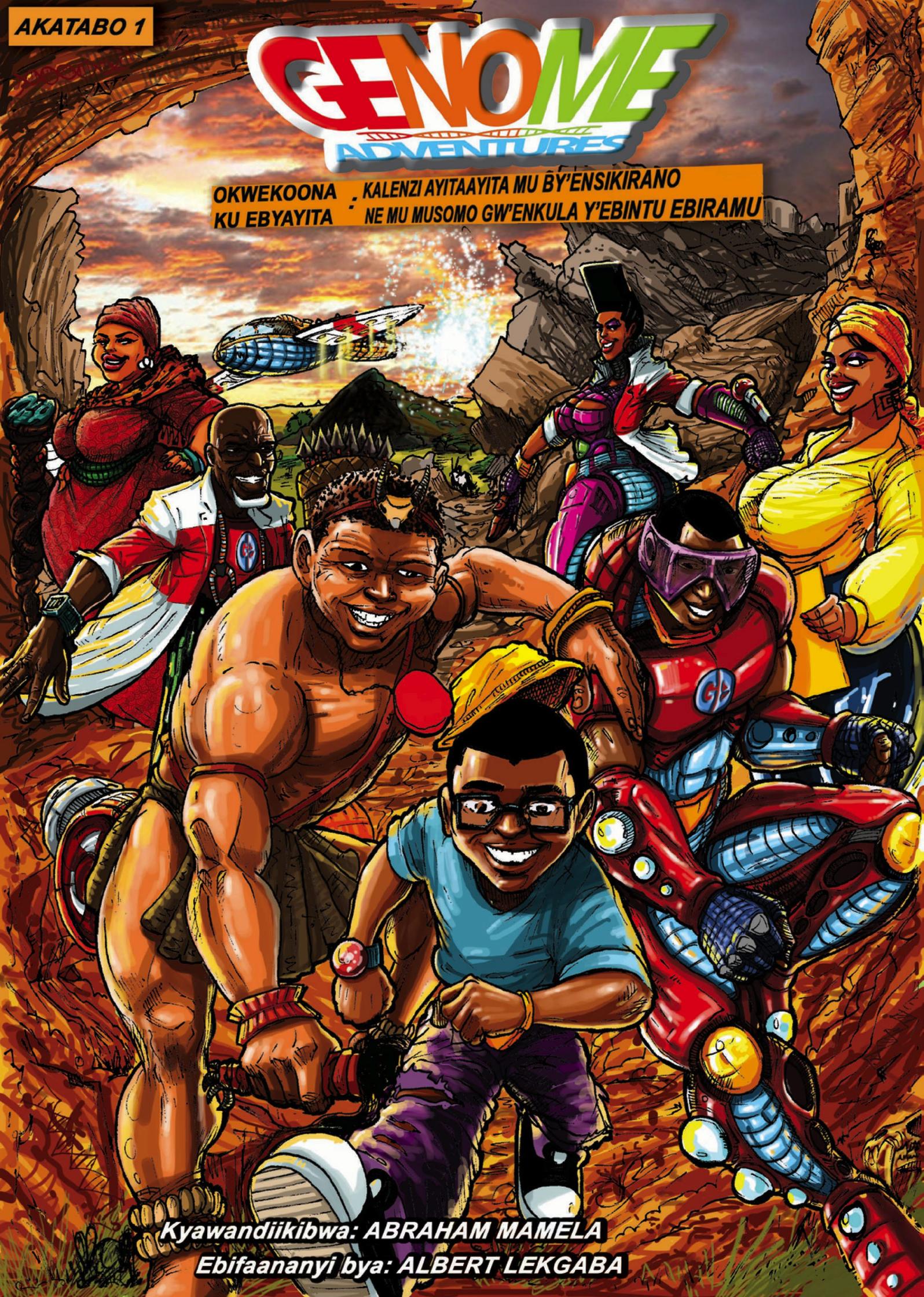


AKATABO 1

# GENOME

## ADVENTURES

OKWEKOONA KALENZI AYITAAYITA MU BY'ENSIKIRANO  
KU EBYAYITA NE MU MUSOMO GW'ENKULA Y'EBINTU EBIRAMU



*Kyawandiikibwa:* ABRAHAM MAMELA

*Ebifaananyi bya:* ALBERT LEKGABA

## FOREWORD



Investment in research and development has proven to be a driving factor for economies in developed countries and is included on the African Union agenda as a solution to poverty and other socio-economic problems. There is a consensus that supporting science and technology will contribute to the creation of knowledge economies in Africa. Indeed, science communication and engagement can bridge the knowledge gap between academia and the general public in Botswana and elsewhere.

“Where Science Meets Fun” is the motto of Genome Adventures, an innovative Wellcome Trust-funded community engagement initiative of the Collaborative African Genomics Network (CAfGEN). CAfGEN is a member of the Human Heredity and Health in Africa Consortium (H3Africa) and is coordinated by the Botswana-Baylor Children’s Clinical Centre of Excellence (COE)- a key partner to the Ministry of Health. Genome Adventures utilizes capacity building workshops, educational comics, and social media to engage community stakeholders, media practitioners, and the general public - especially the youth – in furthering the understanding of genomics and biomedical research.

This four-part Genome Adventures comic book series aims to educate readers on the history of heredity and genetics, the structure and function of DNA and genes, the link between genomics and health, and the process for enrolling in a biomedical or genomics research study, including ethical issues pertaining to informed consent, sample shipping and storage, and community engagement.

This first issue of the Genome Adventures comic book series - Blast to the Past: Kitso Explores Heredity & Genetics – is the result of many months of development by a diverse team of writers, editors, reviewers, and advisors. The team’s collective love for biomedical science, African history, Botswana, and the important role of women in science shines through the pages of this book.

I would like to acknowledge the Wellcome Trust for supporting Genome Adventures and to thank them for their vision “to improve health by supporting bright minds in science, the humanities and social sciences, and public engagement.” I would also like to thank all members of the Genome Adventures team and appreciate the generosity of The Botswana Gazette newspaper, and the Printing & Publishing Company Botswana (PPCB) for assisting with printing and distribution of the comic books. Last but not least I want to thank the Botswana-Baylor Children’s Clinical Centre of Excellence for bringing together this wonderful and innovative endeavor.

Science should no longer be seen as being confined solely to laboratories. Rather it should become an integral part of our daily lives and each of us should participate in its development. This approach of simplifying complex scientific concepts and communicating them in an educative yet entertaining way is an important step towards achieving that reality. Each Botswana, young or old, who reads these books, will be taking our beloved country a step closer to closing our Vision 2016 Pillars of an Educated, Informed and compassionate, just caring nation

A handwritten signature in white ink, appearing to read 'Dorcas K Makgato', enclosed in a white circular outline.

Dorcas K Makgato  
MINISTER OF HEALTH  
REPUBLIC OF BOTSWANA

# KITSO



MULI MUTYAI NZE KASAJJA. MBEERA WANDEGEYA NE SSENGA. NJAGALA NNYO EBY'OKUVUMBULAI NNAZAALIBWA N'AKAWUKA AKALEETA MUKENENYA NAYE EKYO TEKINVUVUBA.

# DR. MABOKO



NZE NKULIRA EKIBINJA EKIVUMBUZI KU BY'OBUTONDE BW'EBIRAMU (NAKAYONDO ABEERE NGA ABAGAMBA KII) NNINA OBUSOBOZI OBUSAMAARZA OBUMPISA MU BISENGE NE MBUZAAWO SUKUUTA KANGE WANO ATE NENKADDIZAAWO ERI. SIKOMA AWO, MMANYA OMUNTU BY'ALOWOOZAI

# KGOSIGADI



NDI MUKYALA ATEEMOTYAMOTYA ERA OMUKULEMBEZE WA BANTU BANGE OWA NNAMMADDALA, BA NNAYUGANDA. NNYINZA OKUBALABIKIRA NGA JJAJJAMMWE OWA BULIJJO, NAYE OMUGGO GWANGE GWENTAMBUZA GULINA AMAANYI AG'ENJAWULO AGAAVA MU BA JJAJJANGEI NGA NKOZESA AMAANYI GANO, NNYINZA OKULOGA ENKUBA, OKULAGIRIRA ENSOLO, N'OKUKOLA EBYEWUUYISA EBIRALA.

# PHODISO

NZE PHILIPPA NAYE OYINZA OKUMPITA "SSENGA". BAABA BWE YAFE YANDEKERA OMWANA WE KASAJJA, ERA KASAJJA, MMWAGALA NGA BWE NJAGALA ABAANA BANGE ABALALAI TUBEERA FFENNA E WANDEGEYA, NGA WAKAVA OTI E KAMPALA TUYINZA N'OKUBEERA BALIRANWA BO!



