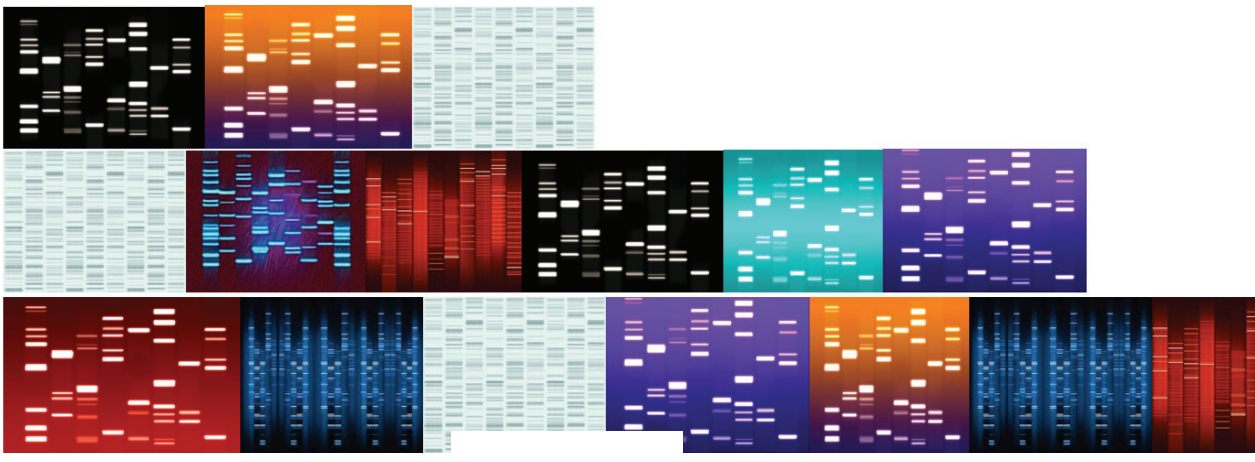
GUIDELINE

# Risk Assessment of Food and Feed Products Derived from Genetically Modified Plants

# 2014



# FOREWORD

A Genetically modified product intended for food, feed or processing needs to be subjected to risk assessment prior to giving approval for retail in the local market.

This document for risk assessment of food and feed products derived from genetically modified plants is intended to provide technical guidance to understand the requirements for safety assessment of food and feed products derived from genetically modified plants.

The Guideline has been prepared in accordance with internationally established scientific principles and guidelines developed through the work of the Organisation for Economic Cooperation and Development (OECD), Food and Agriculture Organization of the United Nations (FAO), World Health Organization (WHO) and the Codex Alimentarius Commission.

The document describes Bhutan's approach to the risk assessment of GM food and feed and is intended to be used in conjunction with the Guideline on Governance Procedures related to risk analysis of Genetically Modified (GM) products derived from genetically modified organisms which outlines the information required to support an application for approval of a GM product.

This document marks the beginning of a structured approach to safety assessment of GM food and feed and necessary changes would be incorporated taking into consideration future scientific advances. The guideline has been developed with the support from the National Biosafety Framework Project, Bhutan Agriculture and Food Regulatory Authority with the financial and technical support from the Global Environment Facility (GEF) and United Nations Environment Program (UNEP).

**Karma Dorji**
**Director General**

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# ACRONYMS

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|---|---|
| BAFRA | Bhutan Agriculture and Food Regulatory Authority |
| BLAST | Basic Local Alignment Search Tool |
| CAC | Codex Alimentarius Commission |
| DNA | Deoxyribonucleic Acid |
| EFSA | European Food Safety Authority |
| FAO | Food and Agriculture Organisation |
| FASTA | Fast All |
| GLP | Good Laboratory Practices |
| GM | Genetically modified |
| GMO | Genetically Modified Organism |
| GMP | Good Manufacturing Practices |
| IgE | Immunoglobulin E |
| OECD | Organisation for Economic Co-operation and Development |
| *r*-DNA | Recombinant Deoxyribonucleic Acid |
| WHO | World Health Organisation |

# GLOSSARY

**Conventional counterpart**: a related plant variety, its components and/or products for which there is experience of establishing safety based on common use as food (CAC, 2009).

**Exposure assessment:** the qualitative and/or quantitative evaluation of the likely intake of biological, chemical, and physical agents via food as well as exposure from other sources if relevant (CAC, 2011).

