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**A REPORT ON THE DACUM PROCESS FOR BIOSAFETY AND BIOTECHNOLOGY IN SWAZILAND**

**25th - 26th November 2013**

**PREPARED BY:**

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**SWAZILAND ENVIRONMENT AUTHORITY**

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**Introduction**

Subsequent to a curriculum Audit on Biosafety and Biotechnology issues in the Swaziland school curriculum, a need was identified to develop a curriculum matrix tool solely design to influence curriculum practitioners on the various important Biosafety issues that need to be incorporated or integrated into the curriculum. This therefore called for SEA and NCC to collaborate closely in coming out with the myriad of issues for integration in the curriculum. For the development of the matrix the DACUM process was followed where various experts in the field were engaged to elicit the necessary information. Thus the DACUM process brought together stakeholders from different organisations and institutions who deliberated and teased out pertinent Biosafety and Biotechnology issues. The DACUM workshop was held on the 25th -26th of November 2013 at the SEA Boardroom.

**Objectives of the DACUM Process**

Developing a curriculum (DACUM is a process that utilizes focus groups to identify the duties and task of a particular occupation as well as the necessary knowledge, skills and attitudes that people should have to work in the occupation. In the DACUM process a panel of experts in the field are engaged on a two-day period to identify the duties and tasks of the respective jobs. The final occupational profile is the presented on a chart format which is further used for the development of curriculum for the field under study.

The Biosafety and Biotechnology DACUM workshop aimed at achieving the following objectives:

* To share with share with stakeholders and experts in the field of Biosafety the DACUM approach to curriculum
* To solicit ideas and information from various experts in the field of Biosafety and Biotechnology
* To analyse various occupations that deal with Biosafety and Biotechnology in order to identify the knowledge, skills and attitudes necessary to perform such occupations
* To develop occupational profile DACUM charts for key occupations identified as relevant to Biosafety and Biotechnology
* To compile a DACUM report on the occupational profile charts developed for the various occupations.

**The DACUM Panel**

The DACUM panel involved the following officers and specialists in the field:

* Dr Diana Earnshaw (Crop Scientist – UNISWA Luyengo)
* Professor A. A. Dlamini (Animal Scientist – UNISWA Luyengo)
* Mandla Ntshakala ( Consumer Representative)
* Jabulani Tsabedze (Farmer Representative)
* Bongani Nkhabindze (Genetics/Biotechnology Specialist - SEA)
* Gcina Dladla (Environmentalist – SEA)
* Calisile Mhlanga (Biodiversity Specialist – SEA)
* Sipho Matsebula (Ecologist – SEA)
* Constance Dlamini (Legal Specialist – SEA)
* Dumile Sithole (Horticulturist – SEA)

**Facilitators**

A team of facilitators that worked in close collaboration with SEA was drawn from the National Curriculum Centre, a government department responsible for the development of curriculum materials for schools. The team comprised the following members:

* **Robert Khumalo**
* **Evart V. Dlamini**
* **Musa. T. Hlophe**
* **Steven B. Dlamini**

The following occupations were identified as key and important for aspirant Biosafety and Biotechnology learners. As a result specific charts for such occupations were developed as a result of the DACUM process AS PRESENTED IN THE Research Charts below:

* **Conservationist**
* **Farm Manger**
* **Biosafety Inspector**
* **Molecular Researcher**