# XGAO-TGGAI

NZE KWATA-MU NSAWO [OBA "KWATA" MU BUFUNZE]. NNENYUMIRIZA OKUBA OMUMBUTI- ABAMU ABANTU BANGE BABAYITA BA 'NNAKALANGA' OBA 'BUNNAKALANGA'. ERA NDI MUZIRA MU BAZIRA MU MAANYI G'OKUTAMBULIZA ABANTU MU BISEERA! ERINNYA LYANGE, NGA TOLIGENZE BUZIBA, LITEGEEZA 'OKULABA OKUSALA NG'AKAGIRITA' KUBANGA ENDABA YANGE NJOGI NGA AKAMBE AKOOGI ERA NSOBOLA N'OKULABA EBY'OMU MAASOI!



# MARANYANE

MULI MUTYAI NGA ERINNYA LYANGE, MAKANIKA, BWE LIRI, NJAGALA EBY'EMIKONO. MWEKEBEJJE OMUBIRI GWANGE! EKITUNDU EKIMU KYUMA ATE EKRALA MUNTU. MU BWONGO NSAZA BUSAZA ERA NJAGALA OKUKOESA EBIKOZESEBWA EBYAKAFULUMAI

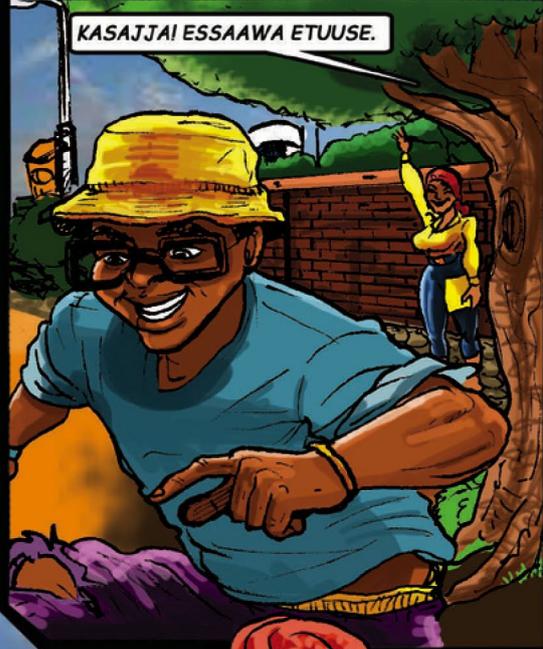


# MMATLI

NZE NNANZIRI. NDI MUNOONYEREZAI NANGE NNINA AMAANYI AG'ENJAWULO AGASOBOLA OKUTONIYA EBINTU OKUBITUUSA KU BUNENE BW'EBIRABIBWA GAALBINDI EZIZIMBULUKUSA ZOKKA NG'OMWO MW'OTWALIDDE N'ABANTUI NJAGALA EBYEWUUNYO SSAAYANSI BY'ATUYAMBA OKUVUBULA ERA NNANDIYAGADDE OKULABA ABAWALA ABATO ABALALA MU UGANDA NGA BAFUUKA BA NNASSAAYANSI NGA NZEI!



LUMU KU MAKYA MU KISAAWE KYA KIRINIKA  
Y'ABAANA E NAGULU, KIRINIKA Y'ABAANA  
ABALINA AKAWUKA AKALEETA MUKENENYA...



KASAJAI ESSAAWA ETUUSE.



KASAJJA NJIJAI!



OMUSAWO AKULINZE.

NKULAMUSIZZA, DR. TEOPISTA.

NDI MUSUKKIRIVU, WEBALE NNYO.

NKULAMUSIZZA, PHILIPPA. OLI OTYA?



ATE GGWE MUVUBUKA, OBADDE MU MBEERA KI?

KIWULIKIKA NGA AKOZE KA DWIRO AKALUNGI.

YE TOLI MU TTII MU Y'OMUPIIRA E WAMMWE EYO?



BULUNGI NNYO, NNYABO. MBADDE NZANNYA KO NE BA NNANGE.

WANDEYA BUMYU, YEEYO?

OLOWOOZA TTII MU YAMMWE ESOBOLA OKUWANGULA UGANDA CRANES, TTII MU YA UGANDA?

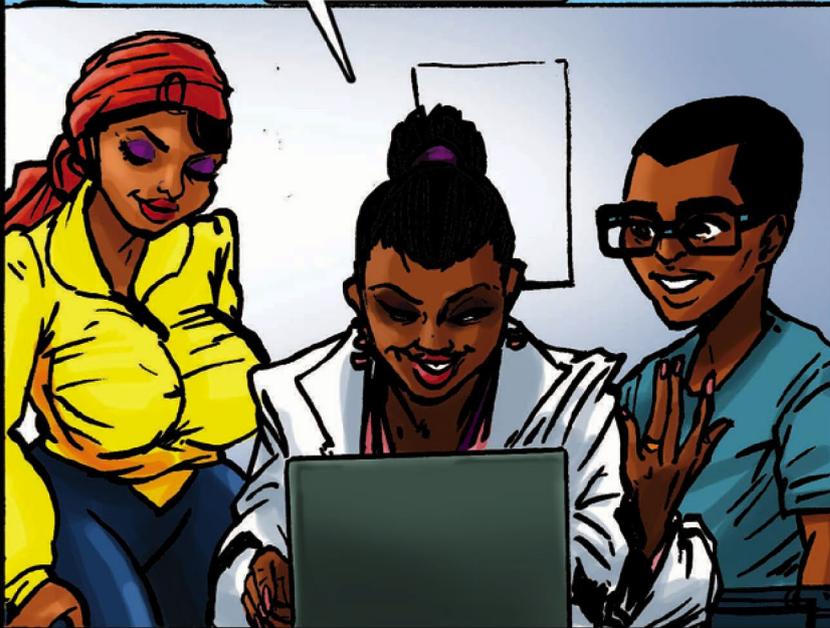


VNEDDA SI FFE BUMYU. FFE BA WANDEGEYA NKULA.

GGYAKO AKABUZA NKULA EYINZA OKUWANGULA UGANDA CRANES.

HAAHAHA OKIKAKASA? MBAAGALIZA MUKISA.

OBUSIRIKALE BWO N'AKAWUKA AKALI MU MUSAAYI BIRABIKA BIRUNGI MUWANGUZI 66WE!



OMANYI EKYO KYE KITEGEEZA? KITEGEEZA NTI OLI MULAMU KATEBULE.



ERA KATI NGA BW'OLI OMULAMU, TWAGALA OKUKUSABA WENYIGIRE MU KUNOONYEREZA.



KWATA, TWALA EKIWANDIKO KINO EKA OKISOME NE SSENGA WO.



OLWO OTUTEGEEZE OBA OYAGALA OKWETABAMU.



GENDA MU MAASO N'OKUSAMBA AKAPITRA WAMU N'OKUTENDEKEBWA ENNYO, MUWANGUZI 66WE. UGANDA CRANES EYINZA OKUZIBWALA OKUWANGULWA.



NJA KUKOLA BWENTYO, MUSAWO, WEERABA.



TULABAGANE OLUDDAKO.



ERA KATI NGA BW'OLI OMULAMU TWAGALA OKUKUSABA WENYIGIRE MU KUNOONYEREZA.

TWALA EBBALUWA ENO EKA... KAKASA NTI OGITTEGEERA BULUNGI.



SSENGA, MBADDE NDOWOOZA KU BBALUWA EYO GYETWAFUNA OKUYA EW'OMUSAWO.

HMMM, DDALA?



OKUNOONYEREZA KUKWATA KUKI?

WALIWO ENGERI EMU YOKKA EY'OKUZUULA KYE KUKWATAKO.



OMUJJANJABI OWOOMUKWANO EBBALUWA ENO EZZE KUKUSABA OKKIRIZE OMWANA WO OKWETABA MU KUNOONYEREZA...

OKUTUYAMBA OKUMANYA EKINENKO ENGERI OBUTOFFAALI OBUKOLA EKIRAMU KYONNA GYE BUKOLA KU BWANGU ABAANA ABALINA AKAWUKA AKALEETA MUKENENYA N'AKA'AKAFUBA GYE BALWALAMU.



OKUSOOKA, TUJJA KUKUGGYAKO AKASAAYI AK'OKUKEBERWA...

DEAR CAREGIVER,

THIS LETTER S... TO PARTICIPATE... HELP US LEARN M... GENES ON HOW... AND TB GET SIG...



OOH ABANGEI LWAKI BAAAGALA OKUNZIGYAKO OMUSAAYI?!

KUBANGA BAAAGALA OKUYIGA EBISINGAWO KU NGERI ABAANA ABALI NGA GGWE GYEBALWAZIBWAMU AKAWUKA AKALEETA MUKENENYA N'AKAFUBA.



NAYE LWAKI BETAAGA MUSAAYI GWANGE OKUSOBOLA OKUKOLA EKYO?



