APPENDIX I
REGULATION OF THE ENVIRONMENT MINISTER
REPUBLIC OF INDONESIA
NUMBER 25 YEAR 2012
CONCERNING
DOCUMENT PREPARATION GUIDELINES FOR ENVIRONMENTAL
RISK ANALYSIS OF GENETICALLY ENGINEERED PRODUCTS

DOCUMENT PREPARATION GUIDELINES FOR ENVIRONMENTAL RISK ANALYSIS OF GENETICALLY ENGINEERED CROPS

I. INTRODUCTION

A. Background

Genetically engineered crops technology provide opportunities to improve the quality and productivity of crops with the intention to provide benefits and quality of life improvement for people. The result of this technology hereinafter is referred to as Genetically Engineered Products (PRG). PRG crops in this regard include PRG food crops, PRG horticulture crops, PRG plantation crops, PRG feed crops, and PRG forestry crops. PRG crops can provide benefits that are effective and in accordance with the desired goals. On the other hand, there are concerns that the products can pose risks to the environment, biodiversity, human and animal health. Therefore, its utilization must be conducted through precautionary approach.

Based on Government Regulation Number 21 Year 2005, environmental safety assessment on PRG crops must be performed prior to its release and distribution. Therefore, PRG crops that are going to be released in Indonesia, both of domestic and foreign origin must first go through Environmental Risk Analysis (ARL) to meet the enviromental safety requirements. ARL include environmental riks assessment, risk management and communication. This is in accordance to Article 47 of Law Number 32 year 2009 which mandate that every application and/or activity that has the potential to cause significant impact on the environment, posing threat to the ecosystem and life, and/or human health and safety is required to conduct environmental risk analysis.

The ARL procedure adheres to the priciple of complete and comprehensive with regard to feasibility. All biotic as well as abiotic factors must be considered to be used as indicators. However, in practice, selection is done to represent the group, e.g. based on its function in the ecosystem.

B. Intents and Purposes

The enactment of this Guidelines is intended as a reference for the applicant in preparing Environmental Risk Analysis documetn for PRG crops as one of the requirement in obtaining environmental safety permit.

C. Scope

The scope of this Guidelines include:

1. Instructions on how to fill the Environmental Risk Analysis documents for PRG crops.
2. The required information including PRG crops, PRG crops genetic traits, potential impact on the environment, risk management and monitoring as well as risk communication of PRG crops.
3. The forms which must be filled by the applicant.

II. FILLING INSTRUCTIONS FOR ARL DOCUMENTS

A. Document and Data Source

The applicant fill out the form using the primary and secondary data specifically:

1. the primary data originating from test result in Indonesia through laboratory, FUT and/or LUT. The test is conducted by trusted institutions following applicable rules and procedures;
2. the secondary data can be from citing results of studies, either conducted in Indonesia or in other countries published in nationally accredited journals, indexed international journals or other media with peer review.

The data and documents are then submitted by the applicant concurrently with the application for environmental safety assessment. The Biosecurity Technical Team (TTKH) will decide whether the data and documents submitted by the applicant are relevant and valid.

B. Types of Data

The data needed in the environmental risk analysis documents is described further in part III (the required infromation).

C. How to Fill the Form

Questions on the form are general in nature, that is it does not differentiate the commodity being tested. Therefore, questions that are not relevant to the engineered traits/events, do not have to be answered.

III. REQUIRED INFORMATION

The data collected include information on PRG crops, PRG crops genetic traits, the potential impact on the environment, risk management and monitoring as well as environmental risk communication of PRG crops.

A. PRG Crops Information

1. General Description

   General description of the PRG crops include, among others:

   a. PRG event name.
   b. The pupose of the genetic modification.
   c. The transformation process.
   d. The inserted gene source organism.
   e. An explanation of the use of the PRG crops abroad.
   f. PRG crops utilization risks.
   g. The application purpose of PRG crops utilization (for consumption as food and/or feed, for export as seed, for food and/or feed).
   h. Advantage of PRG crops compared to the parent plant.
   i. The corresponding agronomical traits.

2. The Description and Utilization of Parent Plant

   The required data and information of the parent plant must at least include the following:

   a. Description of the general name, scintific name and taxonomy status of the parent plant.
   b. Data of the parent plant include, among others:
      1) the origin (where the plant was first taken);
      2) distribution location in Indonesia;
      3) whether the parent plant already present or in the vicinity of LUT location; and
      4) presence of its wild relatives in Indonesia.
   c. The parent plant cultivation history which includes, among others:
      1) the history of when it was first cultivated;
      2) cultivation method;
      3) its utility.
   d. Distribution area of the parent plant.

e. Comparison between biological traits of parent plants and PRG plants, include:
    1) morphology (roots, stems, leaves and seeds); and
    2) propagation method (generative and vegetative).
f. Security history of plant utilization as food or feed.

3. The Description and Distribution of Parent Plant Species

   The distribution data and information of the parent plant species, includes:

   a. the parent plant species center of origin and area condition, includes: country of origin, province/state, climate type, soil type, annual rainfall, temperature, altitude;
   b. The parent plant species distribution in Indonesia;
   c. The existence of the parent plant species in the vicinity of LUT location;
   d. The existence of its wild relatives in Indonesia.

