RISK MANAGEMENT FRAMEWORK FOR GENEBANKS

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Background

The System-wide Genetic Resources Programme (SGRP) is a partnership programme of 15 centers of the Consultative Group for International Agricultural Research whose goal is to maximize the CGIAR System's contribution to the global effort to conserve agricultural, forest and aquatic genetic resources and promote their use to improve livelihoods, nutrition and protect the environment.

A key component of the CGIAR's genetic resources work is the stewardship of the large number of accessions of crop and forest genetic resources in the genebanks around the world that are managed by 11 of the CGIAR Centers. The collections are held on behalf of the world community under agreements between the Centers and the Governing Body of the International Treaty on Plant Genetic Resources for Food and Agriculture. SGRP aims to improve the management of the collections and to position the Centers to play a role in developing a global system for conservation and use of plant genetic resources. A key activity of the SGRP is the strengthening of risk management by individual Centre genebanks, and also across the System for crops managed in common. The World Bank has assisted this activity, through funding provided under the "Collective Action for the Rehabilitation of Global Public Goods in the CGIAR Genetic Resources System: Phase 2" project, the development of these guidelines for a risk management framework and for related tools to promote implementation. These guidelines are designed to also assist non-CGIAR genebanks which are also encouraged, as part of the global system envisaged under the International Treaty, to implement a risk management system for their collections.

These guidelines set out the broad principles for risk management which are based on a review of the frameworks already adopted by the CGIAR Centers. They are, in turn, based on internationally recognized approaches. The steps defined in the guideline follow those set out in the Australia/New Zealand Risk Management Standard AS/NZS 4360:1995, which is presently the only one adopted by a national or international standard setting body. The current draft of a future general ISO standard on risk management also adopts these steps.

The guidelines are summarized graphically below and explained thereafter in this paper:

Step 1 – Communication and consultation

All those who will be involved in implementing a risk management system should be oriented in the concepts, methodology, terminology, documentation requirements and decision-making processes of the system. This should happen for all who are involved at the inception of the system, and thereafter for those who come after and are new to the system. That communication process should also allow for suggestions, from this audience, for improvement.

Step 2 – Establishing the Context

The risk assessment process proper begins with the consideration of the objectives of the genebank, the environment in which the activities operate, and the stakeholders.

Objectives

A complete analysis of all relevant risks of any activity is most likely if their identification is explicitly linked, in the same way that performance indicators of the activity should be, to the agreed objectives of the activity. The common objectives, which all the CGIAR Genebanks are encouraged to use in structuring their risk management systems, are to:

1. Acquire and introduce new germplasm in compliance with international standards, agreements and regulations,
2. Conserve germplasm samples in a secure facility that maintains their viability,
3. Distribute healthy germplasm in compliance with international standards, agreements and regulations
4. Manage and provide complete and accurate germplasm information as a global public good, and
5. Conduct genebank operations in an efficient and sustainable way.

Environment

Genebank activities are affected by various factors in the environment. Those elements that might support or impair the genebank's ability in achieving its objectives and functions should be identified as part of the risk management process. These could be related to such factors as

- The strategic focus and existing or planned portfolio of the Center
- People (staff, consultant, partners)
- The available physical infrastructure
- Financial resources
- Legal compliance requirements
- Technology
- Existing internal processes
- Developments in the external environment such as political changes

These factors may be controlled to different degrees. An understanding of the environment can help determine the proper response to the risks identified in the risk assessment.

Stakeholders

There is a wide range of stakeholders that have an interest in the sustainable operations, products and services of CGIAR genebanks, such as:

- Researchers (breeders, geneticists, agronomists, physiologists, pathologists, entomologists)
- Farmers
- Private sector
- Host country
- Other CGIAR centers
- International crop network
- Donor community

The perceived effects and impact of failure of genebank services to stakeholders can help evaluate the importance of risks and guide the development of necessary mitigation with due consideration of the stakeholders.

Step 3 – Risk Identification

Taking into account information gathered in Step 1, an inventory of relevant risks to the genebank operations should be made. The major risks to genebanks are germplasm mis-identification, unstable storage facilities and insufficient funding support. An extensive list of risks gathered in documents from five CGIAR Centers and genebank of the Philippine Rice Research Institute, discussions with four USDA-ARS conservation and database management sites and information contained in various genebank management literatures has been compiled and is set out in Table 1a for seeds and Table 1b for clonal materials.

The risk assessment tools serves as the input form for risks and other information required under later steps for a particular genebank. For step 3, the general area of genebank operations and specific activity and the risk source/indicator should be identified. These can be selected from those listed in Tables 1a and 1b, but need not be limited to these.