OBUTTOFFAALI OBUKOLA?



KUBANGA...



UMM...

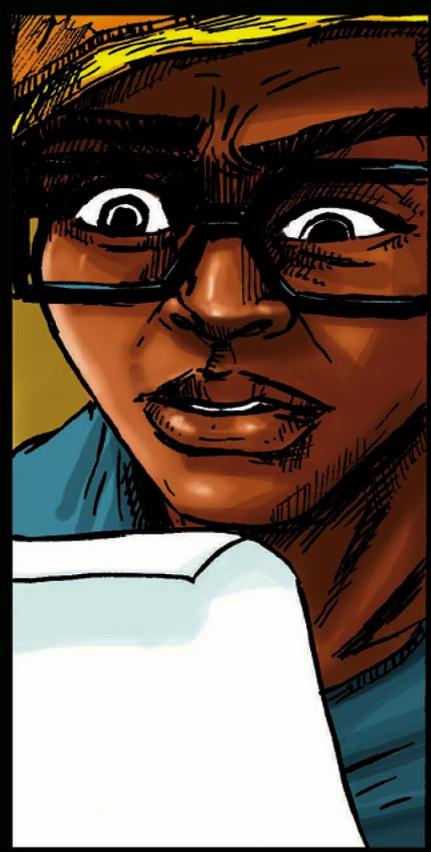
NNANDIKUTUUMYE KAGEZIMUNNYO. MWAMI BIBUZO!



TWALA BUTWAZI EBBALUWA MU KISENGE KYO OGISOME EKIRO KYONNA.



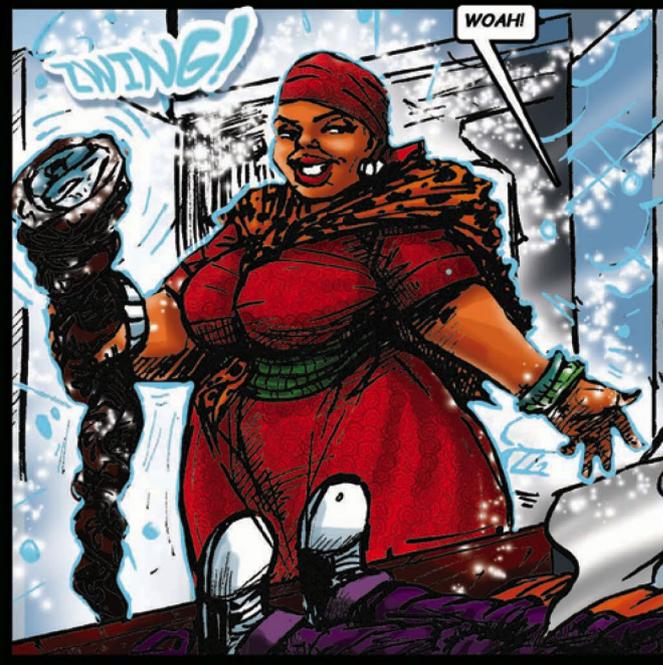
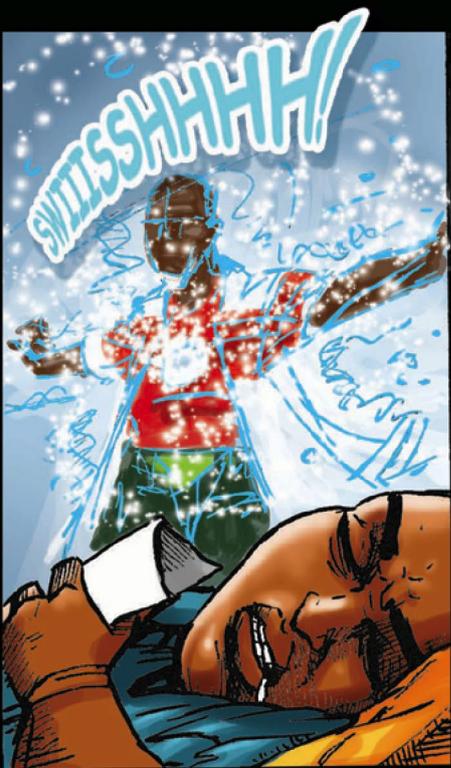
TUJJA KUSOBOLA OKUSALAWO EKY'OKUKOLA KU MAKYA.



SISOBOLA KWEBAKA.



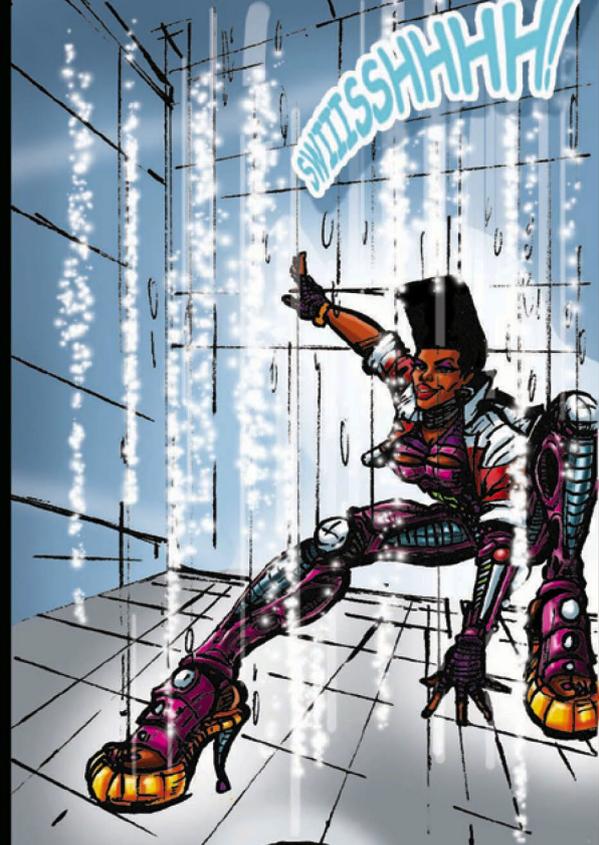
NTEEKWA OKUSOMA EBBALUWA.



WOAHI!



TOTYA, KASAJJA!



SWISSHHHHH!



PPOVVVVVV!



FFE BAZIRA MU BAZIRA!

MMWE BAANI BASAJJA  
MMWE? ERA EKYO  
MWAKIKOLA MUTYA?

NZE DR. MATOVU, NSOBOLA OKUSOMA EMMEEME YO NE MMANYA KIKI KY'OLWOOZA.

ERA AKASEERA KANO KENNYINI, NKIMANYI OLOWOOZA KU BBALUWA EYO. TULI WANO KUYAMBA.



NZE NAKAYONDO. DR. MATOVU ALOWOOZA NTI YE KAFULU WA KAZANNYO KANO, NAYE NZE MUKULEMBEZE YENNYINI OW'EKIBINJA KINO.

NZE NNANZIRI. NNENDA KUBAYIGIRIZA KU EKYEKYAMA EKIKUSIKE MU MUNTU. AMAANYI GANGE GAYINZA OKUKUFUULA AKANTU AKASIRIKITU ENNYO N'ABANTU NE BATASOBOLA KUKULABA.



WOOOAAH! DDALA? NGA OKUFUUSAFUUSAI ATE GGWE. OSOBOLA KUKOLA KI?

SHHHHHH!... NZE KWATA-MU NSAWO. OYINZA OKUMPITA KWATA. NNYINZA OKUKUBUZAAWO NE NKUTWALA MU BIFO BY'OTOTUUKANGAMU.



TEWEERALIKIRIRA, TETUJJA KU KUTUUSAAKO BUVUNE.

TUZZE KU KUVUBUZA.



OKUVUMBULA? NJAGALA EBY'OKUVUMBULAI



TUFULUME TUGENDE TULABE OBANGA TUNAAASISINKANA MUNNAKIBIINA MUNNAFFE OMULALA, OLWO TULYOKE TUSEEYEZE KU HELIX EMMEERI YAFFE LUGOGOMA?



TEWERALIIKIRA, KASAJJA, BW'OBERA NAFFE TOBA NA KUTYA KWONNA. SSENGA WO TAJJA NAKUKIMANYA NTI OVUDDWEWO KO. JJUKIRA, NNYINZA OKUSOMA EBIRI MU MMEEME YO.



KALE FENNA TWEKWATE EMIKONO!



NCII X'AÈ DI TSI C'EE TSEÈ, SÈÈ NAKA TSARI TS'ÈNÈAN Q'OO KOE QABIA TCĀĀ TA A, NAKA NCII KURI DI NE KHŌÈ NE SITA DI NE KOE UŪ TA A.\*



OMULIRO OKUYA MU BISEERA EBY'EMIREMBE N'EMIREMBE...



