



NATIONAL BIOSECURITY INDEX 2019-2020

Bhutan Agriculture & Food Regulatory Authority

BAFRA

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Contents

Introduction.....	2
Livestock Section.....	2
Plant Section	3
Biosafety (GMO) Section	4
National Biosecurity Index	6
Materials and Methodology:.....	7
Animal Biosecurity success Indicators	9
Introduction of Exotic animal diseases and invasive species prevented:	9
Notifiable outbreak of animal disease contained in the country:	10
Number of officials trained on Risk assessment for import of food of animal origin is conducted.....	11
Plant Biosecurity Success Indicators:	12
Exotic plant pests, diseases and invasive alien species prevented	12
Notifiable plant pest and diseases contained	13
Biosafety Success Indicators:	13
GMOs/LMOs entry prevented.....	14
Unauthorised /Invasive GMOs/LMOs incidents containment	14
Result:	15
Conclusion:	16
References:.....	17

Introduction

BAFRA is guided by the Biosecurity Policy of the Kingdom of Bhutan 2010 to implement biosecurity and food safety measures in the country. The Biosecurity Policy of the Kingdom of Bhutan 2010 designates BAFRA as the National Competent Authority to coordinate all biosecurity related activities, sanitary and phytosanitary measures effectively to protect the health and life of humans, farming systems and the environment including the national biodiversity from risks of entry, establishment and spread of exotic pests, diseases and invasive alien species thereby promoting safe trade and ensuring healthy ecosystem. The Biosecurity Policy of the Kingdom of Bhutan 2010 is supported by more than 10 acts dealing with different aspects of management of biosecurity, sanitary and phytosanitary aspects in the country. Further, the different Act are supported by rules and regulations, manuals, standard operating procedures and checklists serving as the prescription manual for regulatory authority and relevant stakeholder's in implementing biosecurity and food safety measures.

At the national level, BAFRA works closely with the Departments headed by the board members as well as other departments and non-departmental agencies viz. Department of Industries and the Office of the Consumer Protection under the Ministry of Economic Affairs, Department of Law and Order under Ministry of Home and Cultural Affairs, National Biodiversity Centre, under the MoAF, National Environment Commission.

At an international level, BAFRA has developed Institutional linkages with Export Inspection Council of India, Department of Agriculture Extension of Bangladesh, Korea Biosafety Clearing House under KRIBB, DNVGL (an international accredited registrar and classification society). In addition, it functions as the International Plant Protection Convention, Sanitary and Phytosanitary Agreement of WTO, and Cartagena Protocol on Biosafety.

For the implementation of biosecurity measures at national and international level is carried out by Plant and Animal Biosecurity Division which has three sections (Plant, Livestock, and Biosafety).

Livestock Section

This Section is responsible for implementing animal biosecurity, veterinary public health and animal welfare aspects of the overall mandates of BAFRA. Animal Biosecurity measures are implemented in line with the Biosecurity Policy of the Kingdom of Bhutan 2010, Livestock Act 2001, Livestock Rules and Regulations 2017 and other tertiary legislations developed under the Act.

Animal Biosecurity measures implemented by BAFRA are:

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A. Pre-border Biosecurity measures

- Conduct import risk analyses for import of animal and animal products including feed
- Make regulatory decision based on the risk assessment (approval/reject) of import application

B. Border Biosecurity Measures

- Quarantine of imported animals from notifiable and exotic diseases by observing a minimum of 15 days quarantine period.
- Provide vaccination, treatment and laboratory services during the quarantine period
- Conduct monitoring, inspection, testing and certification of imported goods (animal & their products) including feed at the border
- Monitor illegal imports of animal and their products including feed

C. Post border biosecurity measures

- Liaise with technical department in preparing disease prevention and control plan
- During animal disease outbreaks, carry out Destruction, Disposal and Decontamination of diseased animals, its products & accessory equipment
- Create awareness on animal on-farm biosecurity
- Regulate in-country movement of animal and animal products
- Carry out inspection and monitoring of good animal husbandry practices in the livestock farms
- Carryout inspection and monitoring of animal products including feed at the processing plant and markets
- Implement animal welfare standards and guidelines
- Implement animal tshethar guidelines
- Conduct research related to animal biosecurity and veterinary public health