4. Description of the donor organism

   The data and information of the donor organism, includes:

   a. The donor organism gene taxonomy status, including scientific name starting from family, genus, species, and strain.
   b. Phylogenetic relationship between the donor organism with other similar organisms.
   c. The origin of the donor organism, including:
      1) location name;
      2) environment of the original habitat; and
      3) geographical distribution.
   d. The possibility for toxin, anti-nutritional substances, and natural allergen to occur. If the donor is derived from microorganism (including its relatives), provide the pathogenic information and its relation to the pathogen.
   e. Security history and safe utilization of the donor organism.

B. PRG Crops Genetic Traits Information

   Genetic traits information that is introduced to the PRG Crops must cover explanation regarding gene or other genetic materials which are utilized and integrated into the PRG crop genome, transformation method, gene or other

genetic materials function and stability, whether the stability of traits inheritance or expression. The PRG crops genetic traits information include:

1. Description of the Genetic Modification, which consists of:
    a. The transformation method used, explain the specific methods utilized for the transformation, for example directly by using particle bombardment or indirectly by using intermediary/mediate vectors of agrobacterium or other intermediaries.
    b. Gene of intereset, which include:
        a. coding sequence;
        b. promoter;
        c. enhancer;
        d. terminator;
        e. origin of replication; and
        f. genetic map.
    c. The following inserted DNA molecular characteristics:
        1) nucleotide origin (part of vector, function, DNA of the original organism);
        2) gene regulation including gene name, gene copy number, promoter and location/time of expression;
        3) information on the possibility of vector can be transferred to another host;
        4) information on the presence of recombinant vector still contained in the final product of PRG crops.
2. Genetic Modification Characteristics

    Molecular characterization and genetic biochemical modification must be comprehensively conducted to obtain clear understanding of the impact caused by the modification on PRG crops environmental safety.
    a. Information about the DNA that has been inserted into the PRG crops genome encompass the characteristics and descriptions of the inserted genetic material, which include:
        1) gene product (protein or other information such as transcript);
        2) the character of transgene expression (expression pattern);
        3) product function of genetic material;
        4) description of the new phenotypic trait;

5) the possibility of pleitropic effect (for example, the resulting protein affects the functions of other proteins in PRG crops).

b. Information on genetic stability and its expression are data and information regarding its stability, susceptibility, and reliability.

Data on the stability of the inserted DNA, is needed to ensure its segregation pattern.

Susceptibility of the PRG crops traits must be tested with the purpose of monitoring the loss of such traits because of certain circumstances.

Reliability of PRG crops encompass superior traits not found on its parent plants, such as, insect resistant trait resulting in reduction of yield loss. The information shall include:

1) data regarding genetic stability indicating that all inherited traits are stable for several generatitons and consistent with the Laws of Inheritance;
2) data regarding its expression (protein or RNA) indicating that all inherited traits have been expressed according to expectation and inherited until the traits are stable;
3) data indicating that the expression is according to expectation if the controlled expression is good for specific time period, tissue, and others.

C. Environmental Safety Information

Environmental safety information for PRG crops include:

1. The Potential Impact on Non-Target Organisms and Biodiversity.

The required information must considered the potential and exposure of PRG and its gene product on non-target organism, and the effect on organism if exposed to it, shall include:

a. The possibility of PRG crops or its gene products causing disease or health problems on humans, plants, animals or other beneficial organisms such as natural predators and soil microorganisms (exposure and hazard).
b. The possibility of actual biological change on key species of insect and soil organism, such as fecundity, hatchibility of egg, life cycle, and other parameters related to insect growth and development.

c. The possibility of actual change that can be hazardous to soil environment.
d. The posibility for the inserted gene to increase the plant toxicity toward humans, animals, or other benficial organisms.
e. Diversity of keystone species (for example: natural predators, pollinators, organisms with economic value) in the PRG planting area inside the LUT and in the non-PRG planting area outside the LUT.

2. The Potential of Becoming a Weed

   The information required is the potential for PRG crops to become a weed. The parameter to quantify the potetial magnitude of becoming a weed is based on the ability of PRG crops to colonize and dominate other plants surrounding it. The data required include:

   a. information on whether there is a member of the genus parent plant that is a weed;
   b. the possibility for the seed to easily fallout;
   c. the possiblity for the seed to naturally dispersed;
   d. the possiblity for the seed to be dormant;
   e. the competitiveness of PRG crops growing outside its habitat.

3. The Potential for Gene Flow

   PRG crops have the ability to polinate other crops/plants that are sexually compatible. Preparation of the crops/plants list with the potetial to be pollinated is based on biological traits similarity between the PRG crops and such crops/plants.

   The gene flows that occur must be considered whether it potentially lead to weed, invasion, and impact on other organism compared with non-PRG crops.

   The informations that need to be reported relating with the potential for gene flow are:

   a. The distribution range of pollen from the plant source and distribution assisted by biotic and abiotic factors.
   b. Data viability as well as dissemination of PRG pollen on surrounding plants.
   c. Potential pollinators.

d. Corss pollination between PRG crops and its wild relatives and the negative effect that occurs from its trait displacement.

D. PRG Environmental Risk Communication

Risk communicatiton is a process of filtering information and opinion related to hazards and risks from interested parties during the risk analysis process, as well as communicating the results of the risk assessment and risk management measures proposed by the interested parties. The implementation of risk communication cosists of 3 stages, specifically:

1. Socialization prior to LUT (Limited Test Field)

   Socialization is performed by the proponent to include the agency implementing the LUT. The information required include: place of implementatiton, date of implementation, official report, participant, as well as description of the implementation and socialization result. In relation to communicating to the public of PRG crops risk, socialization prior to LUT can be conducted on employee or agency worker where LUT is conducted, regency/city government agency (Agriculture Service, Forest Service, and Environmental Management Agency), experts from local university and research institution, and other related parties.