TUSABIKE MU MUKKA GWO OTUZZEYO MU BISEERA BY'ABA JAJJA ABATUSOOKAI



\*OKULAAMIRIZA KWA "KWATA" KULI MU LULIMI NARO OLW'OGERWA E GHANZI MU DISTURIKITA YA BOTSWANA NE NAMIBIA EYE BUVANJUBA. KUDDIRIDDWA OKUVVUNULA BWEKUTYOBWEKUTYO MU LUGANDA.



MAMBOI BILA SHAKA  
WEWE NI  
KITSO.



NZE MAKANIKA NAYE OYINZA OKUMPITA MAKISI. NKWANIRIZZA NNYO KU MMEERI YANGE ENNUNGI. MWATTU TUULA ERA WESIBE OLUKOBA.



YIYO? MWATTU! TEWEGULUMIZA NNYO?



TUGENDA KU NSOZI ZE SSESE KU SSAAWA ENO. MAKANIKA, NNYINZA OKUTANDIKIRA WANO.



HEBU SUBIRI KWANZA, KWANINI UENDESHE WEWE WAKATI MIAMI NI DEREVA MZURI?

KWA SABABU TUNAENDA KWETU. SIKILIZA, KIJANA, UNAFIKIRI NITAENDESHA KASI SANAA?



ENDELEA KUONGEA ZAIDI UONE KAMA HUAJAJIKUTA NJE UMIFUNGA JUU YA MTI WA MARULA.



HAMWEZI KUNYAMAZAI!

USIJALI JUU YAO, KITSO. HAWAHITAJI MAPUMZIKO.



ZOOOON!!!

NI HARAKA AJABU!!!



KARIBU KATIKA NCHI YA WATU WANGU, BINADAMU ASILIA. PIA WANAITWA WATU WA PORINI AU BASARWA.

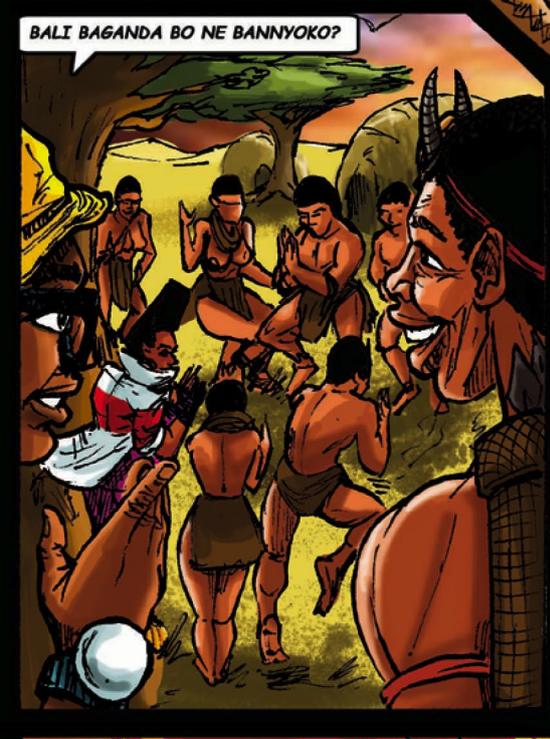
ZOONOM!!



KIKI EKITULEESE WANO?



KINO KYE KIMU KU BIFO BA JTAJJANGE, NJAMBA ABANTU ABAASOOKAWO, WE BASULANGA.



BALI BAGANDA BO NE BANNYOKO?



WOTE MABABU ZETU NI WAMOJA, KAMA ILIYO KWA WENGI WETU, HATA KWAKO PIA KITSO.

KAMA TUKO SAWA, KWA NINI TUNATOFAUTIANA MUONEKANO NA LUGHA PIA?

KABLA YA UHAMIAJI MKUU, KUNDI KUBWA LA WATU DUNIANI ILIKUWA BINADAMU WA ASILI WAKIWA NA TABIA TOFAUTI TOFAUTI.

ENJAWULOYAWULO?

ENJAWULOYAWULO BY'EBINTU EBIRABIKA EBITWAWULA KU BALALA BONNA. OKUGEZA NGA LANGI Y'AMAASO OBA ENKULA Y'AMATU GO.



SIFA AU TABIA ZETU HUAMULIWA NA KITABU PEKEE CHA MALEKEZO KATIKA MIILI YETU KIITWACHO JENI. TUNAONEKANA TUKO TOFAUTI KWA SABABU JENI ZETU NI TOFAUTI.

TWAWUKANA MU NFAANANA ZAFFE KUBANGA OBUTOFFAALI BWAFFE OBUKOLA EKIRAMU KYONNA BWA NJAWULO.

BA JAJAJA FFE NGA BWE BAASENGUKANGA, BAAKYUKAKYUKANGA NE BAFUNA ENDABIKA Y'EMIBIRI - GYABWE ENDALA.



BANNASSAYANSI KYE TULI MU MIBIRI GYAFFE BAKIYITA ENDABIKA EVA MU BUTOFFAALI OBUKOLA EKIRAMU KYONNA.

ABAMU KU FFE TWASIGALA MU BIFO BYE TWAZAALIBWAMU ERA NE TUTAKYUKAKYUKA KINENE.

ATE ABALALA BAASENGUKA, NGA BALINA OKUYIGA OKUBEERA MU MBEERA EMPYA. ABAMU BAAFUUKA BE TUYITA BA BANTU, KAMPEGAWANO ABAKOLEBWA AMAWANGA AMANGI NGA MWE MULI ABASOGA, ABANYANKOLE ERA N'ABAGANDA EGGWANGA LYANGE.

NANGE, NDI MUGANDAI



EBIMERA N'EBISOLO NABYO BIYIGA OKUBEERA MU BIFO EBY'ENJAWULO, NGA BIWA ABAANA BAABYO OBUTOFFAALI BWABYO OBUKOLA EKIRAMU KYONNA N'ENJAWULOWAWULO YAABYO, EKINTU KYE TUYITA ENSIKIRANO.

ERA OMUSOMO GW'EBY'ENSIKIRANO GUYITIBWA MUSOMO GW'ENKULA Y'EBINTU EBIRAMU. MUNTEGEERA?

YEE, SSEBO!



KATI KATUWUBEKO OLUBU  
L'W'EBIGERE EBIKUMI N'EBIKUMI  
BY'EMYAKA EMITONOTONO  
EGYAYITA KU NSI KATI  
EYITIBWA UGANDA OKUYIGA KU  
NSOLO EZIMU EZISANYUSA.



ZOOOOOM!!



KIYITIRIVU, ENTE EZO  
ZIRINA AMAYEMBE MAWANVU  
NNYO!

KIYITIRIVU, ENTE EZO ZIRINA  
AMAYEMBE MAWANVU NNYO.

EZO ZE NTE ENSAGALA.  
EKIZAATIIRIRAKO ENNYO  
GE MAYEMBE GAAZO  
AMAWANVU.

SPLOSH!

NNUNGI ATE  
NGA ZIRABIKA  
ZA MAANYI.  
SSIRABANGA  
KINTU KI  
ZIFAANANA.



ENJAWULOYAWULO YAAZO  
KU BWAZO ZOKKA  
YALONDEBWA BAJJAJJA FFE,  
ABALAALO BA BANTU,  
OBA ABALUNZI, OKUYITA  
MU BUZAALLE N'OBUZAALLE.

ABALAALO BAAKUZA ENTE  
EZISINGA OBULUNGI NGA  
BAKOZESA ENNUME  
EZISINGA OBULUNGI  
OKUFUNA  
ENJAWULOYAWULO  
ZEBAAAGALANGA.

ENNUME ZAALONDEBWANGA  
OKWESIGAMIZIBWA KU BUNENE BWAZO,  
OBWERU BW'AMAYEMBE GAAZO AMANENE  
NGA GEWESE OKUTUNULA WAGGULU.  
OKWO KWE KUMANYA KWAFE  
OKWANNANSANGWA OKUTUYAMBA  
OKULONDA ENJAWULOYAWULO.

NAYE LWAKI BAAAGALANGA OKULONDA  
ENJAWULOYAWULO?

KITUUFU?

WALIWO ABALOWOOZA NTI ENTE ENSAGALA  
ZAAZAZIBWANGA OLW'OBULUNGI BW'AMAYEMBE  
GAAZO. EZO EZALINANGA AMAYEMBE AGASINGANGA  
OBUNENE ZAAWEBWANGA OMUGABE-NAYE AMAYEMBE  
GALINA EMIGASO: OKUKUUMA ENTE N'OKUZIYAMBA  
OKWEGGYAMU EBBUGUMU.

KATI OKIRABYE NTI SI BANTU BOKKA NTI BEBALINA ENJAWULOYAWULO WABULA N'ENSOLO.