Plant Section

With the globalization in trade and travel, Bhutan is no exception to witnessing increased trade volume of plants and plant products entering our country over the years, wherein such trade poses huge phytosanitary risks. Besides, other stressor such as climate change also add on to the risk of introduction and spread of new pest and disease into the country endangering our farming systems and natural environment. To counteract the ill-effects of pest and disease emergence it is certain to resort to use of pesticides and other management options which may succumb the plant resources and natural environment into further vulnerability. Strategically so, the Biosecurity Policy of the Kingdom of Bhutan 2010 guides Bhutan for effective implementation of biosecurity continuum measures through numerous strategies and activities derived from other international standards and best practices. The Bhutan Agriculture and Food Regulatory Authority (BAFRA) under the Ministry of Agriculture and Forests (MoAF) exercises the powers conferred under the Plant Quarantine Act of Bhutan 1993, Seed Act of Bhutan 2000 and Pesticides Act of Bhutan 2000 and the rules thereunder to implement the plant biosecurity measures to protect the health and life of humans, plants and animals including the environment from risks of entry, establishment and spread of exotic pests and diseases and at the same time increases market access and facilitates sustainable economic growth. Under the purview of aforementioned legislations, BAFRA also plays a pivotal role in regulating the quality of agriculture inputs which includes seeds and agrochemicals. It provides seed certification to the commercial entity(ies) following prescribed official control, standards and procedures to maintain the quality standard of certified seeds. Furthermore, it is also responsible to regulate the import and quality aspects of agrochemicals to minimize its deleterious impacts on human health, agriculture systems, biodiversity and watersheds. Since the biosecurity matters arches over all sectors of life and it is therefore a shared responsibility of all the government, private, and professional entities.

- Enforce plant quarantine measures to safeguard the agriculture system and environment from exotic pests and diseases.
- Sanitary and Phytosanitary (SPS) measures to facilitate trade and expand market access of plants and plant materials for both the domestic and exports.
- Regulate and promote the quality of agricultural inputs (seeds, agrochemical)
- Function as the National Official Contact Point for International Plant Protection Convention (IPPC).
- Foster communication and synergies among government, private, and professional entities.

- Develop educational and training programs and materials related to plant biosecurity
- Conduct awareness and education on plant biosecurity
- Inspection and certification of agricultural produces against Regulatory, BhutanGAP and Bhutan Organic standard as per the requirement of ISO/IEC 17065.
- As of June 2019, Plant section has registered 4 farms wherein two farms certified against BhutanGAP standard and 2 farms against Bhutan organic Standard.
- Inspection of agricultural seeds and seedling against minimum seed standard of Bhutan 2019.
- Inspection and certification of non wood forestry products such as Matsutake and Cordyceps
- Regulate and promote the quality of agricultural inputs (seeds, agrochemical)

Biosafety (GMO) Section

This section is responsible for implementing activities related to Genetically Modified Organisms (GMO) as per the Biosafety Act of Bhutan and its Rules and Regulations to protect human, animal and environmental health from the unintended effects of GMOs. Bhutan has adopted a precautionary policy concerning Genetically Modified Organisms (GMOs), with the aim to protect, conserve and safeguard the biodiversity in the country and promote organic agriculture. As such the cultivation, import and distribution of genetically modified crops are currently prohibited in Bhutan (Biosafety Act, 2015). However, genetically modified (GM) foods and feeds in non-viable forms are permitted if its safety has been assessed by Biosafety Technical Working Group and approved by the National Biosafety Board, while the environmental release of viable genetically modified organisms (GMOs) is completely prohibited. Ensuring the safety of imported GM food in the market is one of the main priorities for BAFRA, especially given Bhutan's reliance on significant imports to meet the food needs. This section will facilitate implementation biosafety activities as per the following documents;

1. Risk Assessment of Food and Feed Products Derived from Genetically Modified Plants
2. Guidelines for handling applications
3. Guideline on Environmental Risk Assessment of Genetically Modified Plants
4. Guidelines for Inspection and Monitoring of GMOs/LMOs
5. Manual for training workshop on GMOLMO-Handling of Applications and Inspection

This section also keeps abreast of the developments in the area of Biosafety at international level by closely monitoring FAO GM-platform, CBD website, BCH website, etc and accordingly prepares to apprise National Biosafety Board.