**Genetically modified organism**: an organism that has been modified by modern biotechnology.

**Genotype**: the genetic constitution of an organism.

**Harm**: a biological, chemical or physical agent in, or condition of, food with the potential to cause an adverse health effect (CAC, 2011).

**Hazard characterisation**: the qualitative and/or quantitative evaluation of the nature of the adverse health effects associated with biological, chemical and physical agents which may be present in food. For chemical agents, a dose-response assessment should be performed. For biological and physical agents, a dose-response assessment should be performed if the data are obtainable (CAC, 2011).

**Hazard identification**: the identification of biological, chemical, and physical agents capable of casing adverse health effects and which may be present in a particular food or group of foods (CAC, 2011).

**Modern biotechnology**: the application of:

i) In vitro nucleic acid techniques, including recombinant deoxyribonucleic acid (r-DNA) and direct injection of nucleic acid into cells of organelles; or
ii) Fusion of cells beyond the taxonomic family that overcome natural physiological reproductive or recombination barriers and that are not techniques used in traditional breeding and selection. Genetic modification and genetic engineering are terms that are often used in the same context, but scientifically have a broader meaning (CAC, 2009).

**Phenotype**: an observable characteristic or trait of an organism that is determined by interactions between its genotype and the environment, and may include, but is not limited to physical, morphological, physiological and biochemical properties.

**Recombinant-DNA plant**: a plant in which the genetic material has been changed through in vitro nucleic acid techniques, including recombinant deoxyribonucleic acid (DNA) and direct injection of nucleic acid into cells or organelles (CAC, 2009).

**Risk:** function of the probability of an adverse health effect and the severity of that effect, consequential to a hazard(s) in food (CAC, 2011).

**Risk analysis:** a process consisting of three components: risk assessment, risk management and risk communication (CAC, 2011).

**Risk characterisation**: the qualitative and/or quantitative evaluation of the nature of the adverse health effects associated with biological, chemical and physical agents which may be present in food. For chemical agents, a dose-response assessment should be performed. For biological or physical agents, a dose-response assessment should be performed if the data are obtainable (CAC, 2011).

# 1. INTRODUCTION

Increasing quantities of food and feed products from genetically modified plants and micro-organisms are commercially available, resulting in exposure of consumers even in countries that do not approve genetically modified organisms (GMOs). Concerns have been expressed about the safety of such foods. Consequently, Bhutan, as signatory to the Cartagena Protocol on Biosafety to the Convention on Biological Diversity, a legal binding instrument, seeks to protect human and animal health and the environment from risks of GMOs.

The purpose of the guideline is to contribute to an understanding of the requirements for safety and risk assessment of food and feed products derived from genetically modified (GM) plants or recombinant-DNA plant. The assessment is conducted on the raw, unprocessed crop plant. Should the GM plant be considered as safe as the conventional counterpart, it is assumed that the food and feed from this plant would be as safe as the food and feed products from the conventional counterpart. However, the safety and risk of the processed products from the GM plant should be assessed case by case because of possible changes owing to processing techniques.

Bhutan follows a cautious approach through premarket assessment of the possible risk to human and animal health and to the environment. Guidelines developed by Codex Alimentarius Commission (CAC, 2009), an international organisation under the auspices of the Food and Agriculture Organisation (FAO) and the World Health Organisation (WHO), are being followed for food and feed safety requirements.

A checklist of possible data and information that could be required in the assessment is attached for ease of reference. However, the list does not include the complete information required for all types of safety/risk assessment of GM products. A list of reference is also included to provide more comprehensive description of assessments and to serve as a source of information that could be referred to for each assessment.

The terminology genetically modified organism (GMO) and GM plant is used interchangeably in this document.

# 2. FOOD / FEED SAFETY AND RISK ASSESSMENT

## 2.1 Principles, approaches and concepts

The principles, approaches and concepts for the risk assessment of food and feed derived from GM plants by Codex Alimentarius Commission (CAC, 2009) and the Food and Agriculture Organisation (FAO 1995, 2011) are described here.

***Case by case***

Risk should be assessed on a case-by-case basis. This means that for each case, the risk assessment methodology and required information may vary in nature and level of detail, depending on the GMO concerned, its intended use (e.g. laboratory, field, market) and the likely potential of the receiving environment (e.g. target species).