KAAKATI, EYO Y'ENSONGA LWAKI ABANOONYEREZA MU KIRINIKA YO BAAGALA WETABE MU KUNOONYEREZA KWABWE KW'OMUSOMO GW'ENKULA Y'EBINTU EBIRAMU, MU NGERI EYO BAYIGE KU NJAWULOYAWULO ZO EZITALI ZA BULIJJO. MU KISEERA KINO, KATUYIGE EBISINGAWO KU NJAWULOYAWULO, TUGENDE MU MAASO?

KALEI

KWATA, WATTU OYINZA OKUTANDIKA?

N'ESSANYU LINGI DDALA.

SHOOOOF!!!

TUTANDIKIRE WA?

OMWAKA GWE GWO 1856. TULI MU NNIMIRO YA AUGUSTINIAN ABBEY EY'OMUTUKUVU TOMASI, MU NSI KATI EYITIBWA CZECH KYETWALA.

OMUSAJJA OYO YE GREGOR MENDEL. YALI MUNNADIINI EYAYAGALANGA ENNYO OKUSIMBA KAWO MU BISEERA BYE EBY'EDDEBE.

MENDEL YAKOLA EBY'OKUGEZESAGEZESA BINGI NGA AKOZESA EBIMERA BYA KAWO EKYATEEKAWO OMUSINGI GW'OMUSOMO OGW'OMULEMBE OGW'ENKULA Y'EBINTU EBIRAMU.



OLI OTYA MWAMI MENDEL?

TAJJA KUSOBOLA KUKUWLIRA YADDE OKUKULABA. FFE KATI TETULABIKA, MUJJKIRE.



	HEIGHT	SEED SHAPE	SEED COLOUR	SEED COAT COLOUR	POD SHAPE	POD COLOUR	FLOWER POSITION
DOMINANT	TALL	ROUND	YELLOW	GREEN	INFLATED (FULL)	GREEN	AXIAL
RECESSIVE TRAIT	SHORT	WRINKLED	GREEN	WHITE	CONTRACTED	YELLOW	TERMINAL

MENDEL YEEMUUNYA NNYO ENGERI ENJAWULOYAWULO EZIMU GYEZAALABIKANGA MU BIRIME BYE EBYA KAWO EMIRUNDI EMINGI OKUSINGA KU NJAWULOYAWULO ENDALA. ERA LWAKI ENJAWULOYAWULO EZIMU ZALABIKANGA EZEKATTANGAWO OBWEKKASI NGA TOLABA NE GYEZIVUDE.

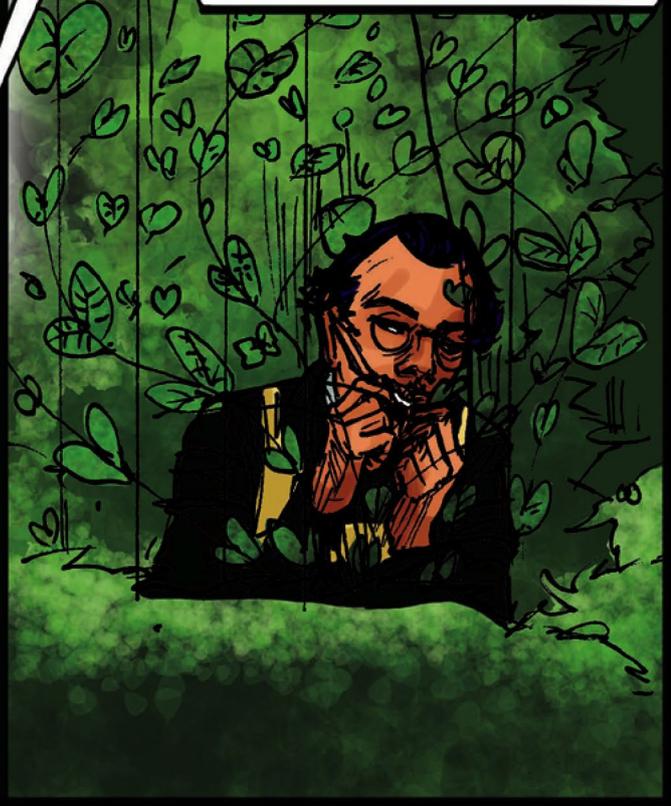
BU KAWO OBUMU BWALI BWA KYENVU, OBULALA BWALI BWA KIRAGALA, EBIMULIYA KAWO EBIMU BYALI BYA KAKOBE, EBIRALA BYALI BYERU. EBIMERA EBIMU BYALI B IWANVU, EBIRALA BYALI BIMPI.

MENDEL YAKUZANGA EBIMERA BYA KAWO.

OTEGEZA NGA BA BANTU ABALAALO BWE BAKUZANGA ENTE?

YEE, KYEKYO KYE NNVINI EBIMERA BYA KAWO NABYO BIRIMU EBIRENZI N'EBI WALI MENDEL YAGGYANGA OLUFUFUGGE KU KIMERA EKIMU N'ALUSIIGA KU KIRALA, ERA BUKAWO OBWABALANGA KU BIMERA BYA KAWO EBYO EBIIGYA NE BUSIMBTWA OKUFUNAMU OBWANA BWA KAWO!

	HEIGHT	SEED SHAPE	SEED COLOUR	SEED COAT COLOUR	POD SHAPE	POD COLOUR	FLOWER POSITION
DOMINANT	TALL	ROUND	YELLOW	GREEN	INFLATED (FULL)	GREEN	AXIAL
RECESSIVE TRAIT	SHORT	WRINKLED	GREEN	WHITE	CONTRACTED	YELLOW	TERMINAL

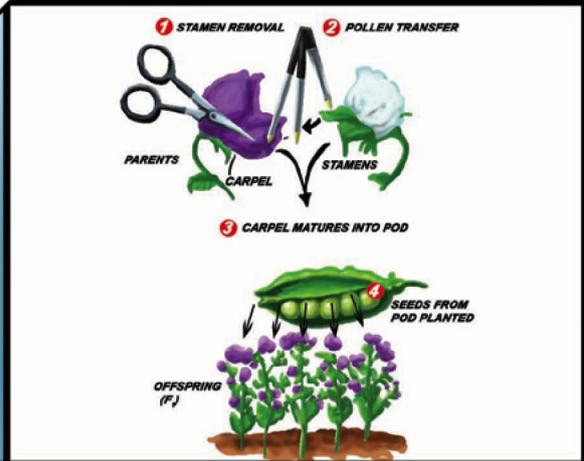


MU KUGEZESAGEZESA OKUMU, YASIIGA OLUFUFUGGE LWE YAGGYA KU KAWO W'EBIMULI EBYA KAKOBE KU KAWO W'EBIMULI EBYERU ALABE EKINAAVAAMU. OYINZA OKUTEEDA OBWANA BWA KAWO BUNO KYE BWAFaanANA?

NKUBUULIRA KI, OBWANA BWA KAWO BWONNA BWASSAARO BIMULI BYA KAKOBE

HMM... KA NJAMBE KA KAKOBE AKATANGAAVU ENNYO?

HEE?

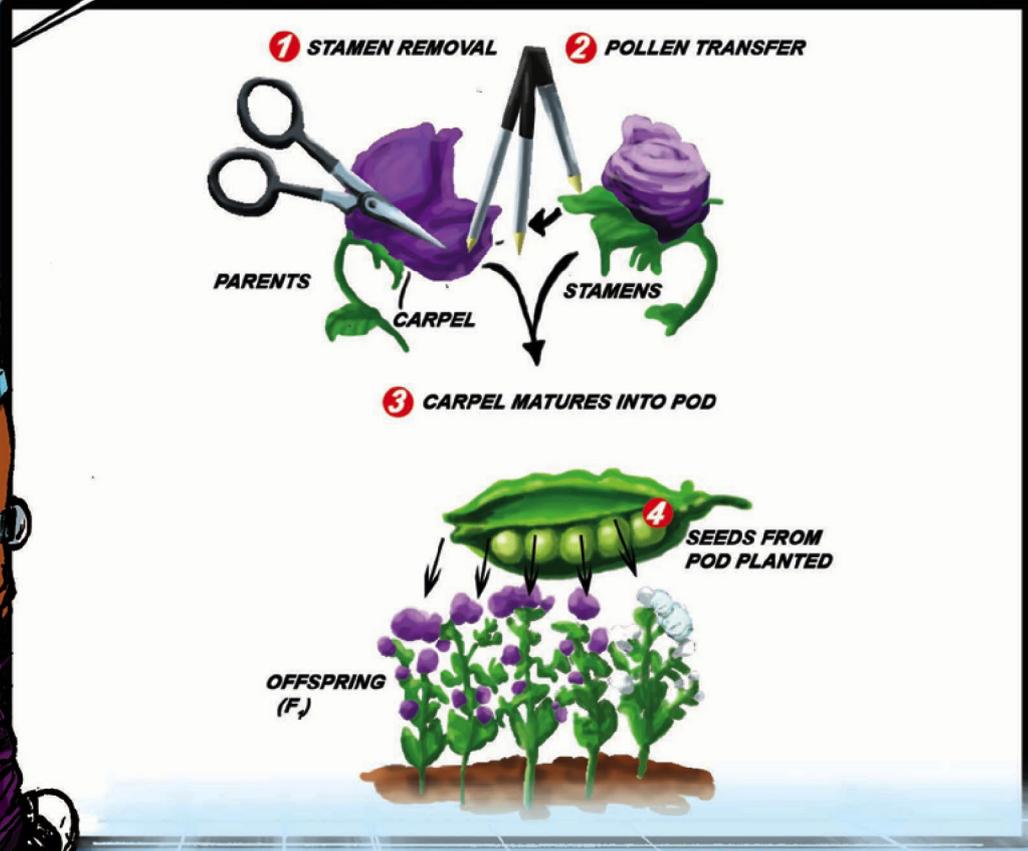


NAYE MANDEL TEYAKOMA AWO. YAKWATA AKAANA AKAMU KU BUKAWO OBWO OBWALINA EBIMULI BYA KAKOBE NAKAZAAZISA NE KAWO OW'EBIMULI EBYA KAKOBE.