2. Socialization of the environmental safety assessment to the public is conducted through Biosafety Clearing House. Proponent is required to provide data and additional informatioin if needed as a result of public notification through the Biosafety Clearing House.

3. Socialization of PRG crops to the public after the release of crops.

   Proponent convey the socialization plan of the PRG crop to the public after the release of the crop (after being declared safe). Socialization can be conducted through brochure/booklet/information handout, website, email, newspaper, magazine/journal, periodic meeting, or other media.

E. Risk Management Plan and Monitoring of PRG crop

Management and monitoring of risk that can occur from PRG crop, include:

1. Monitoring plan and evaluation on the risks that can occur.
2. Risk management plan for biodiversity and the occurance of targeted organism that is resistant towards PRG crop.
3. Measures to be taken when an unforeseen risk occurs after planting the PRG crop.

IV. GLOSSARY

A. Environmental risk analysis is a procedure used to assess the release and distribution of genetically engineered product, which is conducted through measurement, either quantitatively or qualitatively, to estimate the level of hazard that may occur and the probability of the hazard occuring in the environment from utilization of the crop.

B. Biosafety Clearing House for Genetically Engineered Product, hereinafter referred to as BKKH, is part of KKH that fuctions as means of communication between KKH with stakeholders.

C. Modern biotechnology is the technical application of genetic engineering including in-vitro nucleic acid technique and cell fusion from two or more types of organism outside its taxonomic families.

D. Limited Testing Facility hereinafter referred to as FUT is a facility in the form of laboratory and green house meeting the requirement for PRG crop study such as containment, so that plant and gene material does not exit the FUT location.

E. PRG biosecurity is environmental security, PRG food and/or feed security.

F. Environmental security is the condition and effort required to prevent the possibility of risk that is detrimental to biodiversity as a result of PRG utilization.

G. Risk communication is an interactive process from the exchange of information and opinion among individuals, groups, and institutions regarding the risk.

H. Limited Test Field is an area utilized for trial study of plants that required containment such as reproductibe isolation and restrictions of plant and novel gene material in order to remain within the study site.

I. Receiving environment is the environmental conditions for implementing LUT of PRG crops.

J. Precautionary approach is the principle used to assess biosecurity in order to realize environmental safety, food and/or feed security based on sound scientific methods as well as taking into consideration religious rules, ethics, social culture, and aesthetic.

K. Risk management encompass risk evaluation or selection that required management, identification of risk management options, selecting measures for management, and implementation of the chosen measures.

L. Environmental safety study is the overall process of document examination and PRG testing as well as related socioeconomic factors.

M. Risk assessment of PRG is the assessment of possible occurrence of adverse effects on the environment, human and animal health arising from the development and utilization of PRG based on sound scientific methods and specific statistics.

N. Environmental security testing is the evaluation and technical studies of PRG including engineering techniques, efficacy and biosecurity requirements in the laboratory, limited test facility (LUT) and/or limited test field (LUT).

O. Genetically Engineered Product or modified organism hereinafter referred to as PRG is a live organism, parts and/or its processed product with new genetic makeup from implementation of modern biotechnology.

P. Keystone species is a certain species or group of species with ecological guild, that has large effect on the survival of a large number of other species in the community.

Q. Parent plant species is a plant variety with the same species utilized in genetic engineering to assemble the PRG crop.

R. PRG crop is a crop resulting from implementation of genetic engineering and its derivative from cross-breeding, including seed, cutting and other planting materials.

S. Parent plant is a plant variety utilized in genetic engineering to assemble PRG crop.

T. Genetic engineering technique is the DNA recombinant technique utilized to intentionally bring about change in the genome of living things by adding, subtracting and/or restructuring the original genome makeup.

DOCUMENT FORMAT FOR ENVIRONMENTAL RISK ANALYSIS OF PRG CROP

I. TITLE PAGE

ENVIRONMENTAL RISK ANALYSIS
DOCUMENT
[Product Name]

[Name of Applicant]

Year of Preparation

II. INQUIRY FORM

A. PRG Crop Information

1. General Description of PRG Crop

a. Name and information of PRG crop

1) Specify the species/variety name and event of the PRG crop

2) PRG crop information

Explaint its physical traits

Explain its stability

b. Explain the purpose of the genetic modification

c. Explain the transformation process of the PRG crop

d. Explain the source organism of the inserted gene

e. Is the utilization of the same or similar PRG crop had been done before in Indonesia?

☐ Yes	☐ No

Information due to prior utilization of PRG crop in Indonesia	
Beneficial	Adverse

f. Is the utilization of the same or similar PRG crop as plant material had been done before in other countries?

☐ Yes	☐ No

g. Is there a rejection by other countries on the request for utilizing the PRG crop in question?

☐ Yes, there is	☐ No
Explain the basis for rejection	

h. How is the risk of PRG crop utilization in Indonesia compared to those proposed in other countries, if any?

☐ Greater	☐ Same
Explain the factors that cause the greater/smaller risk	

i. Is the PRG crop imported?

☐ Yes	☐ No
Explaing the licensing documentation and assessment in the country of origin	

j. What is the purpose of the PRG crop?