National Biosecurity Index

Biosecurity risks are increasing due to increased global trade and travel, increased agricultural expansion and intensification, increased urbanization close to farmlands, and other factors such as climate change. As a consequence, the country experience outbreaks of Giant African Land Snail (GALS), Citrus Huanglongbing, Spruce bark beetle, Brucellosis, Avian Influenza, Rabies etc. These major biosecurity incidents continue to test public confidence in the national biosecurity arrangements. Bhutan's biosecurity system continues to protect the nation from many exotic pests and diseases. Some of the benefits includes:

- Reducing the cost of agricultural production
- Reducing the impact of pests and diseases on our environment (including associated negative impacts on agricultural productivity and amenity)
- Safeguarding the health of our community
- Supporting animal and plant health

Bhutan's biosecurity system must remain strong and focused to build the national capacity and capability required in the face of inevitable and growing biosecurity risks. As per the FAO (2018), transboundary plant pests and diseases can spread to several countries and reach epidemic proportions if control measures are not put in place. Such plant pests and diseases outbreaks can cause huge losses to crops and pastures, threatening the livelihoods of vulnerable farmers and the food and nutrition security of millions at a time. Bhutan cannot be an exception. Bhutan has been witnessing increased trade volume of plants and plant products over the years. Such trade has associated risks with it as they serve as a pathway for introduction and spread of plant exotic pests and diseases impacting the forestry and agriculture resources including the environment of our country. Some are inferred to be exotic which may have been introduced and established through import of plant and their materials (e.g. Giant African Land Snail outbreak in Gyalpozhang since 2010). In addition, other consequences of under-resourced and neglected plant biosecurity system in the country is introduction of Cryptomeria, Poplar, Thuja and Eucalyptus and its rippling effects to the environment and society which has been realized

only now. Therefore, on the other hand it is a positive pointer and well timed for us to establish and put in place required biosecurity system to counteract such risks posed.

For the reasons aforementioned, the national biosecurity index is included as one of the KPIs under the result (outcome 1) for “Food and Nutrition Security Programme” in 12 Five Year Plan. In line, the same KPI was reflected in 2019-2020 APA at ministry level. Subsequently, the departmental KPIs at output level was designed as an indicator to measure the national biosecurity index. For 2018-2019, the target of national biosecurity index was set at ≥ 80 .

Materials and Methodology

The national biosecurity index is a broad indicator to measure the functioning of the National Biosecurity measures across the biosecurity continuum of the biosecurity system. For the purpose of establishing the national biosecurity index of the country for 2019-2020, the materials and methodology are designed and adopted from the 12FYP.

As per the agreed APA signed between the Ministry, MoAF and BAFRA, the weight given to the National Biosecurity Index (NBI) for fiscal year 2019-2020 is 32 (thirty-two) and the Excellent target set was 90%. This was agreed in the beginning of the APA signing as reflected in the Government Performance Management System (GPMS).

To achieve the national biosecurity index target, seven success indicators were included which measures the biosecurity continuum aspect of the plant, animal and biosafety. Each success indicators have a well-defined description and units for measurement with well-defined targets. The targets were computed as Excellent (100%), Very Good (90%), Fair (70%) and Poor (60%) which were given by default in GPMS. Based on the contribution of the success indicator to the outcome (national biosecurity index), the weights were assigned for each success indicator. Following are the success indicators weight weigh and target for 2019-2020 agreed in the APA agreement.

