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ENVIRONMENTAL RELEASE OF GENETICALLY MODIFIED MAIZE FOR AGRICULTURAL PURPOSES IN NAMIBIA

STRATEGIC ENVIRONMENTAL MANAGEMENT PLAN

Assessed by:

Assessed for:

Gerhard Engelbrecht on behalf of the Members of the Agronomic Producers Association

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Project:	**ENVIRONMENTAL RELEASE OF GENETICALLY MODIFIED MAIZE FOR AGRICULTURAL PURPOSES IN NAMIBIA: STRATEGIC ENVIRONMENTAL MANAGEMENT PLAN**	
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1 INTRODUCTION

Members of the Agronomic Producers Association (APA) intend to apply for the registration of genetically modified (GM) maize in Namibia. This will allow members of the APA to apply for permits to cultivate GM maize for food and feed production. The specific strains of GM maize are: MON 810 (insect resistant), MON 89034 (insect resistant) and NK 603 (herbicide resistant) as well as stacked events combining any of the three events. Similar to any other farming practices, the cultivation of GM maize poses potential positive and negative impacts. This strategic environmental management plan (SEMP) aims to guide the farmers to maximise positive impacts while negating or attenuating negative impacts. The SEMP is based on a strategic environmental assessment (SEA) for the proposed release of the specific strains (Faul et al. 2020).

2 OBJECTIVES OF THE SEMP

Members of the APA requires a SEMP for the proposed release of GM maize for agricultural purposes. The SEMP aims to address potential impacts by providing an over-arching framework of management options to ensure negative impacts on the environment are minimised while positive impacts are promoted. The SEMP should become part of the conditions of each permit issued to farmers who applies for the cultivation of GM maize. Since it is a generic SEMP, it will remain the responsibility of the individual farmers to adapt the SEMP for the specific conditions under which he / she cultivates maize (e.g. dryland vs. irrigation) during the development of their own environmental management plans (EMP).

The objective of this SEMP is to manage the introduction of specific GM maize events and does not assess or manage the actual agricultural and related processes which are separate listed activities under the Environmental Management Act. It is the responsibility of each adopter of GM maize, and thus each farmer, to ensure that they comply to the Environmental Management Act, specifically for example to the requirement for environmental impact assessment (EIA) for listed items such as abstraction of groundwater for commercial and industrial purposes, storage and handling of fuel, pest control, etc.

3 MANAGEMENT PLAN

Table 1 and Table 2 outline the major identified impacts associated with the introduction of GM maize in Namibia. This serves as a framework for the individual EMPs to be prepared by each farmer adopting GM maize for cultivation. Where individual EIAs and EMPs are required by farmers, the SEMP should be incorporated into these.

Reporting requirements are proposed to monitor the success (or failure) of adopting GM maize for cultivation purposes in Namibia. However, it also serves as a reporting system to the Biosafety Council of the National Commission on Research, Science and Technology (NCRST), to monitor any adverse impacts that may occur.

Table 1. Planning

Desired Outcome	Action	Responsible Body	Data Source / Monitoring
To comply with all legal requirements regulating the agronomy sector in Namibia and specifically those that apply to GMOs.	Apply for the necessary permits from the Biosafety Council, NCRST.	Applicant	Maintain a legal register Permits kept on file
To appoint reputable contractors and operational personnel and establish the EMP, a legal requirement that forms part of the contract with the contractor and employees.	Enter into an agreement with contractors (if any) and employees that will be involved with GM maize (transport, cultivation, harvesting, etc.), which includes the established EMP. Ensure that the contents of the EMP are understood by the contractor, sub-contractors, employees and all personnel. This includes the consequences if not adhering to any of the stipulations in the SEMP.	Applicant	Employment contracts on file
Establish a management system to implement and monitor Health, Safety and Environment (HSE).	Make provisions to have a HSE Coordinator to implement the EMP and oversee occupational health and safety as well as general environmental related compliance. Develop and maintain emergency response plans.	Applicant, HSE	Legal register inclusive of the Labour Act and its regulations and the Health Act Site specific EMP
To establish a reporting system to report on monitoring aspects as outlined in the EMP	Establish and regularly update a reporting system to report on monitoring aspects as outlined in the EMP. Keep monitoring reports on file for submission to relevant authorities.	Applicant	Bi-annual summary reports based on all monitoring performed

