USDA's Foreign Agricultural Service (FAS) is seeking to identify U.S. universities willing to host English speaking agricultural scientists from **Ethiopia, Kenya, Rwanda, and Tanzania** under the Norman E. Borlaug International Agricultural Science and Technology Fellowship Program (Borlaug Fellowship Program). These Fellows have been selected competitively based on research priorities, academic and work accomplishments, commitment to Borlaug Fellowship goals and leadership qualities. It is recommended that the program begin in **September 2011,** however, priority should be given to a time that is appropriate for the Fellow's proposed topic of research. The program should last for a period of 8-12 weeks.

Each Fellow has specific research topic interests. Please find below a brief description of the Fellows' research/fellowship interest, educational and research background, and program goals in addition to the attached research proposals and tentative action plans for each Fellow. Click on the hyperlink for each fellow to go to the relevant proposal.

1. Fellow #1 (male-Ethiopia)
    - Background: MSc. in Plant Nutrition; BSc in Plant Science. Currently working on biotechnology and GMO adoption on selected crops.
    - Main Objective: acquisition and adaptation biotechnology and assessment of GMO crops.
    - Wishes to be trained in detection techniques for molecular characterization for major food crops and bioinformatics.

2. Fellow #2 (male-Ethiopia)
    - Background: MSc. in Molecular Biotechnology and BSc in Plant Science. Currently working on biotechnology research.
    - Main Objective: become equipped with disciplinary and practical information on GMOs.
    - Wishes to learn more about GMO risk management.

3. Fellow #3 (male-Kenya)
    - Background: Ph.D. in Biotechnology; Master of Science in Molecular Biology. Lecturer teaching undergraduate and diploma students genetic and plant physiology.
    - Main Objective: to adapt molecular and biotechnological methods to transform crops to withstand drought stress brought about by climate change while observing biosafety issues.

4. Fellow #4 (male-Rwanda)
    - Background: Ph.D. in Plant Microbiology and MSc in Plant Pathology.
    - Main Objective: Characterization of pathogen causing wilt of Irish potato and other solanaceous crops and weeds as well as training on the wilt disease management.

5. Fellow #5 (male-Tanzania)
    - Background: Master of Science in Plant Biotechnology. Plant Biosafety Inspector for Tropical Pesticides Institute.
    - Main Objective: attain modern agricultural biotechnology principles and applications

Institutions may submit proposals to host more than one Fellow. Institutions interested in hosting one or more Fellows should submit a proposal following the guidelines below:

- Indicate the name of the institution and mentor applying to host the Fellow(s);
- Indicate the country, research interests and reference number of each Fellow;
- Provide a tentative action plan based on the Fellow's research proposal and action plan, including topics covered, field visits and other activities;
- Provide a summary of relevant institutional capabilities for hosting international scientists and policymakers in the proposed field;
- Briefly describe the research expertise and international experience of the mentor in the Fellow's field of interest;
- A 1-2 page curriculum vitae should be provided for mentors and other collaborating researchers involved in the proposed program. This is not included in the page count provided maximum noted below.
- Identify the expected skills or knowledge to be acquired by the Fellow at the end of the program;
- Complete a budget based on the attached template with budget notes justifying the budget. If attendance at the World Food Prize in Des Moines, Iowa in October, 2011 is feasible, the budget should include time and funding for the Fellow to attend;
- Complete the following checklist on university administrative policies;

- **Include all components of the proposal in a single PDF document, and;**

- **Proposal, excluding the budget, should not exceed 3-4 pages. If more than one Fellow is requested, an additional two pages per fellow is permitted.**

Please submit the proposal, university administrative checklist and estimated budget via email to: Natasha Acheampong at Natasha.Acheampong@fas.usda.gov or Karen Uetrecht at Karen.Uetrecht@fas.usda.gov. **FAS would like to receive all expressions of interest by June 6, 2011.**

Funding support will be provided through USDA as part of the Borlaug Fellowship Program. For more information on the Borlaug Program, please visit our website at: http://www.fas.usda.gov/icd/borlaug/Borlaug.asp.

The Norman E. Borlaug International Agricultural Science and Technology Fellowship Program aims to promote food security and economic growth by increasing scientific knowledge and collaborative research to improve agricultural productivity. This program targets promising young scientists and policymakers from developing or middle income countries. The Fellows spend 8-12 weeks in the United States and work one-on-one with a U.S. scientist in their field. The mentor coordinates the Fellow's training and in order to continue collaborative efforts, visits the Fellow's host country for 7-10 days within 6-12 months after completion of the training in the U.S.