EKITUUFU OBUSATU BWALI BWA KAKOBE ATE AKAMU KAALI KEERU.

NTEEBEREZA, TWADDAMU KUFUNA BULI KAMU NGA KA KAKOBE?

NAYE EKIMULI EKYERU KYASOBOLA KITYA OKUVA MU BAZADDE ABAALINA EBIMULI BYA KAKOBE YEKKA, BONNA?



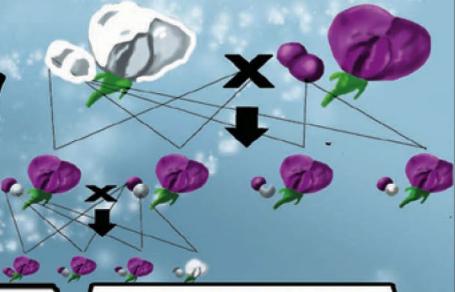
MENDEL YALI AVUMBUDDE EKINTU EKIYITIBWA OBUTOFFAALI OBUKOLA EKIRAMU KYONNA OBUFUNNAMA KU BUNNAABWO. YAZUULA NTI ENJAWULOYAWULO EZIMU, OKUGEZA OKUBEERA EKIMULI KYA KAKOBE, ZAALI ZIFUNNAMA OBA ZA MAANYI NNYO OKUSINGA EZO ZEZIKONTANA NAZO. WANO KYE TWOGERAKO, BYE BIMULI EBYERU.

OKUBEERA OMWERU KWASIGALA 'KWEBASE' MU BWANA KYOKKA NE 'BUZUKUKA' MU BUZZUKULU.

MPANDIIRA OBUZAALIRANWA BW'EBIMERA BYA KAWO.

KWATA, OKOLA KI, OKUKUBA EKIFAANANYI KU KISENGE EKYO?

ERA EKYO BA NNASSAAYANSI KYE BAYITA ENSIKIRANO?

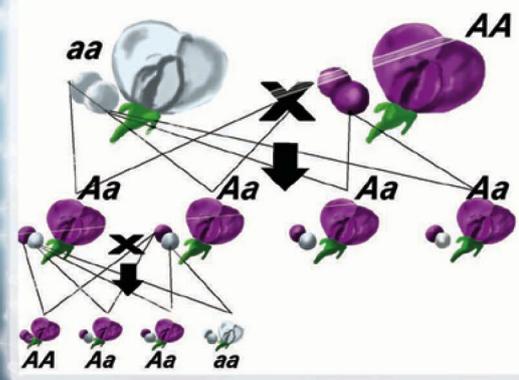


EKIMERA, OKUFAANANA EBINTU EBI RAMU EBIRALA BYONNA, KIRINA OBUTOFFAALI OBUKOLA EKIRAMU KYONNA BUBIRIBUBIRI, OBUYITIBWA AMAKERENDA.

EBYO BYONNA BITEGEEZA KI?

KYOKKA KISOBOLA KUWA BULI MWANA WAKYO EKKERENDA LIMU. 'A' ENNENE LYE KKERENDA EFFUNNAMI ERA NE 'A' ENTONO LYE KKERENDA ERIFUNNAMWAAKO. BULI W'OLABA 'A' ENNENE, OMANYA NTI EKIMEERA KYA KAWO KISAZEWO

KUMULISA BIMULI BYA KAKOBE. OMWAMI OLI AYEWUNISE (EYEWANISE) WALI ALINA MAKERENDA GA 'A' NTONO GOKKA MU NGERI EYO KYE YAVA ASOBOLA OKUMULISA EBIMULI EBYERU BYOKKA.

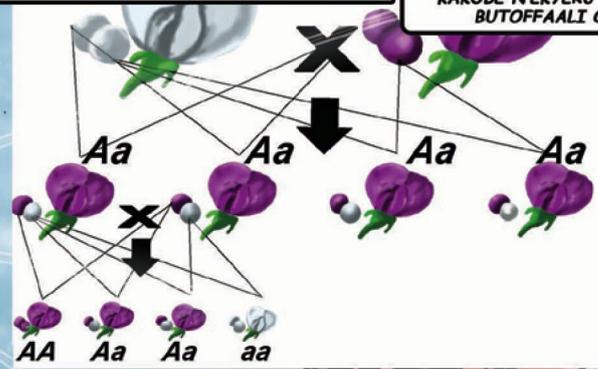


NGA BW'OLABA, WALIWO OMUKISA GUMU KU BULI NZAALA ENNYA EZ'ABAZADDE ABABIRI ABA KAKOBE ABALINA EKKERENDA ERYERU ERIBEKWESEEMU OBW'OKUZAALA OMWANA OMWERU. KANZIGYEYO KA PUNNET SQUARE APP KANGE NKULAGE. OLABYE? OMWANA OMU YEKKA Y'AFUNA AMAKERENDA GOMBI NGA GAFUNNAMWAAKO 'A' ENTONO.

KA NSUUBIRE NTI TOTYA KUYIGA BIGAMBO BIZITOI EKIMERA EKIMU BWE KIBA NGA KIRINA AMAKERENDA ABIRI AGAFAANANA, OKUGEZA NGA AA OBA AA KIYITIBWA EKYEFAANANA. SSINGA EKIMERA KIBA KIRINA AMAKERENDA ABIRI AGATAFAANANA, OKUGEZA AA, KIYITIBWA KITABULETABULE.

NGERIGY'OYINZA OKUJUKIRA KINO FAANANA - KITEGEEZA 'KYE KIMU' ERA 'TABULE' KITEGEEZA KYA NJAWULO. ENNYUKUTA ZIKIKIRIRA EKIKA KY'OBUTOFFAALI OBUKOLA EKIRAMU SO NGA KAKOBE N'EKYERU BIKIKIRIRA ENDABIKA EVA MU BUTOFFAALI OBUKOLA EKIRAMU KYONNA.

	A	a
A	AA	Aa
a	Aa	aa



MENDEL YADDADDAMU OKUGEZESAGEZESA KUNO EMIRUNDI N'EMIRUNDI. YASIMBA BU KAWO OBUSUKKA MU MUTWALOI YAZUULA NTI OBUWANVU BWALI BUFUNJAMA KU BUMPI, BU KAWO BWA KYENVU BWALI BUFUNJAMA KU BUKAWO BWA KIRAGALA, BUKAWO OBW'OLUSUSU OLUBOOBEVU BWALI BUFUNJAMA KU BUKAWO OBULINA OLUSUSU OLUFUFUNYAVU N'EBIRALA...

NAYE NZE SIKITEGEEERA. EKKERENDA ERIFUNNAMWAAKO LYEKWEKA WA? OBUMPI BWEKWEKA BUTYA MU KIMERA EKIWANVU N'OBWERU NE BWEKWEKA MU KIMULI EKYA KAKOBE?

MANDEL YEEBUZA EKIBUZO KYEKIMU. TEYASOBOLA KUDDAMU KIBUZO EKYO MU BUJUVU, KYOKKA YAKOMEKKEZA BWATI NTI AWANTU MU BUZIBA? BW'EBIMERA BYA KAWO BINO, WALIWO EKY'EKYAMA EKIKUSIKE.

HWAAWU! EKY'EKYAMA EKIKUSIKE? KALE BAMBI, SSINGA NANGE NNINA EKY'EKYAMA EKIKUSIKE.

SEED COLOUR	SEED SHAPE	STEM LENGTH
YELLOW	ROUND	TALL
GREEN	WRINKLED	DWARF
YELLOW	ROUND	TALL



OLINA! MU MAZIMA BULI KINTU EKIRAMU KIRINA EKY'EKYAMA.