- ☐ Food consumption
- ☐ Feed consumption
- ☐ To be planted
- ☐ Exported as seed, food and/or feed

k. What are the advantages of the PRG crop over conventional crop?

l. Explain the fungibility of the agronomic traits between the PRG crop with conventional comparator of the species concerned?

2. Description and Utilization of Parent Plant
   a. State the common name, scientific name, and taxonomic status of the parent plant
      1) Common name
         a) Bahasa Indonesia
         b) English
      2) Scientific Name
      3) Taxonomic Status
         a) Family
         b) Genus
         c) Species

d) Variety

b. Parent Plant Data

1) Specify the origin where the PRG parent plant was taken

2) Describe the distribution of the PRG parent plant in Indonesia

3) Is there PRG parent plant existing in the vicinity of LUT site

☐ Yes, there is ☐ No

If there is, explain the handling method

4) Is there any wild relative existing in Indonesia?

☐ Yes, there is ☐ No

If there is, explain the handling method

c. Describe the PRG crop cultivation history

d. Describe the distribution area of the parent plant

Receiving Area	Climate Type	Soil Type		Annual Rainfall (mm)		Temperature (°C)		Altitude (dpl)
Country	Province/ State			Max	Min	Max	Min	

e. Describe the comparison of biological traits of the PRG and Non-PRG crop

1) Crop Morphology

Parts of the Plant	Form/Type		Color		External Structure	
	Non PRG	PRG	Non PRG	PRG	Non PRG	PRG
Root						

Stem						
Leaf						
Flower						
Seed						

2) Generative propagation

Components	PRG	Non PRG
1. Pollination system		
2. Biotic factors assisting pollination		
3. Abiotic factors assisting pollination		

3) Vegetative propagation

Components	PRG	Non PRG
Stem Cuttings		
Leaf Cuttings		
Grafting		
Oculation		
Root Tuber		
Stem Tuber		
Connecting		

f. Describe the secure utilization history as food or feed

3. Description and Distribution of Parent Plant Species

a. State the plant species center of origin

Country of Origin	Climate Type	Soil Type	Annual Rainfall (mm)		Temperature (°C)		Altitude (dpl)
			Max	Min	Max	Min	

b. Explain the parent plant species distribution in Indonesia

c. Is there parent plant species existing in the vicinity of LUT site?

☐ Yes, there is	☐ No
If there is, explain the handling method	

d. Is there any wild relative existing in Indonesia?

☐ Yes, there is	☐ No
If there is, explain the handling method	

4. Description of the Donor Organism
   a. State the common name, scientific name, and taxonomic status of the PRG crop
      1) Common Name

a) Bahasa Indonesia	
b) English	
c) Scientific Name	

      2) Taxonomic Status:

a) Family	
b) Genus	
c) Species	
d) Variety	

   b. Explain the phylogenetic relationshhip between the donor organism with other similar organism

c. Explain the origin of the donor organism

1) Location Name

2) Environment of natural habitat

3) Geographical distribution

d. Explain the possiblility of toxins, anti-nutritional substances, and natural allergens

1) Toxin

☐ Yes, there is	☐ No
Explain	

2) Anti-nutritional Substance

☐ Yes, there is	☐ No
Explain	

3) Natural Allergen

☐ Yes, there is	☐ No
Explain	

4) If the donor is derived from microorganism (including its relatives), provide the pathogenicity information and its relation with the pathogen

e. Describe the security history and safe use of the donor organisme

B. Genetic Traits Information

1. Description of the Genetic Modification

a. Transformation Method

Explain the transformation method used

b. Gene of Interest

1) Coding sequence

State the coding sequence

2) Promoter

Describe the promoter used

3) Enhancer

Describe the enhancer used

4) Terminator

Describe the terminator used

5) State the origin of replication (ORI)

6) Attached the genetic map

c. The inserted DNA molecular characteristics

1) Origin of nucleotide

Vector	Function	Organism of the original DNA

2) Gene regulation

Gene name	Gene copy number	Promoter	Location/Time of expression

3) Is there any information that the vector can be transferred to other host?

☐ Yes	☐ No
If yes, give the distribution data of the vector-host	

4) Is there a recombinant vector in the final PRG crop product?

☐ Yes	☐ No
If yes, explain the potential effects on the environment and PRG product	

2. Genetic Modification Characteristics

Information regarding the conducted genetic modification include the characteristics and descriptions of the inserted genetic material

a. Information regarding the inserted genetic material

1) Character expression and regulation of the inserted gene

Name of the genetic material	Expression (protein, RNA, etc.)	Function	Characteristic expression (specific location, time, etc.)

2) Explain and provide data regarding the new phenotype as a result of genetic modification compared with its parent.

b. Genetic stability information

1) Explain the marker that canbe used to identify PRG crop in the laboratory and in the field.

2) Is the PRG crop have a chance to become unstable genotypically? Provide data on its stability (DNA and expression)

☐ Yes	☐ No
Explain	

3) Is there any intrinsic genetic trait in the PRG crop controlling its survival and distribution in the wild?

☐ Yes, there is	☐ No
If so, please describe the intrinsic genetic trait and the extent of its stability!	

4) Is the genetic modification can limit or eliminate the ability to proliferate or transfer its gene to other PRG crop?

5) Additional information, if any

Explain

C. Environmental Security

1. Potential Impact on Non-Target Organisms and Biodiversity

a. Is the genetic material derived from organisms that can cause disease or harm the health of human, plant, animal or beneficial organism such as natural enemy (parasite or predator) and soil microorganism (solvent P and fastening N2)?