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| DACUM Research chart for a Conservationist | | | | | |
| A.  **Coordinate Biodiversity Issues** | 1. **Develop NBSAP**  * Source funding * Facilitate stakeholder engagement * Set up a project steering committee * Develop TOR for the NBSAP * Engage a consultant to develop a strategy * Validate strategy with stakeholders | 1. **Coordinate the implementation of the NBSAP**  * Communicate the biodiversity strategy to all stakeholders * Facilitate the mainstreaming of the strategy to all sectors * Monitor the implementation of the strategy * Facilitate the revision of the strategy when needed | 1. **Coordinate biodiversity activities in the SEAP**  * Invite target institutions to nominate members to constitute the BPIC * Prepare TORs for the BPIC * Convene regular BPIC meetings * Forward recommendation of BPIC to SEA management * Implement recommendations from BPIC | 1. **Undertake research related to Biodiversity**  * Identify areas of research in line with the NBSAP * Undertake research for purposes of informing planning and decision making * Communicate research findings to stakeholders * Make recommendations on possible areas of research | 1. Facilitate the implementation of the Flora Protection Act, 2002  * Engage communities on impacts of unsustainable harvesting of biological resources * Sensitise law enforcement officers and local authorities on the provisions of the Act, 2002 * Empower law enforcement officers on the identification of indigenous flora * Partner with law enforcement officers in carrying out operations to curb the illegal sale of indigenous flora for fire wood. |
| 1. Liaise with forestry department in implementation of AIPS strategy  * Organise and conduct training workshops on AIPS * Advise communities on control and management of AIPS * Partner with forestry dept on AIPS combating exercises * Avail information on AIPS to the public | 1. **Manage the biodiversity clearing house mechanism (BCHM)**  * Facilitate the establishment of the BCHM * Facilitate training of personnel to man the BCHM * Ensure maintenance of equipment * Build and maintain database on biodiversity resources and activities * Manage the daily operations of the BCHM | 1. **Ensure annual commemoration of biodiversity related days**  * Prepare budget for the activity * Set-up a planning committee to plan for possible activities * Plan and organise all logistics * invite stakeholders to commemorations * actively participate in the commemoration of these days |  |  |  |
| B.  **Prepare Country Reports on Biodiversity** | 1. **Ensure availability of budget**  * Identify possible external funding for the exercise * Prepare proposals requesting for funding from external donors * Prepare budget internal to back-up any possible external funding. | 1. **Organise National Stakeholder’s Consultations**  * Source for appropriate venues for consultations * Invite stakeholders for consultations * Collect and compile stakeholders comments at workshop * Avail stakeholder’s comments to consultant to in cooperate in formulation of report. | 1. **Engage Consultant(s)**  * Prepare TORs for the exercise(s) * Advertise to call for proposals * Review received proposals and select best qualifying candidate(s) * Engage consultant(s) | 1. **Facilitate compilation of reports**  * Avail information and resources to consultant * Guide and supervise consultant on the exercise * Review report text for accuracy of information * Validate output report with stakeholders * Produce a final report. | 1. Avail reports  * Send report to CBD secretariat * Print and publish the reports * Upload reports in SEA website * Avail copies of the report in all strategic places, e.g. libraries, SEA resource centre etc. * Distribute reports to all interested stakeholders and the general public |
| C.  **Enforce Environmental Management Act (EMA). 2000** | 1. **Review Environmental Assessments reports**  * Review as assigned EIA/CMP reports * Review as assigned IEE/CMP reports * Review as assigned EA and strategic Environmental impact Assessment reports * Categorise appropriately proposed project * Advice proponents appropriately on the correct steps to take in fulfilment of the EMA | 1. **Monitor Compliance with the EMA**  * In collaboration with other divisions, monitor compliance with the EAAR Regulations * Monitor compliance with CMPs of operational projects * Monitor conditions of approval on approved projects * Advise SEA management on the need to issue orders in cases of lack of compliance | 1. **Respond to public queries on environmental issues**  * Attend to queries and public complains on environmental issues related to biodiversity * Response appropriately and timely to public complains and queries * Advise the public on the next steps to take to an amicable solution |  |  |
| D.  **Undertake ecological research (gather field data)** | 1. **Identify specific endangered resources**  * Design data collection method * Prepare field data sheets and equipment * Collect field data * Record data * Analyse and interpret data using specialist software programs * Identify resources using appropriate keys | 1. **Carryout surveys of threatened species**  * Prepare filed inventory forms * Conduct filed inventories * Map sites   Prepare control and management strategy | 1. **Identify protection worthy areas**  * Sample areas of interest for species diversity * Conduct surveys of areas * Take inventories of plants and animal species in areas * Map area   Produce reports | 1. **Model problems using computer simulations and evaluate possible solutions**  * Identify problems * Collect data * Source computer programs * Analyse data using computer program * Interpret results * Compile reports | 1. Locate wetlands  * Conduct country surveys of wetlands * Assess resources in wetlands * Map wetlands * Develop protection plan for the wetlands |
| General Knowledge and Skills  Knowledge of Flora and fauna  Knowledge of classification/taxonomy of species  Knowledge of Environmental metrics  Critical thinking  General knowledge of Biology  General knowledge of Coordinate geometry  Knowledge of Map reading (all types of maps)  Communication skills-speaking and writing  Knowledge of Research methodologies  Computer skills (e.g. Website search)  Awareness of government programmes and institutions  Basic Statistical Knowledge skills  Analytical skills  Record keeping skills  Problem solving skills  Knowledge of relevant legislations  Knowledge of Measurements  Project management skills | | | Worker Behaviours  Integrity  Honesty  Environmental sensitive  Like the outdoors (Adaptable)  Team player  Self-confident  Innovative  Detail oriented (pays attention to details)  Independent  Resourceful (willingness to share information)  Safety conscious  Self-motivated  Organized  Time management | | |
| Tools, Equipment, Supplies and Materials  Basic office equipment  Clip board  Log book  Reference materials (e.g. Field guides, Checklists)  Monitoring equipment (e.g.  Biological keys  GPS  Digital camera  GIS software  Microscope  Binoculars  Camping gear  Safety equipment  Car (4x4) | | | Future Trends and Concerns  Sustainability of implementation initiatives  Compliance issues  Cost of commodities  Reduced depletion of biodiversity  Genetic contamination of biodiversity due to GMO introduction  Deforestation  Increased reporting and monitoring on biodiversity issues  Economic value of biodiversity being reflected in the national resource accounting  Increased ecotourism  In Increased awareness on biodiversity issues | | |