OKUGEZA, OYINZA OKUBA NGA TEWALABA KU JAJJA WA TAATA WO. KASAJJA, NAYE DDALA DDALA OLINA AKALEVU KE. KIRINGA NTI OTAMBULA N'AKATUNDU KE BULI W'OLAGAI

MUTUUFU! BAJJAJJA BO BALAMU ERA BAKWEKEDDWA? BULUNGI MU EKY'EKYAMA EKIKUSIKE? KYO.

EKYO WAKIMANYA OTYAA? BULIJJO EKYO SSENGA KYANJNAMBAI

NNYINZA NTYA OKUKWATA KU EKY'EKYAMA KYANGE EKIKUSIKE?

MBADDE NSABIRIRA OLEME KUKIBUZA. KWATIRIRAKOI

WUUUWU!

ABANGE MWAGALA OKUMBUULIRA WE TULI?

TULI MU CAVENDISH AWAKEBERERWA EBY'ABALWADDE MU CAMBRIDGE, BUNGEREZA. OMWAKA GWEGWO 1952. ABAVUBUKA ABABIRI ERUDDA ERI BE BA YAKOBO WATSON NE FARASIKO CRICK, BALI KUMPI KWABULUZA EKY'EKYAMA EKIKUSIKE KY'OBULAMU.

OWAA! OMUKAZI OLI Y'ANI ERA AKUTTE KI MU NGALO ZEPI EKYO KYE KISUMULUZO KYE EKY'EKYAMA EKIKUSIKE?

OMUKAZI ATATEGEEREKEKA YAANI? AKUTTE KI? BA WATSON NE CRICK BANAAYABULUZA EKY'EKYAMA? KASAJJA ANAALEMERA MU BISEERA EBY'EDDA? AMAASO KU LUTIMBE TUBAWE EKITUNDU EKY'OKUBIRI EKY'OBUVUMBUZI BWE BY'OBUTONDE BW'EBIRAMU MU BITABO EBIDDIRINJANA OZUULE!

# **EBINNYONNYOLA EBIKOZESEBWA MU SSAAYANSI**

**EKKERENDA-** ERIMU KU MAKERENDA ABIRI AG'OBUTOFFAALI (CHROMOSOMES/CELLS) OBUKOLA EKIRAMU KYONNA. ABANTU BANNAMUNIGINA OLUUSI N'OLUUSI BABEERA N'OBUKERENDA BUBIRI KU BULI NJAWULOYAWULO OBA EBIRABIKA, NGA BUVA KA NNAKAMU MU BAZADDE BOMBI.

**OBUNGI BW'ABASIRIKALE-** EBIKEBEREBWA MU MUSAAYI OKUPIMA OBUNGI BW'OBUSIRIKALE BW'OMUSAAYI, EKIKA KY'OBUSANDUUKO OBWERU OBUSANGIBWA MU MUSAAYI OBUYAMBA OKULWANYISA ENDWADDE, MU KASAAYI AKABA KAKUGGYIDDWAAKO. YE NGERI EYITIBWAMU OKUSALAWO EMBEERA Y'OKWEKUUMA KW'OMUBIRIGWO GY'ERIMU.

**OKUFUNJAMA-** AKAKERENDA/ AKATOFFAALI AKAKOLA EKIRAMU KYONNA AKASINGA OKUBA N'OMUKISA OKUYISAAWO ENJAWULOYAWULO YEYOLEKE MU MWANA; EKKERENDA ERIRAGA ENJAWULOYAWULO GYERIREETA YADDE NGA OMUNTU ALINA EKKERENDA LIMU LYOKKA. EKY'OKULABIRAKO, EKKERENDA LY'AMAASO AGAKITAKA FUNNAMI, N'OLW'EKYO OMUNTU YETAAGA EKKERENDA LIMU 'ERY'ERIISO LYA KITAKA' OKUFUNA AMAASO AGAKITAKA.

**ETTOFFAALI ERIKOLA EKIRAMU KYONNA-** AKATUNDU KA BULI KATAFFAALI AKATEREKA AMAWULIRE AGASALAWO ENFAANANA OBA EBIRABIKA EBIRINA OKUSIKIBWA OKUVA KU BAZADDE BO.

**OBUTOFFAALI OBUKOLA EKIRAMU KYONNA OBUFUNJAMA KU BUNNAABWO** – SSINGA ENJAWULOYAWULO EMU EBEERA EFUNJAMANNYO OBA EBA YAMAANYI NNYO OKUSINGA ENDALA GYEKONTANA NAYO.

**OMUSOMO GW'ENKULA Y'EBINTU EBIRAMU** - OMUSOMO GW'OBUTOFFAALI OBUKOLA EKIRAMU KYONNA N'ENSIKIRANO

**ENDABIKA EVA MU BUTOFFAALI OBUKOLA EKIRAMU-** NGA OGASSE WAMU OBUTOFFAALI OBUKOLA EKIRAMU KYONNA BWONNA- OBUTOFFAALI OBUKOLA EKIRAMU KYONNA OBA AMAKERENDA AGALEETAWO EKIRABIKA GUNDI OBA ENJAWULOYAWULO (ENDABIKA EVA MU BUTOFFAALI OBUKOLA EKIRAMU) MU MUNTU.

**EBY'ENSIRIRANO-** OMUTENDERA OGUYITIBWAMU OKUGGYA ENJAWULOYAWULO N'EBY'ENSIRIRANO EBIRABIKA OKUVA MUBAZADDE OKUBITWALA MU MWANA WAABWE.

**EKITABULETABULE-** OBUTOFFAALI OBUKOLA EKIRAMU KYONNA BUBIRI OBW'ENJAWULO – AKAMU OKUVA EWA 'MAAMA' N'AKALALA OKUVA EWA 'TAATA' NGA BWA NJAWULO; EKIRAMU BWE KIBA KIRINA AMAKERENDA/OBUTOFFAALI OBUKOLA EKIRAMU KYONNA BUBIRI OBW'ENJAWULO

**AKAWUKA AKALEETA MUKENENYA-** AKAMU KU BUWUKA OBUSIRIKITU ENNYO AKALWAZA NE KATTATTANA ENTEGEKA EKUUMA OMUBIRI NGA MULAMU.

**EKYEFAANANA-** OBUTOFFAALI OBUKOLA EKIRAMU KYONNA BUBIRI NGA BWE BUMU – AKAMU OKUVA EWA 'MAAMA' N'AKALALA OKUVA EWA 'TAATA' NGA BWE BUMU; EKIRAMU BWE KIBA KIRINA AMAKERENDA/OBUTOFFAALI OBUKOLA EKIRAMU KYONNA BUBIRI NGA BWE BUMU.

**OKULAMYA-** OLUKALALA LW'ABAZADDE NE BAJAJJA; OKWOLEKA OBUZADDE NGA BWE BULI; OKULAGA ENSIKIRANO Y'ENJAWULOYAWULO EY'ENKALAKKALIRA OBA ENDWADDE OKUYITA MU MIREMBE EMITONOTONO.

**ENDABIKA EVA MU BUTOFFAALI OBUKOLA EKIRAMU KYONNA-** EBINTU BY'OMUNTU BYONNA BY'OSOBOLA OKULABA OKUGEZA, LANGI Y'AMAASO, LANGI Y'ENVIIRI.

**PUNNET SQUARE-** EKIFAANANYI EKIKOZESEBWA OKUTEEBEREZA EBINAAVA MU KUGEZESAGEZESA MU BY'OKUZAAZISAZAASIZA EKIMU, EKIKOZESEBWA BANNASSAAYANSI ABAYIGA KU BIRAMU OKUSALAWO EMIKISA GY'EKIBA KIGENDA OKUZAALIBWA NGA KIRINA OBUTOFFAALI OBUKOLA EKIRAMU GUNDI.

**EKIFUNJAMWAAKO-** AKAWEKE/AKATOFFAALI AKAKOLA EKIRAMU KYONNA AKASIGALA NGA KAKWEKEDDWA MU MWANA; AKAWEKE AKALAGA KYE KASOBOLA OKUKOLA NGA OMUNTU ALINA OBUWEKE BUNO BUBIRI. EKY'OKULABIRAKO, AKAWEKE AK'AMAASO AGA BBULULU KAFUNJAMWAAKO KATI OLWO SSINGA OMUNTU ALINA AMAASO AGA BBULULU ABA ALINA OBUWEKE 'OBW'AMAASO AGA BBULULU' BUBIRI.