Sl No	Action	Weight (%)	Success Indicator	Unit	Weight (%)	Excellent (100%)	Very Good (90%)	Good (80%)	Fair (70%)	Poor (60%)
1	National Biosecurity Index	32	Number of officials trained on Risk assessment for import of food of	No.	4	20	15	10	5	0

			animal origin is conducted							
2			Exotic animal diseases and invasive species prevented	%	5	>90	>80	>70	>60	>50
3			Notifiable Animal diseases contained	%	5	>90	>80	>70	>60	>50
4			Exotic plant pests, diseases and invasive alien species prevented	%	5	>90	>80	>70	>60	>50
5			Notifiable plant pest and diseases contained	%	5	100	90	80	70	60
6			Unauthorised /Invasive GMOs/LMOs incidents containment	%	4	100	90	80	70	60
7			GMOs/LMOs entry prevented	%	4	80	70	60	50	40

Figure: Success Indicators with targets

For example, for the success indicator “Exotic animal diseases and invasive species prevented”, the weight assigned is 5%. If the SI is achieved with 100%, it was given “Excellent” and “Very Good” if the SI achieved is 90% and more.

For the calculation of NBI, following formula will be used:

$$\text{NBI} = (\text{Sum total weight of SIs} / \text{Total weight of National Biosecurity Index}) * 100$$

Where, NBI -National Biosecurity Index

SI - Success Indicators

Weight - % of weight assigned to each SI

NBI weight – 32% (Predefined)

Animal Biosecurity success Indicators

To measure the Animal biosecurity, the success indicators agreed are:

Introduction of Exotic animal diseases and invasive species prevented

The indicator measures the percentage of exotic animal pest and diseases (listing of exotic animal pest and diseases is beyond BAFRA's control) prevented from incursion into the country. For this success indicator, a target of more than 90% was set and weight of 5 was given.

The Biosecurity prevention measures carried out to prevent the introduction of exotic animal disease through transboundary movement of animal diseases - be it exotic or notifiable animal diseases. As per the disease's outbreaks newsletter from FAO, produced by FAO, ECTAD, there are about 1006 outbreaks of OIE listed outbreaks in the region from July 2019 to June 2020. These diseases are Nipah, Crimean Congo Hemorrhagic Fever (CCHF), African Swine Fever (ASF), Avian Influenza (AI), Japanese Encephalitis (JE), Brucellosis, Lumpy Skin Disease (LSD), and West Nile Virus (WNV). These diseases are listed as the exotic diseases for Bhutan as it has never reported in the country, or these diseases are reported sporadically in the country. Inline, Bhutan has never reported single cases of exotic diseases into the country thereby achieving 100% prevention of introduction, establishment, and spread of exotic and invasive diseases circulating in the region into the country. Following activities are carried out as the prevention measures:

1. Conduct Import Risk Analysis for animal and animal products - More than 2611 import applications were reviewed and conducted import risk analyses to reduce and prevent the incursion of diseases into the country
2. Inspection, certification, treatment and quarantine measures at the Border - From July 2019 to June 2020, 73 cattle, 13 dogs and 2 cats were quarantined. As per the quarantine manual, the samples were collected and tested for exotic and notifiable diseases and passed for entry into the country. Similarly, 3500MT of fresh beef, 1500MT of frozen chicken and chevon, pork, fresh fish, and animal feeds were inspected and certified at the border to reduce the disease incursion into the country after reducing the biosecurity risk below ALOP.

3. Activation of Border Vigilance border - The border vigilance team activated to monitor the illegal movement of animal and animal products.
4. Advocacy on animal biosecurity - The advocacy to general public on ASF conducted in BBS, social media and to pig farmers
5. Strengthening of on-farm biosecurity farms - More than 200 plus pig commercial farms visited and strengthened biosecurity measures
6. Development of ASF contingency plan - BAFRA in collaboration with DoL developed draft ASF contingency plan

As per the Livestock Act 2001, any notifiable and exotic diseases listed in the annexure must be reported and prevention and control measures need to be implemented immediately. Due to the preventive measures taken at the pre-border, border and post border as succinctly listed above, Bhutan has not reported single cases of exotic diseases into the country between July 2019 to June 2020 thereby achieving 100% prevention of introduction, establishment and spread of exotic and invasive diseases circulating in the region into the country. Therefore, we give full weight of 5 (five).