During the program, the Fellows learn new research techniques, gain exposure to the latest scientific developments in various fields of agriculture, access fully-equipped laboratories and libraries, and learn about unique public-private partnerships that help fund agricultural research and science. Equally important, this program provides international scientists and policymakers with opportunities to establish long-term contacts with U.S. scientists and apply newly gained knowledge from U.S. institutions to their country's research and development programs.

The World Food Prize is awarded annually during the Norman E. Borlaug International Symposium in Des Moines, Iowa. This year the World Food Prize is scheduled for October 12-14, 2011. The USDA Borlaug Fellowship Program organizes a side-event each year which includes activities for Borlaug Fellows that provide important networking opportunities for Fellows and international agricultural researchers, policy makers and the non-profit sector. The following link provides more information about the World Food Prize Borlaug Dialogue: http://www.worldfoodprize.org/index.cfm?nodeID=25286.

Host University Administrative Checklist

Please fill out the following checklist concerning the university's policies on the administrative aspects of hosting a fellowship.

Host University Policies	YES	NO
Will all mentors listed in the proposal be present for the majority of the fellowship?		
Will the university be able to provide per diem within the first week of the Fellow's arrival?		
Will the university be able to provide fully furnished lodging with kitchen facilities?		
Does the university tax participants' per diem and housing (if so, please include in the budget)?		

ANNEX

Fellow #1 (male- Ethiopia)

I the applicant am Kefyalew Negisho had German Exchange Service (DAAD) award and studied my MSc at University of Hanover, Germany and graduated with great distinction (Magna cum laude) in September 2009. I conducted my MSc thesis on biotechnology, molecular biology and genetic engineering entitled "Analysis of genes differentially expressed under phosphorus deficiency in roots of Brassica carinata by promoter gus in Arabidopsis thaliana". I had successfully done the gene construct, cloning, prepared competent cell of E.coli and Agrobacterium tumefaciens. I transformed the model plant (Arabidopsis thaliana) using different genes of interest with high transformation efficiency and studied under different abiotic stresses.

I studied plant sciences during my undergraduate studies in Alemaya University. After wards, I was recruited by the Ethiopian Institute of Agricultural Research (EIAR) and worked at Bako national Maize Research Project as breeder and Ambo Plant Protection as a Researcher in the department of pathology. After my MSc I was assigned to work in the national wheat coordination center as a wheat breeder at Kulumsa Agricultural Research center. Currently, I am working in the National Biotechnology Research Program at Holetta Agricultural Research Center in the Plant Molecular Biology Laboratory. I am enthusiastic to conduct different research activities using biotechnological and molecular techniques.

Thus, my current research activities focus on:

Acquisition and Adoption Bt cotton technology to Ethiopia and assessment of GMOs. Hence, I need to strengthen my knowledge and skills mainly in the areas of

- Development of GMOs, their roles in pest management, increase in production and productivity and exchange earnings.
- Acquisition, adoption and handling techniques of Bt cotton.
- Different detection techniques of GMOs
- Detailed techniques on molecular characterization of major food crops.
- Bioinformatics to access different databases and to use molecular softwares.
- How to use different biotechnological machines (say DNA analyzer)
- Bio-safety assessments to maximize GMo utilization

If I have the chance to gain knowledge and skills on biotech technologies, it helps me to fully involve in the introduction, development and popularization of biotech technologies on important traits such insect resistance, herbicide, drought and salt tolerance. This could enable me, to contribute to tackle the major agricultural problems in the country. For instance, the introduction and adoption of Bt-cotton varieties would solve the 30-65% yield reduction due to major cotton insect pests such as African bollworm in the country. This could in turn encourage the cotton producers to produce more cotton due to increased production and productivity of cotton.

The awareness creation of biotech technology would also increase the adoption of GMOs on the other important traits such as on herbicide tolerance, as weed is one of the major agricultural threats for crop production.