**DACUM Research Chart for a Farm Manager**

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| **Organise Marketing** | 1. Conduct Marketing Research  * Identify the potential market for the business * Conduct interviews with the market * Collect mart information from newspapers, publication etc. | 1. Ensure standards of market are adhered to.  * Make sure the place for the business is conducive and accessible to clients * Make sure the product is of good quality * Price the product in such a way that the clients will be able to buy and bring profits to the business | 1. Secure formal market for products  * Market the product with potential clients * Organize meetings with potential clients * Sign contract with formal market * Deliver products to clients * Client pay for product delivered | 1. Establish partnerships with other value chain actors  * Forge links with relevant stakeholders * Attend business forums/exhibitions for networking * Sign memorandum of understanding | 1. Promote the product and services of the farm  * Formulate advertising strategy * Develop advert material * Select suitable media * Advertise product through e.g. media, promotional events i.e. road shows |
| B.  **Organize Production lines** | 1. **Train staff on production**  * Develop training material * Organize training i.e. date, venue, accommodation, food/meals * Train staff on production procedures/ processes * Organize field visits and demonstration exercises | 1. **Ensure timeliness of production activities**  * Plan for production * Make schedule of activities i.e. ploughing, planting, spraying, weeding, harvesting and storage * Supervise activities and provide technical support * Ensure adherence to standards for quality assurance | 1. **Ensure inputs, Machinery, equipments and implements are in good order**  * Develop a procurement plan * Collect quotations from suppliers * Select the cost effective supplier * Purchase equipment and inputs * Ensure payments of deliveries are made | 1. **Manage tools, equipment and supplies**  * Develop an inventory * Acquire the necessary tools and equipment * Establish preventive maintenance schedule for tools and equipment * Monitor conditions of tools & equipment * Provide storage for tools & equipment |  |
| C.  **Manage finances** | 1. **Ensure proper financial planning and budgeting**  * Make cash flow projections for the farm business. * Open bank account * Make budget for the business * Manage business budget | 1. **Control business spending**  * Identify priority areas of spending * Spend according to the priorities * Keep proper financial records on expenditure | 1. **Make financial reports**  * Decide on the design of reports * Review financial records * Prepare financial report * Present report to stakeholders * Make decisions based on the reports |  |  |
| D.  **Manage Human Resource** | 1. **Recruit competent staff**  * Identify gaps for human resource * Inform farm owners on identified gaps * Develop job descriptions for the posts * Develop contracts for employees * Advertise vacant posts * Short list applications * Conduct interviews * Sign contracts with employee * Orient new staff on the job * Assign daily tasks | 1. **open Human resource individual files**  * Design format of keeping records on human resource * Ensure that each file contain correct individual employee information * Ensure safe keeping of files * Ensure that files are kept with up-to-date information | 1. **Provide technical support for staff**  * Ensure staff is well trained technically * Supervise workers to monitor performance * Develop an appraisal mechanism | 1. **Ensure that company laws comply with state labour laws.**  * Gather country’s labour laws * Align company laws with those of the state * Adhere to country’s labour laws * Establish labour contracts * Establish a code of conduct | 1. **Motivate staff**  * Organize staff retreats/fun days * Provide bonuses if possible * Conduct motivational talks |
| E  **Manage Resources** | 1. **Mobilize financial resources**  * Identify institutions for financial assistance * Evaluate the cost of borrowing * Select institution from which to borrow * Apply for business loans to grow/ develop the business * Ensure business loans are properly serviced * Ensure that financial records are kept * Make sure that financial reports are submitted to relevant authorities | 1. **Design and implement monitoring and evaluation strategies**  * Design reporting instruments for staff * Design instruments for controlling use of inputs, equipment and implements * Design and manage log sheet for staff | 1. **Ensure security for business assets and premises**  * Build appropriate structures following set standards * Establish maintenance schedules * Monitor the conditions of the structures * Keep the structures in good condition | 1. **Timely services for business machinery/implements/vehicles**  * Keep inventory of the machinery and equipment * Service machinery and equipment regularly * Monitor conditions of equipment regularly * Repair equipment * Store equipment safely and in order * Dispose unneeded equipment * Keep and follow user guides when servicing equipment * Ensure proper use of equipment |  |