Notifiable outbreak of animal disease contained in the country

The indicator measures the percentage of notifiable animal disease outbreaks (as listed in Livestock Rules and Regulation 2017) successfully contained in the country in the specified period as per the specific disease prevention and containment plan. The target was set at more than 90 % for excellent achievement and a weight of 5 (five) was assigned.

It includes the Biosecurity prevention and containment measures carried out to prevent and contain the outbreak of notifiable diseases and exotic animal disease in the country.

As per the notifiable disease outbreaks report, there were 63 outbreaks of notifiable diseases between July 2019 - June 2020. In line with the Livestock Rules and Regulation 2017 and subsequent disease prevention and control plan, the diseases are contained without spread of diseases. The series of activities undertaken are:

- a. Regulation of in-country movement of animal and animal products: More than 1873 applications were processed for the in-country movement of animals as per the biosecurity guidelines.

- b. Inspection and monitoring of farm biosecurity - A total of 532 livestock commercial farms were inspected and monitored as per the specific commercial farm biosecurity checklist.
- c. Containment of notifiable disease outbreaks in the country - BAFRA in collaboration with DoL, about 63 outbreaks of diseases are contained as per the specific disease prevention and control plan.

Although there were more than 63 outbreaks of notifiable diseases as listed in the Livestock rules and regulation 2017 in the country, the outbreaks were all contained as per the specific disease's outbreaks. Therefore, as per the SI description, the achievement is 100%. (Note: The details of the activities conducted is available in "Animal Biosecurity Report 2019-2020".

Number of officials trained on Risk assessment for import of food of animal origin is conducted

The indicator measures the number of of BAFRA livestock officials trained on Import Risk Analysis for the import of animal and animal products. As per the target, 20 officials have to be trained to achieve the excellent achievement before weight assigned is 4 (four).

In order to understand the basis of IRA process involved in decision making to the field offices, it was felt necessary to conduct training to the field offices. Therefore, through European Union Rural Development & Climate Change Response Program 4 days training was conducted from 10-13 December 2019 to the BAFRA field offices. The objective of the training was to train the livestock officials on the outline processes and procedures for importation of animals, animal products and animal related items into Bhutan involved in Import Risk Analyses

The outcome of the training are:

1. To train the livestock officials on the IRA process
2. To seek feedback on the draft IRA guideline from the field offices

The plan was to administer the training in two batches as there are more than 65 BAFRA livestock officials. The first batch of the training was attended by 35 BAFRA officials from the entry point offices and field offices in western region which are from livestock background. The training was administered by Dr N.P Dahal, DoL and Dr Kinley Penjor, BAFRA. The resource persons have formal education and training in Import Risk Analyses. The training was administered in three modules:

- Module 1: Theory consisting of presentation by the resource person on the IRA steps and procedures

- Module 2: Providing reading materials and video materials for the participants on IRA
- Module 3: Practical session through groups works

The whole training was completed in December 2019 with successful training of 34 BAFRA field officials. Therefore, the SI was achieved 100%. (Note: The details of the training is available in the “IRA Training Report”.

Plant Biosecurity Success Indicators

To measure the Animal biosecurity, the success indicators agreed are:

Exotic plant pests, diseases and invasive alien species prevented

The success indicator measures the percentage of known and reported exotic plant pests and diseases (listing of exotic plant pests and diseases is beyond BAFRA’s control) prevented from entry into Bhutan. A weight of 5 (five) was give with an excellent target to be achieved with more than 80%.