Weekly Action Plan
Research Activities /Week (s) /Planned outcomes

Training on management and handling of Molecular Labs, and GMOs in the lab and in the field /Week1 / Lessons will be gained on standard molecular lab handling especially with that of GMOs

Training on used of important molecular lab machines (say DNA analyzer and others)/ Week 2-3 /Safe and efficient utilization of molecular lab machines will be attained

Training on genomics and proteomics /Week4 /Detailed knowledge on the genomics and proteomics will be acquired

Detection of GMOs from different sources /Week5/ Different detection techniques will be applied

Training on bioinformatics tools /Week 6/ Assists to access different biotech databases and information

Training on molecular software's such an Vector NTI and Plasmid construct /Week7-8/ Very good knowledge and skills on several molecular analysis and their application will be achieved

MAS using SSR and SNP Week9 Varieties will be selected for drought tolerance using SSR/SNP
Review on economic returns from GMO production /Week10/ Seminar will be prepared and presented on GMO economic return by the trainee

Molecular characterization and genetic distance study /Week11/ The crops under study will be characterized and their genetic distance will be analyzed
Cloning, restriction digestion, and transformation and plating, isolation of plasmid, preparation of competent cells /Week12/ Lessons of good molecular techniques and application will be obtained

Fellow #2 (male - Ethiopia)

My Scientific research experience starts when I was a 3rd year Undergraduate student at Alemaya University. At that time I had a chance to join Debre Zeit Agricultural Research Center. During my stay I have learned ~~about~~ how to conduct agricultural research. After graduation I joined Shero Agricultural Research Center and I laid a strong scientific background. My research interests at that time was solving the production & productivity problems of our agriculture. I was working in the crop improvement program and together with other researchers in my department we developed two faba beans varieties (high yielding & rust tolerant) that were released for large scale multiplication and production in the region. While working on pulse crops the neurotoxin ODAP in grass pea, which has ~~caused~~ crippled a number of citizens has caught my attention. Through a scholarship I got from Gent University (Belgium) I studies molecular biotechnology and As part of my MSc thesis research project, I genetically engineered grass pea and obtained the first genetic transformants of the varieties obtained from Ethiopia. I made two presentations on GMO applications on Sorghum & were liked by my professors.

During my stay at Gent University which has a big reputation in molecular biotechnology I have learned about the basic principles of biotechnology.

I strongly believe that progresses made in various areas of biotechnology can benefot my country in modernizing its agricultural sector. This in turn contributes towards attaining food security. participating in this program will empower me with transdisciplinary information and practical skills (experience) in order to critically evaluate the issue of GMO's from the needs of my country. specifically the course I have indicated in the research action plan "week 3" Agricultural productivity strategies for the future is directly linked with increasing agricultural productivity & is of paramount importance.

My research interests revolve around using biotech tools to improve/enhance crop productivity and contribute to the wider development goal of improved food security.

Proposed Action Plan

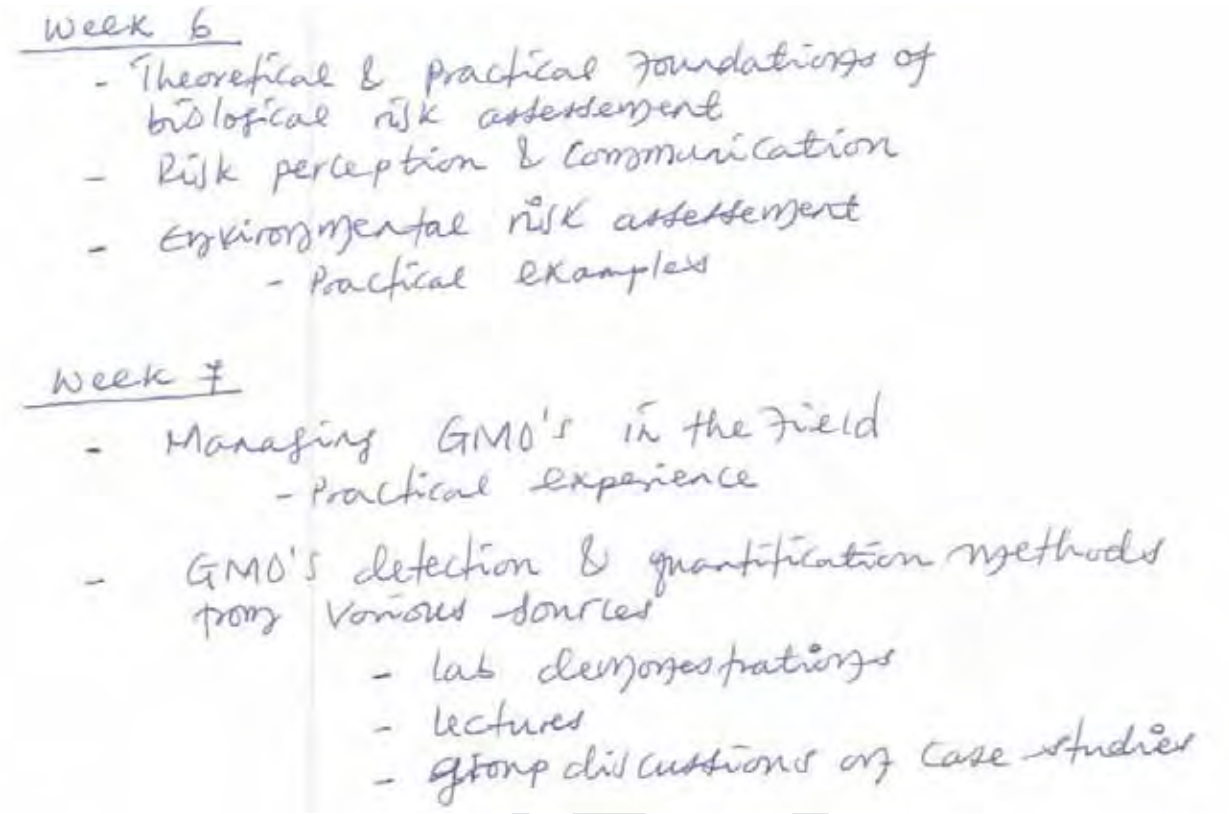
Week 1
- Course background
- Biotechnology and its applications
- creation of GMO's
- Global Status of Commercialized GMO's

