region have laws to protect Plant Breeders' Rights.
- This has negative impacts on availability of on plant breeding.

IPRs reforms

- Patent and Designs Act, Chapter 344 of 1990 prescribes products eligible for patent right. Section 1, Sub-section (4) excludes plant or animal varieties from patenting
- Intellectual Property Commission Bill (IPCOM) that is fully compatible with the TRIPS Agreement has been presented to the National Assembly for debate.
- It is critical to protect breeders' rights if plant breeding in Nigeria is to go a notch higher and be able to satisfy national needs.

International seed regulation

Seed Regulatory aspect	Description	Institutions responsible
Seed Certification (SC)	Quality assurance process. Inspection done by National Designated Authority (NDA), e.g. GSID, to confirm DUS and VCU (Value for Cultivation and Use)	OECD: Organization for Economic Cooperation and Development. Has developed the seed schemes recognized internationally
Seed Testing (ST)	This is done to provide credible information on purity, germination, limits on moisture content and seed-borne diseases, size, weight, vigor, viability and varietal quality. Certificate of quality is issued if the NDA is satisfied.	ISTA: International Seed Testing Association. Provides uniform rules and guidelines for testing and also accredits of seed testing labs
Phytosanitary Measures (PMs)	These are rules governing importation and marketing of plant species. Aims to prevent spread of diseases, pests and invasive species	WTO: has provided sanitary and PMS(WTO-SPS) to guide movement of seeds across boarders. Allows countries to seed their own PMs based on science. IPPC: International Plant Protection Convention. The IPPC sets the standards and currently 177 countries are signatories.

International seed regulatory institutions

Seed Regulatory aspect	Description	Institutions responsible
Plant Variety Protection (PVP)	Breeders of new improved plant verities need protection of their intellectual property right so that they can exclusively benefit from it. IPRs are legal instruments used to protect creations of the mind which have commercial value, such as inventions. They grant exclusive rights to the creator to protect access to and use of their property from unauthorized use by third parties. ARIPO/OAPI (for Africa)	UPOV: International Union for the protect varieties of plants. The aim is to encourage of new varieties for benefit of society. It is intergovernmental body. WTO-TRIPS: Trade Related Aspects of Intel Property Rights also obligates member-sta protect breeders-rights. Rights only given i is new, distinct, uniform, stable and has VC PGRFA: International Treaty on Plant genet resources for Food and Agriculture facilita equitable global benefit sharing.. In Ghana Plant Protection & Regulatory Se Department (PPRSD) of MOFA is responsib
Capacity building	Developing and strengthening seed production capacity, regulation and policies are a priority areas for the international community GIPB: Global Partnership for Plant Breeding was set up by FAO to help poor countries to develop seed production and regulation capacities	FAO: Assists members in building capacitie following ways: • National seed policy • Regional harmonization of seed regula • Seed production and quality assurance • Quality Declared Seed (QDS)
Arbitration	This refers to the procedure for resolving seed trade disputes.	ISF: International Seed Federation has dev procedural rules for seed trade dispute set

HOW SEED MARKETING

Seed Marketing is done by:

- Companies and agro-dealers
- Farmers and farmer groups
- NGOs/FBOs/CBOs eg AGRA/AATF
- ICTs (eWallet)
- Agricultural shows/trade fairs
- Media
- Extension Services

Extension service is:

- Ineffective
- inefficient
- Underfunded
- Understaffed
- Corrupt (stories of staff using official motorcycles for private business)

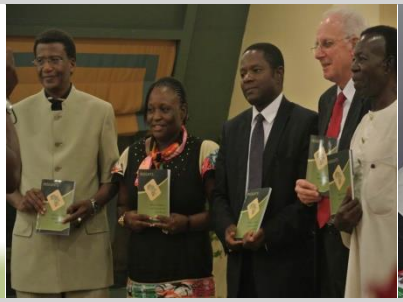
Challenges facing seed sub-sector

The following are some of the major challenges facing the seed systems in Africa:

- Unstable government policy
- Weak seed market systems
- Low seed adoption rate
- Lack of up to date data on seed
- Inadequate capacity building
- High production costs
- Inadequate distribution channels
- Poor extension service
- Poor storage facilities

Challenges facing seed sub-sector

- Poor policy implementation
- Inadequate enforcement of seed laws and regulations
- Poor funding of research for seed development
- Counterfeiting and adulteration of seeds
- Underdeveloped irrigation systems
- Inadequate land for seed production
- Lengthy variety release process
- Expensive credit facilities
- Lack of harmonized regional seed policies and regulations
- Unavailability of seeds in commercial quantities
- Lack of awareness of new varieties
- Insufficient supply of good quality breeder/pre-basic seeds
- Poor agro-dealer network
- Weak national seed trade/grower associations



To give our scientists...