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| **General Knowledge and Skills** | **Worker Behaviours** |
| * Agribusiness management skills * Agriculture educational background * Human resource management skills * Institutional development capacity * Good inventory control strategy * Good marketing skills and communication skills * Effective strategy on resource mobilization and management * Adherence of safety standards in the work place * Interpersonal skills | * Commitment * Demonstrate clear thinking capability * High level of confidence on the job * Good behaviour * Good team player |
| **Tools, Equipment, Supplies and Materials** | **Future Trends and Concerns** |
| * Land * Fencing material * Water and irrigations materials and equipments; pipes, water pumps, sprinklers, etc. * Farm houses i.e. sheds, milking parlour, calf pens * Offices; computers, book shelves, stationery, telephone, etc * Tractors, vans, planters, ploughs, boom sprayers, harrows, oxen, slashers, hand hoes, combine harvesters, centre pivot. * Protective clothing * Tools; spade, hoe, fork, * First aid kit * Mobile phone | * Adopting new technologies in the marketing for efficiency in production. * Consider application of climate smart agriculture technologies and adherence to environmental concerns. |

**DACUM Research Chart for Biosafety Inspector**

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| **Prepare for Inspections** | 1. Collate appropriate documents required to carry out inspection  * Identify type of documents required e.g. inspection form or checklists, clipboard, pen etc. * Prepare technical information that may be required * Prepare previous inspection reports (if revisiting) * Assemble documents | 1. Organize equipment required for the inspection  * Identify type of equipment to be used * Acquire equipment * Ensure equipment is in good working order | 1. Arrange site visit  * Determine type of inspection (known or unknown) * Identify documents for review * Make an appointment with the client | 1. Carry out self –preparation with bio- safety requirements of the regulated activity  * Clarify questions concerning activity * Terms & conditions of the approval * Obtain guidance on critical hazard points * Obtain history of previous of previous activities | 1. Inform client of site visit  * Call client and arrange visit * Obtain information on who will host the inspection on site * Obtain directions to the site |
| B.  **Conduct Inspection** | 1. **Conduct meeting with site manager**  * Explain the purpose of the visit * Explain how the inspection will be conducted * Obtain update on progress of regulated activity * Request for documentation on the activity * Provide any other relevant information | 1. **Inspect documentation**  * Check for permitted events * Verify adherence to terms & conditions of approval * Notify regulatory authority in case of non-compliance * Cease GMO consignment where documentation is inappropriate | 1. **Carry out site inspection**  * Develop an inspection plan * Acquaint self with relevant documents * Take note of compliance with regulations * Verify adherence to terms & conditions of approval * Record observations * Carry out tests (if necessary) * Issue out verbal order (in case of non-compliance) | 1. **Document findings**  * Compile an inspection report * Submit the report to the Bio-safety Registrar * Notify regulatory authority in case of non-compliance * Make follow-up actions as per the recommendation from the Board | 1. **Implement outcome of the inspection**  * Give feedback to client on the inspection * Advise site manager of follow-up steps * Advise site manager of upcoming compliance requirements * Maintain all notes, checklists and submitted reports in secure storage for the necessary length of time |