week 2
- Biotechnology & biodiversity
- Biotechnology & biofuels
- Biotechnology & food security

week 3
- The benefits & biotechnology to farmers, consumers and the environment
- Agricultural productivity strategies for the future
- Agricultural biotechnologies for developing Countries

week 4
- Agricultural Biotechnology health impacts
- Socio-economic impacts of biotech
- Agricultural biotechnology impacts on wild life

week 5
- GMO's: Risks & Benefits
- Food and feed Safety
- Environmental Safety
  - * case studies
  - * lectures



Week 6

- Theoretical & practical foundations of biological risk assessement
- Risk perception & communication
- Environmental risk assessement
  - Practical examples

Week 7

- Managing GMO's in the field
  - Practical experience
- GMO's detection & quantification methods from various sources
  - lab demonstrations
  - lectures
  - group discussions of case studies

Fellow #3 (male- Kenya)

The fellowship will give me an opportunity to carryout/conduct intensive Scientific research and training towards addressing the problem of food insecurity through Agricultural biotechnology while addressing biosafety issues related to GMOs. This fellowship will enable me to be among the few Scientists in Kenya and in the region who will be competent enough in the field of Biotechnology. The training will allow rapid development of crop plants with new agronomic traits adapted to climate change with enhanced yield. These will contribute to food security, agricultural diversification and income generation to resource poor local populations with significant economic advantages. In addition the knowledge and skills obtained will be transferred to graduate Students by way of teaching and presentation at conferences and workshops.

2. I am pleased to apply for this fellowship to enable me pursue an intensive course in the fields of Molecular Biology, Systems biology and biotechnology. The skills and knowledge I will acquire will be applied in establishing a robust tissue culture for a number of tropical crop plants including coconut and cashew nuts in the coastal region of the country. A well established tissue culture platform will lead to the development of plants through somaclonal variations that could withstand water limited conditions. This might contribute ~~to food security~~ to increased agricultural productivity in Kenya. In addition, through tissue culture work, crop plants ~~and~~ could be developed that are resistant to pests and other biotic stress that will have a positive impact to agricultural productivity. Knowledge gained from genetic engineering will will be applied in transforming crop plants for drought stress tolerance. Drought tolerant crops in addition to having enhanced yield on top of heterosis will lead to increased agricultural productivity. Furthermore, such knowledge could be used in setting up biotechnology based innovation incubation centers to develop and commercialize seeds for agricultural crops. An addition to training obtained from the fellowship will lead to developing biotechnology tools to generate rigorous stress tolerant and high yielding seeds from crops through genetic engineering and support tropical crops improvement programs in Kenya. The fellowship will enhance the capacities of Kenya to use biotechnology to mitigate the effects of climate change in order to increase tropical crop production. Kenya has ratified the Biosafety bill and my institute will be involved in tissue culture and genetic manipulation techniques for crop improvement. In the process they need to make sure that the country has enough and well trained scientists in this discipline. So by participating in the course my work as a lecturer and a researcher in the field of biotechnology will be performed safely and will help me make sensible recommendations to the governments, policy makers and decision makers. In general, I will be confident in my work after learning biosafety rules regarding GMOs. Based on my position, Kenya will benefit from this course by having a well trained manpower will full potential in addressing the issues of biosafety as we adopt this technology.