☐ Yes	☐ No
If yes, explain the possible consequences	

b. Are there any chronic effects on keystone species in insects and soil organisms

☐ Fecundity ☐ Hatchibility of egg ☐ Life cycle ☐ Other parameter, specify ...
Explain

c. Can the new trait change the ability of the crop to increase or decrease the soil containing compounds (e.g. nitrogen, toxic compounds)?

☐ Yes	☐ No
If yes, explain the changes	

d. Is there a possibility that the inserted gene can increase the plant toxicity on humans, animals, or non-target organisms?

☐ Yes, there is	☐ No
If so, please provide the data	

e. The effect on keystone species
Convey the observation data during LUT implementation

No	Keystone Species	Number of individuals by location/plot		
		PRG inside of LUT	Non PRG inside of LUT	Non PRG outside of LUT
1				
2				
3				

2. The potential to be a weed
a. Are there any members of the parent plant genus that have not been modified known as weed?

☐ Yes, there is	☐ No
If so, please specify the type and location of its distribution	

b. If the PRG crop is allowed to form seed, is there any possibility the ripe seeds fall out easily?

☐ Yes, there is	☐ No
If so, please describe the possibility	

c. Can the seeds dispersed naturally?

☐ Yes	☐ No
Explain	

d. Can the seeds become dormant?

☐ Yes	☐ No
If yes, explain the dormant period!	

e. Does the PRG crop has the ability to grow outside of its habitat?

☐ Yes	☐ No
Explain	

3. The potential for gene flow
   a. Dissemination of plant pollen (by insect vectors or by other means)

Pollination system	Biotic factors (e.g. pollinator)	Abiotic factors (e.g. wind)

b. Potential for gene flow from PRG crops

Crop/plant relaltive	Distance from PRG crop (m)			
	1-5	6-10	11-20	> 20

c. Give the viability data of the plant pollen in question

d. Specify the potential pollinator organisms and their distribution in Indonesia

e. Is there any literature regarding a cross between similar PRG crop with its wild relative known as weed?

☐ Yes	☐ No
Specify the literatures	
1.	
2.	
3.	

f. Provide quantitative data of successful crosses between the crop with any of its wild relatives, if any!

g. What negative effects arising from the transfer of such traits?

D. Environmental Risk Communication

1. Socialization Prior to LUT (Conducted by the applicant together with LUT implementing agencies):
   Describe the socialization of LUT for PRG crop that have been conducted to the public prior to the implementatiton of LUT (to be filled by applicant that have implement LUT)

Description of the socialization process	
Location of socialization	
Date of socialization	
The number of participants (attached the attendance list)	
Description/information (attached the official report)	

2. Socialization Post-Release (Conducted by the Applicant)
   Explain how the PRG socialization plan to the general public will be implemented. Delivery of risk communication will be conducted through: (Tick √ on the appropriate statement in the box)

☐ Brochure/booklet/information handout

☐ Website ☐ E-mail

☐ Newspaper ☐ Magazine/Journal

☐ Periodic meeting ☐ Other

Explain the details of each mode of risk communication based on your answers above!	
Brochure/booklet/information handout	
Website	
E-mail	
Newspaper	
Magazine/Journal	
Periodic meeting	
Other	

E. Management and Monitoring Plan of PRG Crop

1. Explain the management plan to be carried out after the release of the PRG crop

2. Explain the monitoring plan and environmental security evaluation after the release of the PRG crop

3. Explain the measures to be taken against the negative impact on the environment

THE ENVIRONMENT MINISTER
REPUBLIC OF INDONESIA,

BALTHASAR KAMBUAYA

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PREPARATION GUIDELINES FOR ENVIRONMENTAL RISK ANALYSIS OF GENETICALLY ENGINEERED MICROORGANISMS FOR VACCINE

I. INTRODUCTION

A. Background

Through genetic engineering, genetically modified products (PRG) for vaccines with novel properties such as decreased malignancy and increased immunity can be produced. Vaccine derived from PRG is commonly known as PRG vaccine. PRG vaccine can be in the form of live microorganisms, dead microorganisms, and PRG microorganism derived materials. PRG vaccines have been produced and marketed in various countries. In order to provide effective benefits and in accordance with the desired result, theefore the utilization of PRG vaccines must comply with the priciples and rules that apply.

Utilization of PRG microorganisms for animal and fish vaccines raise a concern that the animal and fish vaccines are likely to pose enviromental pollution risk that could potentially interfere with the health of animal, fish and human. The possibility of those risks occuring need to be minimized through precautionary approach.

Based on Article 14 of Government Regulation Number 21 Year 2005 determined that the environmental safety assessment of PRG microorganism must be conducted prior to distribution of such microorganism. Therefore, PRG microorganisms of domestic origin or abroad for distribution in Indonesia, must be accompanied by basic information to indicate the product meets the environmental risk analysis requirements. The PRG microorganism also have to consider social, economic, religious, ethical, and aesthetic rules. Consideration of religious rules and ethics, among others, are that genes transformed into the PRG

microorganism must be derived from organisms that do not conflict with rules of a particular religion and ethics.

As mandated in Article 47 of Law Number 32 Year 2009 concerning Environment Protection and Management, therefore environmental risk analysis of PRG microorganism utilization must be conducted. Environmental risk analysis encompass risk analysis, management, and communication.