| C.  **Interview Personnel** | 1. **Identify personnel to be interviewed**  * Identify areas of operation requiring scrutiny * Select personnel to provide appropriate information * Inform site manager of personnel required for interview | 1. **Determine appropriate questions to be asked**  * Identify issues to be ascertained * Prepare interview schedule * Organise items of the interview schedule | 1. **Conduct interview**  * Seek interviewee’s consent * Ask pertinent questions * Ascertain if there is any confidential information * Probe client where need arise * Document responses | 1. **Analyse data**  * Decide on the analytical framework * Conduct analysis * Record confidential information separately * Compile a report |  |
| D.  **Verify Key information** | * 1. **Take samples of produce** * Prepare for field visits * Undertake inspections * Conduct preliminary tests * Take samples for lab analysis | * 1. **Carry out tests** * Record the samples * Submit the samples to the designated laboratory * Request for results * Compile & submit a report the desired outcomes and impact * Review the memorandum of understanding as per the recommendations of the mid-term and summative evaluation reports | * 1. **Request for production records as required by the Act** * Prepare for an inspection * Undertake the inspection * Request for production records * Review the records * Compile & submit a report | 1. **Keep record of necessary information**  * Document all inspections under taken * Take pictures, records if necessary * Submit information to be included on the database * Implement M&E guidelines * Review the guidelines periodically (when necessary) |  |
| E  **Implement and recommend corrective action** | 1. **Take possession and detain where necessary**  * Have recommendations from the Board through the Registrar * Implement the recommendations * Compile a report | 1. **Cause dismantling of anything that contains GMOs likely to affect biodiversity**  * Verify if it is the rightful place for dismantling * Ensure destruction of the GMO if recommended * Compile a report | 1. **Inform regulatory authority**  * Report the inspection findings * Verify and authenticate the findings * Submit any samples taken | 1. **Document findings**  * Compile an inspection report * Submit the report * In case of non-compliance notify regulatory authority * Make follow-up actions as per the recommendations from the Board |  |
| F  **Capacitate staff and public on biosafety issues** | 1. **Train staff on biosafety issues**  * Identify courses to develop your skills * Identify training institutions * Process applications for study * Undergo the studies * Compile training report | 1. **Workshops**  * Establish networks with other stakeholders * Identify relevant workshops * Attend workshops * Compile workshop report | 1. **Public Awareness**  * Assist the Registrar’s Office in facilitating workshops * Help in circulating invitations to workshops * Assist in workshop logistics and provide relevant assistance during workshops | 1. **Bio safety Activities**  * Attend any Bio safety activities as directed by the Registrar * Assist in coordinating activities organized by the Registrar’s Office * Compile reports as require |  |

**Future Trends and Concerns for the department**

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| General knowledge and skills | Worker behavior |
| Technical skills on biotechnology and bio safety- a good understanding of ecology, general biology, molecular biotechnology and gene transfer  Communication skills  Legal orientations on inspections and investigation  Safety and health skills  Agriculture  Record keeping skills  Organizational skills  Interpersonal skills | Integrity  Confidentiality  Confidence  Time-to-task  Honest  Trustworthiness  Non-corruptibility  Good conduct  High work ethic |

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| Tools and equipment | | Future trends and concerns |
| Car  Camera  Clip board  Voice recorder  Log book  Protective clothing  Computer  Cell phone | Telephone  Tape measure  GMO testing kit  Global Position System (GPS)  Sampling material  Cooler box  Access to storage  First aid kit | Proper documentation accompanying consignment  High level of compliance to the Bio safety Act, 2012  Vulnerability to Corruption  Curbing of illegal GMO imports |