Proposed Action Plan:

Week 1: Molecular biology techniques including RNA & DNA extraction, PCR techniques. Sample collections, RT-PCR and QPCR. The planned outcome will be enhanced skills in molecular biology techniques.

Week 2: Southern and Northern hybridization techniques'. The outcome will be enhanced ability to detect integration of genomic segments within the genome.

Week 3: Bioinformatics: - In silico cloning techniques, sequence analysis. The outcome will be I will be in position to interactively use bioinformatics to possibly clone genes into vectors before the actual cloning takes place. Sequence analysis will also include promoter analysis.

Week 4: & 5 Cloning techniques - including Agrobacterium mediated transformation; biolistic transformation: use of GUS and GFP as reporter genes to analyze transient gene expression: use of different medium composition to enhance regeneration of explants and callus induction. Study competance of different explants to agrobacterium mediated transformation study the different promoters for gene expression

Week 6: Biosafety on food and environmental aspects of agricultural biotechnology:
- Applications of plant biotechnology
- Theoretical and practical foundations of biological risk assessments.

Week 7: - Food and Feed safety in relation to GMOs
- Environmental safety in relation to GMOs

Week 8: National and international regulatory systems in relation to GMO's

Week 9: Risk perception and Risk communication in relation to GMOs

Week 10: set up of drought stress Experiments.

Week 11: Evaluation of drought stress tolerance in transgenic plants compared to non transgenic plants.

Week 12: Field evaluation of drought tolerance and yield parameters for transgenic crops.

Fellow #4 (male- Rwanda)

An application for the Borlaug fellowship is hereby made to work on characterization of bacterial wilt pathogen (Ralstonia solanacearum) causing wilt on various solanaceous plants, including potato and tomato, and management of the disease. Potato is an important food as well as cash crop in Rwanda. However, the potato sector faces enormous biotic constraints, which limits productivity. Potato bacterial wilt is the single most important disease affecting potato seed production. Since only 2o/o of clean seed is produced in the country, the importance of this disease cannot be taken lightly. ln fact, it is also one of the most important diseases throughout the entire potato sector. Efforts by the Rwandan government are underway to increase potato seed production. However, without addressing the problem of this disease, the level of success will be minimal. R. solanacearum also causes economic losses on tomato and other solanaceous crops in the country.
R. solanacearum has not been characterized nor is the package for managing the wilt disease complete in Rwanda. Under this fellowship, I propose to train on characterization of this pathogen, especially at molecular level, at a USA University or Research lnstitute. Since the pathogen has a broad host range, including banana
(moko disease), which is not a solanaceous crop, the management of the disease, in my own opinion, is rather complicated, especially at the field level. While in the USA, I also intend to train on development of a complete control package for R. solanacearum. Since I am the head of Biotechnology Unit at ISAR, where we do disease diagnosis and characterization, I will initiate a program to characterize and manage bacterial wilt diseases using experience gained in the USA.

Bacterial wilt pathogen, Ralstonia solanacearum, will be characterized both at the morphological/biochemical and molecular level. For this purpose, laboratory reagents like chemicals, enzymes, buffers, oligonucleotide primers, etc. will be required. Training on bacterial wilt disease management will also be carried out. This could involve a combination of lectures and visits to fields of any host crop. For this purpose, and for the purposes of sampling for laboratory analysis, transport and field logistics will be needed. Due to involvement of molecular biology work, which is quite laborious and time consuming, a total of 12 weeks will be spent on the entire research program as follows:

Proposed Action Plan:

Week 1: Administrative procedures and familiarization of the host research group
Week 2: Field visits; sampling
Week 3: Media preparation and isolation of R. solanacearum from field samples
Week 4: Continuation of bacteria isolation and initiating morphological/biochemical characterization
Week 5: Morphological/biochemical characterization of R. solanacearum and planning molecular characterization of the pathogen
Week 6: Finalizing morphological/biochemical characterization and initiating molecular characterization (DNA extraction)
Week 7: Molecular characterization
Week 8: Molecular characterization
Week 9: Molecular characterization and training on bacterial wilt management (lectures)
Week 10: Molecular characterization and training on bacterial wilt management (field visits)
Week 11: Morphological/biochemical and molecular data analysis and initiating a scientific report writing
Week 12: Finalizing the scientific report writing and preparation to return to Rwanda