Environmental Risk Analysis (ARL) of PRG microorganism is a measurment activity to estimate the level of quantitative and qualitative hazards that may be posed and opportunity for the emergence of environmental hazards caused by the use of such microorganisms. Environmental risk analysis of PRG microorganism is based on the character fo the recipient organism, the intoduced trait, its use, the recepient animal, and the interaction of these components. Environmental risk analysis results are used as the basis for deciding whether the relevant PRG microorganism is acceptable or not.

B. Intent and Purpose

The intent of the enactment of the Guidelines is as a reference for applicant in preparing Environmental Risk Analysis document for PRG Microorganism for vaccine as one of the requirements to obtain environmetal safety permit.

C. Scope

The scope of this Guidelines include:

1. Instructions on how to fill the documents for the Environmental Risk Analysis of PRG Microorganism for vaccine.
2. The required information including vaccine information, PRG microorganism information, potential impact on the environment, risk management and monitoring, as well as environmental risk communication of PRG microorganism.
3. Forms that must be filled by the proponent.

II. INSTRUCTIONS ON HOW TO FILL THE ENVIRONMENTAL RISK ANALYSIS DOCUMENTS

A. Data Source

The proponent fills the document with primary and secondary data. Primary data is derived from testing results in Indonesia through laboratory and/or FUT by following the applicable procedures and rules.

Secondary data can be in the form of citation of studies, both conducted in Indonesia or other countries and published in accredited national journals, indexed international journals or other media with peer review. The data and documents are submitted by the proponent concurrently with application for environmental security study. Biosecurity Technical Team will decide whether the submitted data and documents by the applicant are relevant and valid for conditions in Indonesia.

B. Types of Data

All of the collected data must encompass information of PRG microorganism, PRG microorganism traits, environmental security, risk management and monitoring as well as risk communication of PRG microorganism.

III. REQUIRED INFORMATION

The collected data must include vaccine information, PRG microorganism information, potential impact on the environment, risk management and monitoring, as well as environmental risk communication.

A. Vaccine Information

Vaccine information include, among others:

1. Vaccine name, the disease controlled by the vaccine, animal type and age range targeted by the vaccine.
2. Reason for utilizing PRG microorganiism as vaccine.
3. Advantages of utilizing PRG microorganism for vaccine compared to utilizing conventional microorganism.
4. Information on the gene donor organism as vaccine.
5. Information regarding usability of PRG vaccine and its relation to other vaccines.
6. Vaccine dosage forms.

7. Information regarding utilization of similar PRG microorganism in Indonesia and in other countries, as well as the purpose of applicant conducting biosecurity study of the PRG microorganism in question.

B. PRG Microorganism Information

1. General Description of PRG Microorganism

   This description includes, among others, parent microorganism information, gene donor organism, information regarding name and function of the inserted gene (if there is any gene being inserted), as well as the type and purpose of the genetic modification. This description must satisfy an explanation of the vaccine trait tested for its safety.

2. PRG Microorganism Genetic Trait Information

   a. Description of the modified parent organism, including common name, scientific name, cultivation and propagation methods, as well as the primary genotype and phenotype traits relevant to its use as vaccine and the safety of the environment. If there is a gene that has been removed, modified and/ot disabled specify the gene name and the stages of the utilized procedure.

   b. Description of the donor gene, including information regarding the gene interest, size and coding sequence, genetic construction method, location and orientation of the inserted gene (if any) and the copy number as well as characteristics of all genetic components including gene markers, regulators and other elements affecting gene function.

   c. Specify the intermediary parent microorganism (if any), including other organisms (e.g. bacteria) utilized to produce or perform genetic engineering prior to genetic modification to the PRG parent microorganism.

3. Genetic Modification Character

   The molecular character and biochemical genetic modification must be comprehensively described to obtain clear information regarding the impact of modification to genotype and phenotype (e.g. changes in the antigenecity trait) and the security of the PRG microorganism.

   Information regarding the inserted gene, including: gene products (proteins or RNA that are not translated) to determine the presence/absence of

harmful compounds in the PRG microorganism vaccine, gene product function and new phenotype/trait description.

4. Description of the possibility for the inserted gene inserted into the PRG microorganism for vaccine to be transferred to other organisms.

C. Environmental Security Information

Environmental security information of PRG microorganism for vaccine that are required:

1. The ability of PRG microorganism to spread, including information on:
   a. how long can the PRG microorganism for vaccine be reisolated from the excreta of the vaccinated animal;
   b. how long can the PRG microorganism for vaccine survive in an environment contaminated by the PRG microorganism.
   c. physical and chemical factors affecting the PRG microorganism toward its environment.
2. Information coverage of PRG parent microorganism host for vaccine.
3. The potential of horizontal gene transfer from PRG microorganism for vaccine to animal and/or fish as well as other microorganism based on information from molecular studies among others using PCR technique and hybridization.
4. Possible negative impacts of PRG microorganism for vaccine on the environment.
   a. can the PRG microorganism form spores; If yes, how is the spore resistance properties in the environments;
   b. potential for the spread of PRG microorganism on non-targeted animal and/or fist as well as the impact of the spread;
   c. potential for the spread of PRG microorganism on humans and its impact.

D. Environmental Risk Communication of PRG

Related to Environmental Risk Communication of PRG, data on farmers and public perception regarding the risk of PRG microorganism are required as well as efforts by the applicant in communicating the risk of PRG microorganism to the general public, associations related to farmers, government agencies and research institutions.