This year FAO reported emergencies on outbreaks of transboundary pests and diseases, such as Cassava Mosaic Virus, Brown Streak Virus, Fall Army Worm (FAW) and Desert Locust in most part of the world. In particular, the desert locust, which is of great concern to Bhutan, has already invaded more than two dozen districts covering more than 50,000 hectares of western India. However, there is no official notification on introduction and outbreak of exotic plant pests and diseases in the country, hence it indicates that the phytosanitary measures implemented has been very successful in preventing the introduction of exotic plant pests and diseases from the foreign countries. Similarly, no record of invasive alien species has been reported. In addition, following activities are carried as a prevention measure:

- a. BAFRA has developed Bhutan Phytosanitary Treatment Manual (BPTM) 2020 to guide the quarantine inspectors for mitigating the phytosanitary risks through different treatment protocols (both chemical and non-chemical treatments).
- b. BAFRA has also imparted training to the officials on BPTM 2020.
- c. Conducted Pest Risk Analysis: The PRA is prepared in response to the PRA proposal submitted by the Department Agriculture, Cooperation and Farmers Welfare (DACFW) India for export of fresh okra, onion and tomato to Bhutan. A total of 127 pests are identified to be associated with the specified commodity types. Of these, only ten pests are identified to be of quarantine concern as a result of importation of these three commodities to Bhutan. Among these, only six pests have been identified requiring pest risk management measures. Quarantine pests that require risk management includes

Liriomyza sativae on okra and tomato. *Clavibacter michiganensis* subsp. *michiganensis* is associated with importation of tomato and requires risk management. *Frankliniella occidentalis* and *Urocystis cepulae* pose moderate pest risk associated with importation of onion from India, and thus require risk management.

In line to the SI description, there is no official notification on introduction and outbreak of exotic plant pests and diseases in the country, hence it indicates that the phytosanitary measures implemented has been very successful in preventing the introduction of exotic plant pests and diseases from the foreign countries. Therefore, the SI was achieved 100%. (Note: The details are available in “Plant Biosecurity Report 2019-2020”).

Notifiable plant pest and diseases contained

The indicator measures the percentage of successful containment of Giant African Land Snail (GALS) outbreaks in the country. For this particular SI, a weight of 5 (five) was assigned. A target of 100% was assigned to achieve an excellent achievement.

Giant African Land Snail (GALS) outbreaks are limited to Gyelposhing and Limithang. The containment activities are in full swing in these areas. Till now there is no record of GALS spread/migration beyond these two quarantine zones. The containment measures implemented for this season are:

1. Regular surveillance, monitoring, inspection and internal quarantine to prevent/minimize the risk of outbreak and further spread to other non-infested places.
2. Awareness programs are conducted to inform the people about GALS and its harmful impact to wide range of plants, animals, human beings and their environment.

Since there was record of GALS spread/migration beyond the two quarantine zones (Mongar and Limithang). Therefore, the SI was achieved 100%. (Note: The details are available in “Plant Biosecurity Report 2019-2020”).

Biosafety Success Indicators

As per the signed APA, there are two success indicators to measure the Biosafety measures in the country in terms of preventing introduction and managing the biosafety incidents. These are:

GMOs/LMOs entry prevented

The indicator measures the percentage of GMOs/LMOs prevented from entry into Bhutan through appropriate surveillance and prevention activities. The weight of 4 (four) and annual target of more than 80% was assigned for an Excellent Achievements.

In effort to implement Biosafety Act of Bhutan 2015 and in view of BAFRA's responsibilities to prevent entry of any viable GMO into the country, we have profiled approved GMOs in our region especially in India and Bangladesh. It is found that Bt-brinjal and Bt-cotton are approved in Bangladesh and India respectively for commercial use and owing to nearness of these two countries to Bhutan it was highly likely that these GMOs can enter into our country.

As such we procured rapid test kit for particular GM element (Cry1Ac) for testing Bt-brinjal and dispatched to almost all BAFRA field offices for conducting surveillance. As per the surveillance report http://www.bafra.gov.bt/wp-content/uploads/2017/12/Bt-Brinjal-Report_May-2020.pdf, there is no evidence of import or introduction of Bt-brinjal into the Country.

Since there is no official report of introduction of GMOs/ LMOs into the country. The target is 100% achieved.