Fellow #5 (male- Tanzania)

Specifically I want to achieve the following goals;

i. Acquire the insight of principles modern biotech for its sound application in the country

ii. Increase knowledge on genetic engineering techniques/recombinant DNA technology in the lab, e.g.

a. to identify gene of interest
b. to isolate the gene of interest
c. integrate this gene in a target crop
d. ascertain the occurrence of the integrated gene
e. how to measure the expression of the incorporated gene
f. how to measure the efficacy of the GM crop in the lab and field

iii. Procedures and application of Marker Assisted Selection (MAS) of potential useful traits as a tool in plant breeding

iv. Methods of field and Laboratory data collection and analysis to measure the relevance to potential negative impacts and benefits of GMOs (the Biosafety side of GMOs)

v. Learn the principles and tools of risk assessment of GMOs at various stages e.g. containment level, CFT and prior to commercialization

vi. How to address GM food safety issues

vii. How to communicate (communication strategies) the Biotech/Biosafety information to the stakeholders and

the public as a way of awareness creation

viii. How to undertake the risk assessment of GMOs/GM crops and what would be the appropriate risk mitigation measures at various stages of GM crop

ix. Learn about the commercialization package of GM crops

x. How to address the socio-economic issues related to application of modern biotechnology especially in developing countries where Agriculture is practiced by small scale farmers

xi. Learn potential areas of agricultural biotechnology research and try to relate to the Tanzanian environment

Proposed Action Plan:

Week One
1. Research Activities
Principles of Modern Biotechnology
Applications of Modern Biotechnology
Applications of Agricultural Biotechnology e.g. MAS
2.Expected Outcomes
Increased competence on applications of agricultural biotechnology, MAS in particular will applicable to our expected project entitled "Mapping of QTLs linked to Powdery Mildew Disease resistance in Tomato for selection of disease resistant tomato suitable for Tanzania"

Week Two
1. Research Activities
Overview of genetic engineering/Recombinant DNA technology
Principles of Recombinant DNA technology
Applications of Recombinant DNA technology in plant transformation
2.Expected Outcomes
Increased molecular laboratory techniques to be applied to our Biosafety Reference Laboratory and elsewhere in the country

Week Three
1. Research Activities
Hand-on experience in how to;
identify gene of interest
isolate the gene of interest
integrate this gene in a target crop
ascertain the occurrence of the integrated gene
how to measure the expression of the in cooperated gene
2.Expected Outcomes
trained in hand-on molecular laboratory skills applicable to our Biosafety Reference Laboratory, Molecular pests and diases diagnosis, plant characterisation and elsewhere in the country

Week Four
1. Research Activities
How to measure the efficacy of the GM crop in the lab and field
Methods of field and Laboratory GMO data collection and analysis
Data interpretation and its implications
2.Expected Outcomes
Trained in experimental set up and data collection necessary for risk assessment

Week Five
1. Research Activities
Principles and tools of risk assessment of GMOs
Procedures in undertaking risk assessment
Procedures in developing risk mitigation measures

Research Action Plan (Continued)

2. .Expected Outcomes
Capacity to complement to risk assessment of GM crops in the country

Week Six
1. Research Activities
How to addrees GM food safety e.g.
Toxicity, allergenicity, carcinogenicity
2. .Expected Outcomes
Attained skills to deal with GM food concerns

Week Seven
1. Research Activities
Communication strategies of biotechnology to stakeholders & public
What information, how, when, where and to whom should it be done?
Who has to do it appropriately?
2. .Expected Outcomes
Acquired knowledge to prepare our biosafety/biotechnology communication action plan

Week Eight
1. Research Activities
Commercialisation package of developed GMOs/GM crops
How is it done?
What data/information should prepared?
2. .Expected Outcomes
skills to prepare the general release package

Week Nine
1. Research Activities
Agricultural biotechnology and socio-economic issues
How to take into consider socio-economics in biotechnology application
What socio-economic issues to consider
How should these be communicated
2. .Expected Outcomes
Acquired knowledge to address the socio-economic impacts of biotechnology

Week Ten
1. Research Activities
Research in Agricultural biotechnology e.g.
Research problem formulations
Research design
2. .Expected Outcomes
Increased competence in preparing demand driven research problems

Week Eleven
1. Research Activities
Study tours to companies developing GMOs
Field Excursions to CFT sites and farmers growing GM crop
2. .Expected Outcomes
Experience on how the GM crops do in the field as related to non-GM crops since seeing is believing