**DACUM Chart for a Molecular Researcher**

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| **Perform Laboratory Tests** | 1. Apply Policies & Procedures  * Understand the policies * Implement the policies * Define the procedures clearly | 1. Run Tests  * Ensure that the equipment is in good condition * Outline the protocols clearly * Supervise the lab activities | 1. Validate Test Results  * Ensure authenticity of results * Ensure proper documentation of activities * Maintain a database for all tests done * Ensure high standards of professionalism and integrity | 1. Maintain Inventory  * Keep records of all equipment * Ensure that all the equipment is in great condition * Keep up with recent technologies | 1. Carryout Projects / Experiments  * Liaise with regulatory bodies in cases of sensitive projects * Ensure safety to the staff, the environment and the end users of any developed technologies |
| B.  **Manage Information** | 1. **Create links with other stakeholders**  * Identify relevant stakeholders * Engage in MoUs where necessary * Facilitate workshops with stakeholders | 1. **Respond to Communications**  * Receive communique * Respond to any queries regarding the lab activities * Create links with other relevant stakeholders | 1. **Manage Data**  * Collect data * Analyse data * Create Reports * Present reports | 1. **Perform Customer Care Activities**  * Market Lab Services * Track customer complaints * Respond to customer complaints * Monitor improvement outcome * Implement service improvements |  |
| C.  **Develop Laboratory Process** | 1. **Develop Protocols**  * Research on available recent and efficient protocols * Modify the protocols to suit your resources * Clearly outline the protocols | 1. **Coordinate Experiments/ Projects**  * Liaise with stakeholder that have similar projects or needs * Ensure non-duplication of activities that are done by other stakeholders | 1. **Maintain Equipment**  * Keep records of all equipment * Ensure that all the equipment is in great condition * Keep up with recent technologies | 1. **Assist the Public / Stakeholders**  * Have a list of stakeholders that require your services * Provide services to other stakeholders * Develop a standard fee structure | 1. **Maintain Quality Systems Essentials**  * Ensure that local & international SOPs are followed * Ensure the lab abides to local & international standards |
| D.  **Provide Supervision** | 1. **Enforce Policies & Procedures**  * Understand the policies * Implement the policies * Define the procedures clearly | 1. **Designate Lab Staff**  * Hire staff * Orient the staff * Schedule the staff * Develop the staff * Discipline the staff | 1. **Organize the Staff**  * Hire staff * Orient the staff * Schedule the staff * Develop the staff * Discipline the staff | 1. **Enhance Proper Communications**  * Facilitate staff communication * Conduct staff meetings * Resolve conflicts | 1. **Oversee the Staff**  * Manage staffing workloads * Conduct staff competency testing * Monitor staff competency * Evaluate the staff |
| E.  **Educate others** | 1. **Prepare Training Material** | 1. **Staff Training** | 1. **Public Capacity Building** | 1. **Integrate biosafety or modern issues into all sectors**  * Create links with stakeholders * Facilitate meetings and workshops on Biosafety * Assist in integrating Biosafety into the different sectors |  |

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| General knowledge and skills | Worker behavior |
| Knowledge of Molecular Biology  Knowledge of rDNA Recombinant Technology  Knowledge of classification/taxonomy of species  Critical thinking  General knowledge of Biology  Communication skills-speaking and writing  Knowledge of Research methodologies  Computer skills (e.g. Website search)  Awareness of government programmes and institutions  Basic Statistical Knowledge skills  Analytical skills  Record keeping skills  Problem solving skills  Knowledge of relevant legislations  Knowledge of Measurements  Project management skills  Knowledge of Laboratory Standard Operating Procedures (SOPs) | Integrity  Honesty  Environmental sensitive  Like the outdoors (Adaptable)  Team player  Self-confident  Innovative  Detail oriented (pays attention to details)  Independent  Resourceful (willingness to share information)  Safety conscious  Self-motivated  Organized  Time management |

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| Tools and equipment | Future trends and concerns |
| PCR  Gel Electrophoresis  Florescent picture capture  Micro-centrifuge  Chromatography  -20oC & -80oC Refrigerators  Water bath  Basic lab equipment  Camera  Clip board  Log book  Protective clothing  Computer  Cell phone  Telephone  GMO testing kit  Sampling material  Cooler box  Access to storage  First aid kit | Accredited GM testing facility  A pool of Molecular Biologists in the country  Having the technical skill to develop our own GM products |