Unauthorised /Invasive GMOs/LMOs incidents containment

The indicator measures the percentage of unauthorized/invasive GMOs/LMOs (listing of unauthorized/invasive GMOs/LMOs is beyond the control of BAFRA) incidents within Bhutan that are successfully contained through the implementation of appropriate incident management responses (awareness on incident management response plan and communication strategy documents to field officials-this document was developed during FY 2018-19). For this indicator, a target of 100% was given for excellent achievement category and a weight of 4 (four) was given.

BAFRA learnt that cultivation of cotton is reviving in Pemagatshel through Tarayana Foundation and Agency for Promotion of Indigenous Crafts (APIC). Since cottons are mostly genetically modified, BAFRA felt necessary to carry out surveillance and hence procured two specific rapid kits that can detect specific GM elements (Cry1Ac and CP4EPSPS). Surveillance was conducted in Pemagatshel, Samdrupjongkhar and Panbang. As per the current survey report (<http://www.bafra.gov.bt/wp-content/uploads/2017/12/Report-on-Cotton-Survey.pdf>), it is concluded that there is no introduction of Bt-Cotton into the Country and cotton that we have in these dzongkhags are assumed to be conventional cotton.

Relevant stakeholders and BAFRA field officials were trained on finding approved GMOs in other countries by using global BCH, FAO, OECD tools during BBCH workshop conducted from 3-5 March 2020 and report can be found at <http://www.bafra.gov.bt/wp-content/uploads/2020/06/Technical-Report-on-Bhutan-Biosafety-Clearing-House-Workshop-1.pdf>.

As per the law, the cultivation of GMO is completely prohibited, any activity involving viable GMO is illegal and should the test results show positive for tested samples such incidents will be fully contained by following Biosafety incident management strategy document.

In line to the SI description, it is 100% achieved.

Results

For the calculation of the National Biosecurity Index, the summary of the Success Indicators along with the weight and achievement made in 2019-2020 was given in figure 2.

SI No.	Success Indicator	Unit	Weight	Achievement
1	Number of officials trained on Risk assessment for import of food of animal origin is conducted	No.	4	Excellent
2	Exotic animal diseases and invasive species prevented	%	5	Excellent
3	Notifiable Animal diseases contained	%	5	Excellent
4	Exotic plant pests, diseases and invasive alien species prevented	%	5	Excellent
5	Notifiable plant pest and diseases contained	%	5	Excellent
6	Unauthorised /Invasive GMOs/LMOs incidents containment	%	4	Excellent
7	GMOs/LMOs entry prevented	%	4	Excellent

As discussed in the material and methodology, formula for the calculation of National Biosecurity Index is as follow:

$$\text{NBI} = (\text{Sum total weight of SIs} / \text{Total weight of National Biosecurity Index}) * 100$$

Where, NBI -National Biosecurity Index

SI - Success Indicators

Weight - % of weight assigned to each SI

NBI weight – 32% (Predefined)

$$\begin{aligned}\text{Therefore NBI} &= ((4 + 5 + 5 + 5 + 5 + 4 + 4)/32) * 100 \\ &= (32/32) * 100 \\ &= 100\%\end{aligned}$$

Therefore, the National Biosecurity Index for 2019 – 2020 is 100%.

Conclusion:

The National Biosecurity Index is the generic indicator for the performance of biosecurity measures undertaken by BAFRA and other collaborating stakeholders as defined in the Biosecurity Policy of the Kingdom of Bhutan 2010 in preventing the incursion of pest and diseases of animals and plants at the border and diseases outbreak containment activities implemented including the GMO/LMO incidents. For the fiscal year 2019 – 2020, 7 success indicators are selected which encompasses the measures to be taken at the pre-border and border and post border in managing the biosecurity risk for plant, animal and biosafety. The sum total weight of all 7 success indicator divided by the weight of the NBI multiplied by 100 gives the index of the national Biosecurity Index for 2019-2020. As per the formula, for 2019-2020, the National Biosecurity Index is 100%.

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