**OKWEKOONA KU EBYAYITA: KASAJJA AYITAAYITA MU MUSOMO GW'ENKULA Y'EBINTU EBIRAMU N'ENSIKIRANO EKYAWANDIIBWA MU NSI BOTSWANA MU KIRINIKA Y'ABAANA BOTSWANA-BAYLOR OMUTENDERA OGUSOOKA (1.0), KYASOOKA KUFULUMIZIBWA MU 2015**  
OBWANNANYINI © BOTSWANA-BAYLOR CHILDREN'S CLINICAL CENTRE OF EXCELLENCE 2015

## OKWEBAZA

**OMULIMU GWA TANDIKIBWA:** ABRAHAM MAMELA, ALBERT LEKGABA, EDWARD PETTITT

**ABAWANDIISI:** TIDIMALO DENNIS, TIERRA HOLMES, DANIEL KOEHLER, NATASHA MORAKA, AAMIRAH MUSSA, JONATHAN STRYSKO, MASUTLHA TSWELELOPELE

**ABASUNSUZI BE BY'OBUSAWO/BE BYA SSAAYANSI:** MASEGO TSIMAKO-JOHNSTONE, SEBALD VERKUIJL

**ABAYAMBI MU PULOJEKITI:** THATO REGONAMANYE, TAPIWA KANGWA

**ABASUNSUZI ABAVUBUKA:** ANNAH KETLAARENG; KETELELO MOAPARE

**OKKUVUNULA O'LUNGEREZA KWAKOLEBWA:** JACQUELINE BALUNGI KANYWA, ISREAL KALYESUBULA  
**OKKUVUNULA O'LUGANDA KWAKOLEBWA:** MUGEMBA JAMES KATUMBA, PATRICK MASEMBE

**AKAKIIKO AK'ABAWI BA CAFGEN AMAGEZI AB'OMUKITUNDU:** KESEGO BASHA-MUPELI (CEYOHO: CENTRE FOR YOUTH OF HOPE); SHEIK H. HASSAN (BOTSWANA MUSLIM ASSOCIATION); CINDY KELEMI (BONELA: BOTSWANA NETWORK ON ETHICS, LAW, AND HIV/AIDS); NONTOMBI KRAAI (INTERNATIONAL LINKS); IRENE KWAPE (BOCAIP: BOTSWANA CHRISTIAN AIDS INTERVENTION PROGRAMME); PHENYO MAHUMA (BCC: BOTSWANA COUNCIL OF CHURCHES); ALICE MOGWE (DITSHWANELO: THE BOTSWANA CENTRE FOR HUMAN RIGHTS); KGORELETSO MOLOSIWA (BONEPWA: BOTSWANA NETWORK OF PEOPLE LIVING WITH HIV AND AIDS); ONKEMETSE MONTSHEKI (CHILDLINE BOTSWANA); JOB MORRIS (SAN YOUTH NETWORK); KAGO MOTEKETELA (YOUTH MEMBER); BUYANI ZONGWANI (MISA: MEDIA INSTITUTE OF SOUTHERN AFRICA)

**ABANOONYEREZA MU CAFGEN BOTSWANA:** GABRIEL ANABWANI, S.W. MPOLOKA, MOGOMOTSI MATSHABA, OLEKANTSE MOLATLHEGI, KEFENTSE MATHUBA, ABHILASH SATHYAMOORTHY, MADUKE KULA, LEANO PHETOGO, CLINS MMUNYANE, NICHOLAS MURIITHI, KENNEDY SICHONE, KOKETSO MAPLANKA, PINKIE GOBUAMANG, LETOYA CYNTHIA BALEBETSE

## OKWETEGULA

YADDE TUKOZE EKISOBOKA OKULABA NTI SSAAYANSI AKOZESEBBWA YOYOYO OMUTUUFU, EBIWANDIIBWA MU KITABO KINO TETEGEEZA NTI MAGEZI AGAWEEBWA KU BY'OBULAMU. ETTEEKA GYE LIVA NE GYE LIKOMA, ABAWANDIISI N'ABAABUKA MU KYAPA EKITABO KINO N'ABAKOZI BAABWE TEBAKKIRIZA OKUVUNAANYIZIBWA EBY'OBULABE, EBY'OKUFIIRIZIBWA OBA EBY'OKWONOONA BYONNA EBINATUUKA KU MUNTU EYESIGAMA ENNYO KU BYE TUWANDIISE.

### EKITABO KINO TWAKISSAAKO ENVUMBO

TEWALI KITUNDU KY'EKITABO KINO EKIJJA OKUWANDIIBWA NATE, OBA OKUTEEREKEBWA MU BYUMA BI KALIMAGEZI OKUKISOBOZESA OKUGGULIBWAWO NATE MU BYUMA EBIRALA OBA OKUWEEREZEBWA MU NSABIKA EYA BULI NGERI OBA OKUYISIBWA MU MIKUTU EGITALI GIMU NGA OKUYITA KU MUTIMBAGANO, OKWETIKIBWA, OKUKOPPOLOLWA, OKUKWATIBWA KU KATAMBI OBA MU KUYITA MUNGERI ENDALA ZONNA AWATALI KUWEEBWA LUKUSA OKUVA KIRINIKA Y'ABAANA EYA BOTSWANA ESANGIBWA KU KIBANJA 1836 KU LUGUUDO HOSPITAL WAY, MU DDWAALIRO PRINCESS MARINA HOSPITAL, KU NDAGIRIRO PRIVATE BAG BR 129, GABORONE, BOTSWANA



# GENOME ADVENTURES

OBUVUMBUZI BWE BY'OBUTONDE BW'EBINTU EBIRAMU KYA KUYIYA KYA COMMUNITY ENGAGEMENT INITIATIVE OF THE COLLABORATIVE AFRICAN GENOMICS NETWORK (CAFGEN) EKISASULIRWA WELLCOME TRUST. CAFGEN KIRI MU KIBIINA KYA HUMAN HEREDITY AND HEALTH IN AFRICA CONSORTIUM (H3AFRICA) KIKUBERIZIBWA AB'EDDWAALIRO LY'ABAANA ERIYITIBWA BOTSWANA-BAYLOR CHILDREN'S CLINICAL CENTRE OF EXCELLENCE (COE). OBUVUMBUZI BWE BY'OBUTONDE BW'EBINTU EBIRAMU KIKOZESA AMASOMO AGAFUULA ABANTU OKUBEERA AB'OBUSOBOZI, EMIZANNYO EGIYIGIRIZA, WAMU N'EMPULIZIGANYA EZ'OLUKALE OKUKUNGA ABATUUZE BE KIKWATAKO, BANNAMAWULIRE ERA N'ABANTU BONNA OKUTWALIRA AWAMU- OKUSINGIRA DDALA ABAVUBUKA- MU ESSOMO MU MUSOMO GW'ENKULA Y'EBINTU EBIRAMU NE MUKUNOONYEREZA KU BY'OBUTONDE BW'EBY'OBUSAWO. EKIGENDERERWA KY'OBUTABO BWAFFE OBW'EBYOBUVUMBUZI BWE BY'OBUTONDE BW'EBIRAMU KWE KUSOMESA ABASOMI EBYAFAAYO BY'ENSİKIRANO N'OMUSOMO GW'ENKULA Y'OMUNTU, ENKULA N'ENKOLA YA DNA N'OBUTOFFAALI OBUKOLA EKIRAMU KYONNA, OLUJEGERE OLUGATTA ESSOMO MU MUSOMO GW'ENKULA Y'EBINTU EBIRAMU. N'OBULAMU, N'ENGERI Y'OKWEWANDIISA MUKUNOONYEREZA MU BY'OBUTONDE BW'EBY'OBUSAWO OBA ESSOMO MU MUSOMO GW'ENKULA Y'EBINTU EBIRAMU, NGA MW'OTWALIDDE AMATEEKA AGAFUGA OKUKOLA OKUNOONYEREZA AGEKUUSA KU KUKKIRIZA NGA OMAZE OKUTEGEEZEBWA/OKUNNYONNYOLWA, OKUTAMBUZA N'OKUTEREKA EBIGGYIDDWAKO OLW'OKUNOONYEREZA N'OKUSOBOZESA ABATUUZE B'OMUKITUNDU OKWENYIGIRAMU.

BW'OBERA NGA WANDIYAGADDE OKUMANYA EBISINGA EBITUKWATA KO, GENDA KU MIKUTU GY'EMPULIZIGANYA FACEBOOK, TWITTER,

 [GENOMEADVENTURES.WEBLY.COM](http://GENOMEADVENTURES.WEBLY.COM)

 [FACEBOOK.COM/GENOMEADVENTURES](https://FACEBOOK.COM/GENOMEADVENTURES)

 [TWITTER.COM/GENOMEADVENTURE](https://TWITTER.COM/GENOMEADVENTURE)

 [PINTEREST.COM/GENOMEADVENTURE](https://PINTEREST.COM/GENOMEADVENTURE)

*Abaasobozesa omulimu*

**wellcome**trust & **NIH**