***Comparative analysis***

Risk analyses of food and feed include safety assessment, which is a comparison between the food derived from GM plants and its closest conventional counterpart with a history of safe use, focusing on determining similarities and differences and/or lack of equivalences between the GM plant and its comparator. If a new or altered hazard, nutritional or other safety concern is identified by the safety assessment, the risk associated with it should be characterised to determine its relevance to human and animal health. Safety is not absolute, but relative, and the comparative analysis is the starting point of the assessment. This approach is considered the most appropriate for safety assessment of food and feed derived from GM plants.

***Iterative***

Risks should be evaluated and reviewed as appropriate in the light of newly available scientific data. Conclusions and assumptions should be examined relative to new information.

***Science based***

Risk should be assessed using information obtained through application of science and scientific methods, i.e. rigorous and systematic, reproducible, with testable risk hypothesis, qualitative and/or quantitative. Methods should be appropriate and data generated should be of high quality to withstand scientific scrutiny and peer review.

## 2.2 Phases and steps in risk assessment

The assessment is grouped into two phases, namely a pre-risk assessment phase, followed by the risk assessment phase. The detailed requirements of each phase are listed in Annexure A and illustrated in Figure 1.

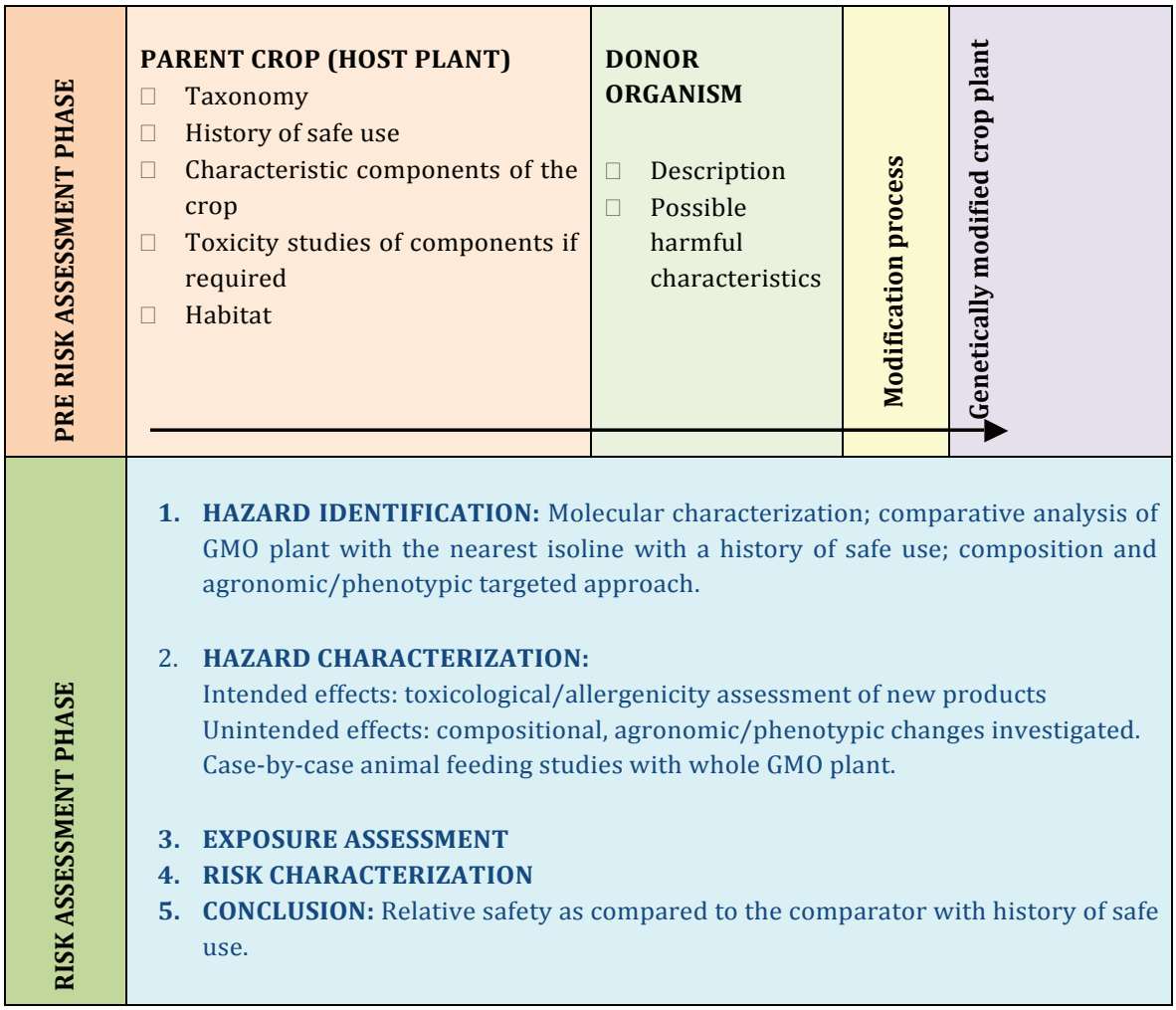


***Figure 1: Risk assessment requirements (CAC, 2009)***

***Pre-risk assessment phase***

The information required during this phase consists of:

- Description of host plant and use as food/feed
- Description of donor organism(s)
- Description of DNA to be introduced and transformation process

### *Risk assessment phase*

Risk assessment is conducted step by step. The four steps are hazard identification, hazard characterisation, exposure assessment and risk characterisation.

### *STEP 1: Hazard identification*

The assessment starts with a comprehensive molecular characterisation (OECD, 2010), and an assessment of the expressed substances. This is followed by a comparative analysis of compositional and agronomic and phenotypic characteristics. The components for comparison are described below.

### *Comparators*

The first choice of comparator should be the conventional counterpart, referring to:

a) A non-GMO isogenic variety, in the case of vegetative propagated crops; and
b) A genotype with a genetic background as close as possible to that of the GM plant, in the case of crops that are propagated sexually.

It may not be possible in all instances, for example in some stacking events. Information should be provided on the breeding scheme in relation to the GM plant, the conventional counterpart, and/or other comparator(s).