Matters that need to be communicated among others:

1. Benefit of vaccination program using the intended PRG vaccine.
2. The success of the intended PRG vaccination can be affected by the implementation of the vaccination program.

E. Management Plan and Risk Monitoring of PRG Microorganism

Information related to risk management of PRG microorganism contain the management plan, monitoring and security evaluation after the distribution of PRG microorganism. Management plan include:

1. Anticipative measures to be taken if a possible hazard occurred during the distribution of PRG microorganism.
2. Waste handling in the distribution of PRG, for example: how to exterminate PRG microorganism for animal and/or fish vaccine in the event of unintentional spread covering the use of disinfectant and monitoring after disinfection.

The required monitoring after distribution of PRG microorganism include:

1. Periodic survey to determine the possibility of emerging strains of similar microorganisms with the PRG vaccine.
2. Survey of the possible emergence of a new strain of microorganism causing the intended PRG vaccine to become unprotective.

IV. GLOSSSARY

A. Biosecurity of genetically engineered product is the environmental security, food and/or feed security of genetically engineered product.

B. Environmental security is the condition and effort requirred to prevent the possibility of adverse risk on biodiversity as a result of utilizing genetically engineered product.

C. Genetically Engineered Product or modified organism hereinafter referred to as PRG is a live organism, parts and/or its processed product with new genetic makeup from implementation of modern biotechnology

D. Modern biotechnology is the technical application of genetic engineering including in-vitro nucleic acid technique and cell fusion from two or more types of organism outside its taxonomic families

E. PRG microorganism is a microorganism derived from implementation of genetic engineering. The microorganism referred in this guidelines is microorganism for animal and/or fish vaccine.
F. Material of PRG microorganism origin is the cell of the PRG microorganism itself and/or its metabolism product.
G. Processed material of PRG microorganism origin is a product derived from the cell of the PRG microorganism or its metabolism processed using a specific way or method with or without additives.
H. Risk assessment of PRG is an assessment of the possible occurence of adverse effects on the environment, human and animal health caused by the development and utilization of PRG based on sound scientific method and statistics.
I. Assessment is the overall process of document inspection and PRG testing as well as related socioeconomic factors.
J. Testing is the evaluation and technical studies of PRG microorganism including engineering techniques, biosafety requirements in laboratories and limited test facility.
K. Testing of PRG microorganism for vaccine in Limited Test Facility (FUT) is a stability test of the PRG microorganism genotype and phenotype in the laboratory Biosafety Level (BSL) according to the hazard level of the PRG microorganism.
L. Biosafety Commission of Genetically Engineered Products, hereinafter referred to as KKH PRG, is commission whose task is to make recommendations to the Environment Minister, the Minister of Agriculture, and the Head of the National Agency of Drug and Food Control in preparing and establishing policy as well as issuing PRG biosafety certificate.\
M. Biosafety Clearing House for Genetically Engineered Product, hereinafter referred to as BKKH, is part of KKH that fuctions as means of communication between KKH with stakeholders.
N. Genetically Engineered Product Biosafety Technical Team, hereinafter referred to as TTKH PRG, is the team whose task is to assist KKH PRG in implementing evaluation and technical assessment of biosafety as well as the feasibility of utilizing PRG.

O. Announcement is the delivery of information to the public regarding the evaluation and technical assessment result of PRG biosafety through KKH PRG official news and on the bulletin board or the media prior to issuing biosafety recommendation of PRG by KKH PRG.
P. Person is an individual, group of pesons and/or legal entities.
Q. Applicant is the person requesting permission to the Minister in charge an/or the Head of Non Government Organization (LPNK) authorized for the circulation and/or release of PRG.
R. Circulation is an activity or series of activities in the framework of commodity distribution to the public, either for trading or not.
S. Day is the calendar day.

DOCUMENT FORMAT FOR ENVIRONMENTAL RISK ANALYSIS OF PRG FOR VACCINE

I. TITLE PAGE

ENVIRONMENTAL RISK ANALYSIS

DOCUMENT

[Product Name]

[Applicant Name]

Year of Preparation

I. QUESTION FORM OF THE REQUIRED INFORMATION

A. Vaccine Information

1. Information about the PRG vaccine

a. Specify the vaccine name

b. What disease can be controlled with the use of this vaccine?

c. Is the host of the parent microorganism comes from the costructed vaccine?

d. Specify the animal and/or fish species as the target application of this vaccine.

e. Specifiy the age range of the target animal and/or fish.

2. What is the reason for utilizing PRG microorganism as the petitioned vaccine?

Explain

3. Advantages of using PRG microorganism as vaccine compared to conventional microorganism (non PRG).

4. Is the gene donor organism have been commonly used in the production of PRG microorganism for animal vaccine?

5. PRG vaccine usefulness and its relevance with other vaccines
   a. Is the PRG microorganism in the vaccine included as polyvalent vaccine for animal and/or fish?

☐ Yes	☐ No
Explain	

   b. Can the administration of the PRG animal vaccine be followed by administration other vaccine without having a strong negative impact on its effectiveness?

Explain

   c. Is the PRG microorganism in the animal vaccine eliminates the usefulness of other vaccines administered after?

Explain

   d. If the PRG microorganisms in animal and/or fish vaccines are used for zoonotic disease, explain the vulnerable species, including its age groups.