Table 2. Management Procedures

Impact	Desired Outcome	Mitigation	Responsible Body	Data Source / Monitoring
Skills development and training	♦ Education and skills transfer to benefit Namibians	♦ Appoint Namibians and identify training and skills development needs ♦ Provide regular training and skills development	Applicant	♦ Keep record of all training provided and provide employees with references for training completed
Employment	♦ Sustainable employment for Namibians	♦ Economic benefits of cultivation of GM maize will increase employment security ♦ Opportunities for additional income generating activities to be investigated	Applicant	♦ Labour Act and its regulations ♦ Updated employment records and contracts on file
Socio-Economic Upliftment and Economic Resilience	♦ Contribution to local and national treasury as well sustaining a stable earning potential for employees and industry	♦ Prior to embarking on the cultivation of GM maize, each farmer must do feasibility calculations taking specific local conditions into consideration	Applicant	♦ Feasibility reports on file
Demographic Profile and Community Health	♦ To prevent the spread of communicable disease and prevent / discourage socially deviant or criminal behaviour. To prevent community health impacts.	♦ Sustain the existing employee base and where additional vacancies exist, Namibians should be appointed ♦ Educational programmes on aspects such as HIV/AIDS and drug abuse.	Applicant; HSE	♦ Labour Act and its regulations ♦ Health Act ♦ Keep record of all educational programmes or training provided ♦ Employee records on file
GM maize establishing outside of cultivated fields and becoming invasive or damaging to the environment	No GM maize establishing in natural habitat	♦ Contain GM seeds and prevent spillages during transport ♦ Spill clean-up plan where accidental spills occur during transport ♦ Prevent theft of GM maize seeds	HSE; Contractors; Employees	♦ Spill management plan ♦ Record all spills and include maize strain, date, location and spill clean-up measures with photo records ♦ Submit report to the NCRST
Horizontal gene transfer and cross-pollination with non-GM fields	Prevent the insertion of GM genes into closely related species or cross-pollination with non-GM maize fields which must	♦ Maintain a buffer zone of 800 m between GM and non-GM maize fields	Applicant	♦ Seed supplier guidelines and contractual obligations of farmer

	remain uncontaminated (e.g. organic fields and non-GM maize producers)			♦ Keep record of any potential cross-contamination events and report to NCRST
Insect resistance against Bt proteins resulting in "super bugs"	♦ Delay or entirely prevent the onset of Bt resistance in key Lepidopteran pest species.	♦ Develop and implement an insect resistance management plan in collaboration with the seed supplier ○ all farmers must adhere to the refuge strategy as stipulated by the GM seed supplier ○ as part of the insect resistance management plan, intermittently apply insecticides to kill any pest insects that may have developed Bt resistant traits	Applicant; HSE; Supplier	♦ Insect resistance management plan ♦ Regular inspection of all maize fields to ensure early detection of extraordinary damage to crops that would indicate Bt resistance. ♦ If Bt resistance is expected, implement the insect resistance management plan and notify the NCRST and seed supplier. ♦ Keep record all instances of suspected pest resistance to Bt. Note at least the species, date, extent of crop damage and measures taken. ♦ Keep record of all instances of insecticide application as a measure to combat non-lepidopteran pests or to prevent / delay resistance in insects against Bt proteins. Note at least the date, insecticide used, concentration of active ingredients as applied, and the reason for application.
Weed resistance against glyphosate (herbicide resistance) resulting in "super weeds"	♦ Delay or entirely prevent the onset of glyphosate resistance in weeds	♦ Develop and implement a weed resistance management plan in collaboration with the seed supplier ♦ The plan should among others include: ○ application of glyphosate herbicide as per the prescribed concentration (i.e. not lower or higher concentrations as this may be ineffective) and application procedures	Applicant; HSE; Supplier	♦ Weed resistance management plan ♦ Inspection of all maize fields after application of glyphosate to ensure early detection of surviving weeds that may indicate resistance. ♦ If glyphosate resistance is expected, implement the weed resistance management plan and notify the NCRST and seed supplier. ♦ Keep record all instances of suspected weed resistance to

		○ weed control prior to planting which should include herbicides of alternative active ingredients to allow killing of weeds that may have developed resistance to glyphosate ○ weed control prior to its production of viable seeds ○ cleaning of farm implements to prevent distribution of potential resistant weeds ○ crop rotation		glyphosate. Note at least the species, date, extent and measures taken. ♦ Keep record of all instances of herbicide application as a measure to combat weeds or to prevent / delay resistance in weeds against glyphosate. Note at least the date, herbicide used, concentration of active ingredients as applied, and the reason for application.
Soil and groundwater contamination as a result of excessive herbicide application	♦ Prevent glyphosate herbicides from contaminating soil and ultimately groundwater	♦ Limit herbicide application as far as is practically possible ♦ Application of glyphosate herbicide as per the prescribed concentration and application procedures ♦ Prevent spray drift by applying herbicides during calm weather conditions.	Applicant; HSE	♦ Keep record of all instances of herbicide application.
Glyphosate presence in harvested maize kernels posing health threats	♦ Maize products that are safe to eat and free from residual glyphosate.	♦ Limit herbicide application as far as is practically possible ♦ Application of glyphosate herbicide as per the prescribed concentration and application procedures	Applicant; HSE	♦ Keep record of all instances of herbicide application including last date of application and date of harvesting.
Erosion and loss of fertile soil	♦ No erosion and soil loss due to water and wind	♦ Implement conservation tillage practises	Applicant	♦ None

4 CONCLUSIONS

The above SEMP framework, if properly implemented, will guide the responsible and sustainable implementation of GM maize for cultivation in Namibia. This will minimise or prevent adverse impacts on the environment while promoting benefits. Where any negative impacts occur, immediate action must be taken to reduce the escalation of effects associated with these impacts and mitigation measures must be implemented. This is specifically important for potential resistance development in insects and weeds. To ensure the relevance of this document, it needs to be reviewed and updated to be project specific for each farmer or incorporated into their respective EIAs and EMPs where required. Importantly, all monitoring records must be submitted to the NCRST.