### *Plant components*

The components of the crop to be analysed will depend on the plant characteristics, the uses of the plant, and the nature of the genetic modification. The raw unprocessed agricultural commodity is normally analysed as the starting point. The components to be analysed should be in accordance with the Organisation for Economic Cooperation and Development consensus documents (OECD, online). Specific scientific analysis may be included, depending on the intended endpoint effect of the genetic modification. The characteristics of the introduced trait need special consideration, which includes analysis of the level of the newly expressed protein and, where necessary, metabolites of potentially modified metabolic pathways.

Depending on the purpose of the genetic modification, the effect of processing needs to be assessed. However, should there be no indications of changes in the composition of the raw GM products as analysed in the comparative assessment; it is unlikely that processed food would have different qualitative or quantitative characteristics from the comparator processed product. Depending on the nature of the newly expressed protein it may be necessary to assess effects of processing on this protein.

***Livestock feeding trials (wholesomeness studies)***

These trials are included to confirm the nutritional value of the feed derived from the GM plant.

***Agronomic and phenotypic characteristics***

The analysis includes an assessment of agronomic and phenotypic characteristics of the GM crop under different environmental conditions. The protocols for field trials should include the biological endpoints to be considered of the GM plant compared to the nearest isoline and commercial control plants.

***Field trials: experimental design and statistical analysis***

Having the various indicators identified in the planning phase of the analysis, field trials are designed and performed to assess differences and equivalences. Three test materials are used: the GM plant, its comparator, and the non-GMO reference varieties. An experimental design for safety evaluation developed by European Food Safety Authority (EFSA, 2011) is recommended. Field trials are important because of natural variation owing to environmental and genotypic effects.

Environmental variability needs to be controlled to establish the effect of genotypic differences. Therefore, non-GMO reference varieties are included in the experimental design to ensure adequate estimate of the variability required to set the equivalence limits. A minimum number of eight sites (locations) are selected that are representative of the range of likely receiving environments. At least six reference varieties are included in the design.

The trials are conducted in a single year or spread over multiple years. Statistical analysis for the comparative assessment involves two approaches. The first is a test to verify whether there are significant differences between the GM plant and its comparator. The null hypothesis is that there is no difference between the GM plant and its comparator. The second is a test of equivalence to verify whether the GM plant is equivalent or not. The null hypothesis is that the difference between the GM plant and the set of non-GMO reference varieties is equivalent for the specific endpoint considered. The equivalence limits represent appropriately the range of natural variation expected for reference varieties with a history of safe use (EFSA, 2011).