Explain

6. Is the vaccine used an active vaccine?

Explain

7. Is the utilization of PRG microorganism for the same animal/fish vaccine has been done before in Indonesia?

☐ Yes	☐ No
Explain	

8. Is the utilization of PRG microorganism for the same or similar animal/fish vaccine has been done before in other countries?

☐ Yes	☐ No
Explain	

9. Is there any country that rejected the utilization of PRG microorganism for the same animal/fish vaccine? If there is, what is the basis for the rejection?

☐ Yes	☐ No
Explain the basis for rejection	

10. Is the PRG microorganism for vaccine derived from import?

☐ Yes	☐ No
Explain the licensing and assessment documents from the country of origin	

11. What is the purpose of filing for assessment of the PRG microorganism for animal vaccine to be imported/manufactured?

B. Information of PRG microorganism

1. General Description of the PRG microorganism
   a. Specify the information for the petitioned PRG microorganism:
      1) Genus Name :
      2) Species :
      3) Strain/sub-type :

   b. Specify the information for the gene donor organism:
      1) Genus name :
      2) Species :
      3) Strain/sub-type :
      4) Name/type of the inserted gene :

   c. Specify the type and purpose of the genetic modification:

2. Microorganism Genetic Traits Information
   a. Information on the modified parent microorganism
      1) Common name and scientific name (taxonomy)

2) Cultivation and propagation method:

3) Properties of the genotype and phenotype relevant with the utiliztion of vaccine and environmental security:

b. Donor Gene Information:

1) Donor gene:

Describe the gene of interest name, source, and function

2) Coding sequence

Specify the coding sequence!

3) Specify the location of the inserted gene and the copy number

4) Describe the genetic construction method

5) If there is a gene that has been removed or disabled, specify the stages of the procedure used.

c. Specify the intermediary parent microorganism (if any), including other organisms (e.g. bacteria) used to produce or perform genetic engineering prior to genetic modification ro PRG plant microorganism.

2. Genetic Modification Character

Explain the impact of modification to the genotype and phenotype (e.g. changes in the immunogenicity/antigenicity and pathogenicity traits), and the security of the PRG microorganism. Information regarding the inserted gene, including: gene products (proteins or RNA that are not translated) to determine the presence/absence of harmful compounds in PRG microorganism vaccine, gene product function, and phenotype descriptions/new properties.

3. Is there possibility of the inserted genes in PRG microorganisms for animal vaccines be transferred to other organisms? if yes, answer the following questions:

1) To what organisms and provide a list of those already tested?
2) What is the mechanism of the removal?
3) What negative effect occured as a result of the trait removal?

C. Environmental Safety

1. Spreadability of microorganism

a. How long can PRG microorganism for vaccine can be reisolated from the excreta of the vaccinated animals?

b. How long can PRG microorganism for vaccine survive in an environment contaminated by the PRG microorganism

c. What physical and chemical factors affecting the PRG microorganism toward its environment

2. What is the natural host of the PRG parent microorganism for animal vaccine, and possible alternative host?

3. What genetic trait that has been modified? What phenotypic trait (e.g, pathogenicity/virulence and immunogenicity trait)? Provide a complete description regarding:

a. To what extent does the genetic modification characterized (change in genotype and phenotype)? Provide the data

b. Where is the location of the inserted genes and how many copies are there?

c. What markers or sequences that can be used to identify the microorganism?

4. Possible negative effects of the PRG microorganism for vaccine toward its environment

a. Ability of the PRG microorganism to form spores

Explain

b. Potential for the spread of microorganisms in non-target animal and/or fish as well as the impact of the spread

Explain

c. Potential for the spread of the PRG microorganism on human and the impact of the spread

Explain

d. Does the PRG microorganism in the animal vaccine genotypically has the opportunity to be unstable?

e. Can the genetic material of the PRG microorganism unite into the vaccinated animal and/or fish genes?

☐ Yes ☐ No
Explain further with supporting data

f. Can the PRG microorganism in the vaccine be found both in the vaccinated animal and its dropping (faeces or urine)? If so, how long after the vaccination was administered?

Specify the supporting data

g. Can the PRG microorganism in the vaccine be transmitted from vaccinated animals to unvaccinated animals? If yes, explain the mechanism of transmission to animals or other species and the possible impacts (beneficial/detrimental?)

Explain

h. Does the PRG microorganism in animal vaccine has the ability to change back into its pathogenic form?

☐ Yes	☐ No
Explain further with supporting data	

D. Environmental Risk Communication

1. Explain how the communication of the PRG microorganism risk is conveyed to the public (specify the socialization goals and the mode of delivery). Risk communication will be conducted through: (Tick √ the appropriate statement in the box!)

☐ Brochure/booklet/information handout

☐ E-mail

☐ Website

☐ Periodic meeting

☐ Other media

☐ Others

2. Explain the details of each mode of risk communication based on your anwers above!

Brochure/booklet/information handout	
Website	
E-mail	
Other media	
Periodic meeting	
Others	

E. Management and Monitoring Plan

1. How is the plan that will be performed by the applicant after obtaining the environmental safety certificate?

Explain

2. How is the plan for monitoring and evaluating the safety of PRG microorganism in animal vaccine post circulation (post market surveillance)

Explain

3. What measures will be taken if hazardous condition arise in the production and utilization of PRG microorganism in animal vaccine?

Explain

4. How is the handling of waste in the production of PRG microorganism in animal vaccines?

Explain

THE ENVIRONMENT MINISTER

REPUBLIC OF INDONESIA,

BALTHASAR KAMBUAYA