***STEP 2*: *Hazard characterisation***

Intended effects are those changes that conform to the purpose of the genetic modification. Unintended effects could arise from any form of plant breeding. Unintended effects in GM plants may be owing to disruption of genomic sequences through the insertions, actions of transformation-induced genomic deletions and rearrangements, including within the inserted DNA, or pleiotropic effects caused by the

new traits. Predictable or unexpected unintended effects are further investigated, should they occur. These latter effects may be detected through comparative studies. Should differences of safety and nutritional concern be identified, the hazard is characterised. A dose response assessment is then performed to quantify potential toxicological and/or nutritional effects. Appropriate test models and suitable test material are used to obtain data for identifying adverse effects.

## *Studies to characterise intended changes*

***Toxicology***

Toxicological *assessments* are considered for the presence and levels of newly expressed proteins and potential presence of other new constituents, possible changes in the levels of endogenous constituents beyond normal variation, and the impact of other changes in composition owing to the genetic modification (EFSA, 2011).These studies are designed to characterise a hazard and to determine exposure levels that do not result in adverse effects to humans and animals.

Toxicological testing of newly expressed proteins may include molecular and biochemical characterisation; a search for homology to proteins known to cause adverse effects; information on the stability of the protein; and resistance to proteolytic enzymes.

Studies to determine safety in the case of altered levels of food/feed constituents and assessment of whole food/feed containing products of GMOs could also be required. Animal feeding studies, such as 90-day feeding studies with rodents according to an approved protocol, may be required case by case (OECD, online; EFSA, 2013).

New methods, such as profiling and metabolomics, may complement standard methods.

***Allergenicity***

*Immunoglobulin E (IgE)*- mediated food allergy represents the major form of food allergy, which could be severe and life threatening. Proteins are the most important constituent of food responsible for allergies. The most common food allergens should have been identified at an early stage of the research in the development of the GM plant and the non-allergenicity of the source of the transgene is verified. The assessment of the newly expressed proteins includes amino acid sequence homology comparisons with known allergens; specific serum screening where there is indication of sequence homology; pepsin resistance and *in vitro* digestibility testing; and, if necessary, *in vitro* cell-based assays or *in vivo* tests on animal models.

Assessment of the allergenicity of the whole GM plant should be based on the prevalence of allergenicity among the population for the specific crop e.g. soybeans.

***STEP 3*: *Exposure assessment***

An exposure assessment is conducted to estimate quantitatively the likely exposure of humans/animal to the food and feed derived from GM plants. Data from local or regional population dietary intake studies of the conventional crop, if available, are considered. Particular attention is given to GMO-derived food/feed with modified nutritional properties. Post market monitoring is advisable in the latter case.

***STEP 4*: *Risk characterisation***

During this step, uncertainties and variabilities in the assessment should be described. If the previous steps in the risk assessment are shown to be incomplete, more data need to be generated. Alternatively, managerial decisions are made regarding the risk.

## 2.3 Conclusion

Recommendations are made on the safety of the GM product relative to the conventional counterpart.

## REFERENCES

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## World Wide Web references

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# BHUTAN AGRICULTURE AND FOOD REGULATORY AUTHORITY
# ANNEXURE A

## CHECKLIST

## Information for safety assessment of food/feed products derived from GM plants

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The risk and safety assessment is conducted as described in the guideline on risk assessment of food and feed products derived from genetically modified plants. The checklist is based on Codex Alimentarius Commission guideline (CAC, 2009) and serves only as reference to items that could be included in an assessment. The list of items is not exhaustive; nor would all the items be required in all assessments.

**GENERAL INFORMATION**

| Item | Information/remarks |
|---|---|
| Application number | |
| Name of product | |
| Date | |
| Applicant | |
| Address of applicant | |

**PRE-RISK ASSESSMENT PHASE: DESCRIPTION OF THE GM PLANT**

| Item | Information/remarks |
|---|---|
| Crop | |
| Transformation event(s) | |
| Type of modification | |
| Purpose of the modification | |

**PRE-RISK ASSESSMENT PHASE: GENERAL CONSIDERATIONS**

| Description of host plant and use as food/feed | |
|---|---|
| Item | Information/remarks |
| Common name | |
| Scientific name | |
| Taxonomic classification | |
| History of cultivation and development through breeding | |
| Cultivar/breeding line or strain/traits that may adversely affect human or animal health | |
| Genotype/phenotype relevant to food/feed safety | |
| History of use as food/feed | |
| Toxicity/allergenicity potential of plant | |
| Sensitivity of the population | |

**PRE-RISK ASSESSMENT PHASE: GENERAL CONSIDERATIONS**

| Description of donor organism (s) | |
|---|---|
| Item | Information/remarks |
| Common name | |
| Scientific name | |
| Taxonomic classification | |
| History of concerns on food/feed safety | |
| Naturally occurring toxins/ anti-nutrients/allergens/ pathogenicity/relationship to pathogens | |
| Use in food/feed supply if any | |

## PRE-RISK ASSESSMENT PHASE: GENERAL CONSIDERATIONS

| Description of DNA to be introduced and transformation process | |
|---|---|
| Item | Information/remarks |
| Method used for transformation process | |
| DNA used to modify plant (e.g. helper plasmids), source (plant, microbial viral, synthetic) | |
| Expected function of DNA in plant | |
| Intermediate host organisms | |
| Characterisation of genetic components including marker genes/regulatory and other elements affecting the function of the DNA | |
| Size and identity of DNA | |
| Location and orientation of sequence in final vector/construct of the DNA to be introduced | |
| Functional DNA to be introduced | |

## RISK ASSESSMENT PHASE

### STEP 1: HAZARD IDENTIFICATION – MOLECULAR CHARACTERISATION

| DNA insertion into plant genome | |
|---|---|
| Item | Information and substantiation for inclusion/omission of information/remarks |
| Characterisation and description of inserted genetic materials | |
| Number of insertion sites | |

| |
|---|
| Organisation of inserted genetic material in each insertion site:<br><br>☐ Copy number<br>☐ Sequence data of inserted material<br>☐ Sequence data of surrounding region<br>☐ Indication of identity of any substance expressed as a consequence of inserted material, if applicable<br>☐ Analysis of transcripts or expression products to identify new substances |
| Identification of any open reading frames (ORF) within inserted DNA or created by the insertion with contiguous plant genomic DNA, including those that could result in fusion proteins |
| Demonstration of the arrangement of genetic material used for insertion has been conserved / significant rearrangements occurred upon integration |
| Demonstration whether deliberate modifications made to the amino acid sequence of expressed protein resulted in changes in its post-translational modification/affect sites critical for its structure or function |
| Presence of antibiotic marker genes? |

**RISK ASSESSMENT PHASE**

**STEP 1: HAZARD IDENTIFICATION INCLUDING AGRONOMIC/PHENOTYPIC ANALYSIS**

| **Expressed substances** | |
|---|---|
| Item | Information and substantiation for inclusion/omission of Information/remarks |
| Gene products (protein or un-translated RNA) | |
| Function of gene product(s) | |
| Level and site of expression in plant of expressed gene product(s) | |
| Level of metabolites in edible part of the plant and rest of plant parts | |

| | |
|---|---|
| Amount of target gene product(s) if function of expressed sequence(s) / gene (s) is to alter the accumulation of a specific endogenous messenger RNA or protein | |
| Has the intended effect of modification been achieved? | |
| Have all expressed traits been expressed and inherited in a manner that is stable through several generations consistent with laws of inheritance? | |
| Has the newly expressed trait(s) been expressed as expected in the appropriate tissues in a manner consistent with the associated regulatory sequences driving the expression of the corresponding gene? | |
| Is there any evidence to suggest that one gene (or more) in the host plant has been affected by the transformation process? | |
| Confirm the identity and expression pattern of any new fusion proteins | |

**RISK ASSESSMENT PHASE**

**STEP 1: HAZARD IDENTIFICATION – COMPOSITIONAL ANALYSIS**

| Item | Information/remarks |
|---|---|
| Selection of key components: nutrients, antinutrients, metabolites, toxicants, allergens (OECD) | |
| Comparator – conventional counterpart | |
| Statistical design of trial | |
| Location and number of trial sites | |
| Change in compositional profile | |
| Significant differences in composition (provide details) | |

**RISK ASSESSMENT PHASE**

**STEP 1: HAZARD IDENTIFICATION: COMPLEMENTARY STUDY(S) – NUTRITION STUDIES**

| **Livestock feeding trials (wholesomeness studies)** | |
|---|---|
| Items | Substantiation for inclusion/omission of Information/remarks |
| Give good reason for considering a livestock feeding trial (e.g. chicken, goat) based on findings of the comparative analysis | |
| What is the purpose of the feeding trial? | |
| Does the feeding trial add value to the comparative analysis findings? | |
| How sensitive is the trial for the purpose in mind? | |
| Are the parameters acceptable for the purpose of the trial? | |
| Does the trial design and analysis of results conform to acceptable statistical analysis? | |
| How did you interpret the results of the trial? | |
| Did the trial demonstrate the expected nutritional/benefit of nutritionally enhanced/improved plants through modern biotechnology? | |
| Has nutrient bioavailability been demonstrated where applicable? | |

**RISK ASSESSMENT PHASE**

**STEP 2: HAZARD CHARACTERISATION – INTENDED CHANGES**

| **TOXICITY OF EXPRESSED SUBSTANCE (non-nucleic acid substances)** | |
|---|---|
| Item | Information and substantiation for inclusion/omission of Information/remarks |
| Description of protein | |
| Toxicity studies with expressed protein(s)<br><br>□ Sequence homology with known toxicants<br>□ Mammalian toxicity study(s) with the protein<br>□ Stability of protein to heat / processing<br>□ Degradation in gastric and intestinal fluid | |
| Evaluation of toxicity – other new constituents/changes in endogenous toxicants | |

**RISK ASSESSMENT PHASE**

**STEP 2: HAZARD CHARACTERISATION – INTENDED CHANGES**

| **ALLERGENICITY STUDIES** | |
|---|---|
| Item/question | Information and substantiation for inclusion/omission of Information/remarks |
| History of safe use:<br><br>Is the donor organism (organism from which the desired gene is obtained) associated with allergenicity or possible allergic responses in humans? (Allergenic sources of genes are defined as those organisms for which reasonable evidence of IgE mediated oral, respiratory or contact allergy is available) | |
| Does the novel protein contain any sequence homology to known allergens? (From comparisons of allergens contained in FASTA or BLASTP algorithms for example) | |
| Mode of action and specificity<br><br>Is there any evidence through the testing of immunological *in vitro* assays (sera screening or testing) that there is specific | |

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|---|
| binding of IgE antibodies to the novel protein<br><br>□ Is sufficient sera utilised in the assay to provide valid and reliable results?<br>□ Do you consider, in your expert opinion, the sera used in the assay is of good enough quality to be utilised in the study? |
| *In vitro* evaluation of stability and digestibility<br><br>What are the conclusions from the digestibility and liability assays? |
| Has the expression level of the protein and dietary intake been determined? |
| If the donor organism has a possibility of allergenicity, but *in vitro* assays (immunological assays) provide negative results, is there evidence of additional screening such as skin prick tests or clinical trial data? |
| Is the allergy clinically validated? |
| Is there a possibility that IgE cross-reactivity could occur between the novel protein and other known allergens (is there a sequence homology of > 35 % over an 80 amino acid segment of the novel protein compared to known allergens? |
| Based on the weight of evidence, is there a need for further assays? |

**RISK ASSESSMENT PHASE**

**STEP 2: HAZARD CHARACTERISATION – INTENDED CHANGES**

| **NUTRITIONALLY ENHANCED/IMPROVED FOOD THROUGH MODERN BIOTECHNOLOGY** | |
|---|---|
| Question | Information and substantiation for inclusion/omission of Information/remarks |
| What comparator is used as the conventional counterpart? Are you satisfied with this comparator or would you have required another? | |
| What is the upper level of intake of the nutrient that has been enhanced in the GM product? Is this upper level of intake an internationally or nationally relevant one? | |

| | |
|---|---|
| If consumption data are available, can you provide a rough estimate of the nutrient uptake if this food had to replace the current conventional food? | |
| Is there evidence that exposure to the nutrient at levels near the upper intake level causes adverse reactions or symptoms in humans? | |
| What are these symptoms of acute exposure as well as chronic exposure? | |
| Can the nutrient of interest in the GM food be found in differing molecular forms? | |
| Are all these differing molecular forms of the nutrient safe to consume, i.e. does change in molecular form render the nutrient toxic or a potential allergen? | |
| Do all these molecular forms of the nutrient provide the same benefits? For example, does a molecular change in a complex carbohydrate render it less likely to offer the same energy output? | |
| Is there any evidence in the application that the nutrient of interest is being produced in more than one molecular form? | |
| What is the existing bioavailability of the nutrient in question in conventional food? | |
| Is there any evidence that the bioavailability of the nutrient in question has changed due to the genetic modification? | |
| Evaluate the methods used for testing for bioavailability | |

**RISK ASSESSMENT PHASE**

**STEP 2: HAZARD CHARACTERISATION – UNINTENDED CHANGES**

| **ENDOGENOUS ALLERGENS (Case-by-case)** | |
|---|---|
| Question | Remarks |
| Give reason for inclusion of studies on possible unintended changes in levels of endogenous allergens for this crop | |
| What are the common/major allergens present in the recipient organism before (peer reviewed studies)? | |
| Evidence that the genetic modification described in the application did not result in over-expression of the possible | |

| |
|---|
| allergens indicated in the question above. |
| Do you have any knowledge about the over-expression of the known allergens as a result of genetic-modification? |
| What is the conclusion? |

**RISK ASSESSMENT PHASE**

**STEP 2: HAZARD CHARACTERISATION – UNINTENDED CHANGES – TOXICOLOGICAL STUDIES**

| **90-DAY RODENT FEEDING TRIALS (TOXICOLOGY STUDIES)** | |
|---|---|
| Questions/ statements | Information and substantiation for inclusion/omission of information/remarks |
| Motivation for inclusion/exclusion of the study | |
| Description of the study | |

**RISK ASSESSMENT PHASE**

**STEP 2: HAZARD CHARACTERISATION – EFFECTS OF PROCESSING**

| **EFFECTS OF PROCESSING** | |
|---|---|
| Questions/statements | Information/remarks |
| Description of the effect of processing | |

**STEP 3 AND STEP 4: EXPOSURE ASSESSMENT / RISK CHARACTERISATION**

| Item / question | Information and substantiation for inclusion/omission of information/remarks |
|---|---|
| Has an exposure assessment and a risk characterization been conducted? | |
| What is the conclusion? | |

## RISK/SAFETY ASSESSMENT TRANSPARENCY ISSUES

| Item/question | Explanation |
|---|---|
| Explain variability and uncertainties in the assessment (data gaps) | |
| Explain assumptions made | |
| Explain any judgment made in the assessment | |

## QUALITY ISSUES

| Item/question | Information and substantiation for inclusion/omission of information/remarks |
|---|---|
| Are the detection methods validated? | |
| Are statements of Good Laboratory Practices (GLP)/Good Manufacturing Practices (GMP) and quality assurance included and signed? | |
| Are statements confirmed by the country accreditation authority? | |

## REPORT OF RISK ASSESSOR/REVIEWER

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   Dr. Wilna Jansen van Rijssen lectured in pharmacology and pharmacognosy before joining the national Department of Health, Pharmaceutical Services, and moved on to food control where she was responsible for the chemical section of food safety that included GMOs. Her involvement in GMO included food safety and risk assessments, development of legislation and guidelines, participation in several Codex Alimentarius committees, the OECD Task Force for the Safety of Novel Food and Feeds, the OECD working group on Harmonization in Legislative Oversight in Biotechnology; and the SADC Advisory Committee on Biotechnology and Biosafety. Her experience in work with GMOs stretches over more than 20 years. After retirement from government, she was appointed member of the GMO advisory committee of the government GMO Executive Council and also on the veterinary clinical committee with responsibility for toxicological assessment of new pesticide molecules. She currently serves on the board of the SA Agricultural Research Council. Her PhD thesis (title: Analysis of the credibility of South African risk governance of genetically modified organisms and pesticides) is based on her experience in governance and the risk assessment of GMOs and toxicological assessment of pesticides. She is registered with the SA Council for Natural Scientific Professions. She received training from the FAO in training the trainers and has been a resource person for training in Africa. She is author and co-author of several scientific papers and popular scientific publications.

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