Also, as part of the risk identification step, risk ownership should be identified. This means identifying the organizational unit or manager who is responsible for monitoring, analyzing, evaluating the risk and implementing the controls or contingency plans associated with the risk. Most of the risks identified will be managed by managers and staff within the genebank or larger Genetic Resources Unit (or equivalent) in which the genebank staff are organizationally located. Others will be managed in partnership with other units within the Centers. The suggested partner units are identified in Tables 1a and 1b.

Step 4 – Risk Analysis

Risk analysis should cover both the potential impact (or consequence) of the identified risks, and their likelihood (probability). In the case of likelihood, an intrinsic likelihood should be first considered, taking into account the nature of the risk and its probability in the absence of controls or other mitigations, and then adjusted for mitigating controls that are confirmed as being in place. To develop a quantitative risk assessment, a point system for the scales or levels of the likelihood and impact of risks should be devised in the context of genebanking operations. The point system should not be made overly complicated and, consistent with the approach taken by many CGIAR Centers for their enterprise wide risk management frameworks; a 3-point scale is proposed: 1 point (Low), 2 points (Medium), and 3 points (High) for both likelihood and impact.

Intrinsic Likelihood

Table 3 provides suggested definitions for the likelihood scale. These likelihood levels can be amended to suit a particular genebank's conditions. Should a genebank wish to initially simplify this further, a 2-point scale could be adopted: 1 point (Low) and 2 points (High) for both likelihood and impact.

Table 3. Likelihood levels.

Low (1)	Very unlikely to practically impossible. 1-5% of the time. (Ex. One or no occurrence in more than 10 years)
Medium (2)	Occasional. 6-10% of the time. (Ex. One occurrence in 5 years.)
High (3)	Moderately frequent to frequent. Above 10% of the time. (Ex. One to twelve occurrences in 1 year.)

Impact

Since risks can impact multiple aspects of genebanking, namely: people, germplasm, information, operations, environment, asset/resources, legal, and reputation, quantitative cut-offs can be set for each area. For initial implementation, to keep the process simpler, impact of legal and reputation risks may be excluded. Table 4 sets out suggested definitions for the impact scale taking into account these multiple aspects.

Table 4. Impact levels.

CATEGORY	ASPECT	LOW (1)	MEDIUM (2)	HIGH (3)
GERMPLASM	Diversity	Recoverable from original and several other sources	Recoverable from few sources	Recoverable from only 1 to 3 sources to total loss.
	Availability	Delays availability by one season or cycle	Delays availability by two-three seasons or	Delays availability by more than three

		for seed, or by one year for clonal.	cycles for seed, or by two-three years for clonal.	seasons or cycles for seed, or by more than three years for clonal.
	Viability	0-1% loss for seed or 10% loss for clonal in one year	2-5% loss for seed or 11-20% loss for clonal in one year	Above 5% loss for seed or above 20% loss for clonal in one year
	Purity/Integrity	0-0.1% genetic change	0.2-5% genetic change	Above 5% genetic change
INFORMATION	Quality	0-5% gap in data or 0-5% loss in data accuracy or above 91% usefulness	6-10% gap in data or 6-10% loss in data accuracy or 30-90% usefulness	Above 10% gap in data or 10% loss in data accuracy or less than 30% usefulness
	Access/dissemination	Loss of accessibility by countries outside network	Loss of accessibility by non-CGIAR centers within crop-based network	Loss of accessibility by other CGIAR centers and within center
PEOPLE	Complement	Reduces manpower requirement by 0-10%	Reduces manpower requirement by 11-20%	Reduces manpower requirement by more than 20%
	Efficiency	Targets met on time or with 2 days delay	3 days delay	More than 3 days delay
	Health	Discomfort to minor first aid	Restricted work	Permanent partial or total disability
	Retention	2-3 years on the job	1 year on the job	Less than 1 year on the job
ENVIRONMENT	Discharges	With slight physical or chemical changes to environment. Limited within building or operational area	With minor environmental damage but no adverse effects on current conditions. Can be contained within the institute premises.	With local environmental damage that could affect neighborhood and partially interfere with activities. May extend to immediate neighbors.
	New pests and diseases	Spread limited within screenhouse or laboratory building	Spread within institute farms	Spread beyond institute farms
	Chemicals used	Low toxicity	Moderate toxicity	High toxicity
ASSET/ FACILITY	Cost of damage	US$ 0-500	US$ 501-5,000	More than US$ 5,000
	Resource management	0-20% used on uncharacterized germplasm	21-30% used on uncharacterized germplasm	More than 30% used on uncharacterized germplasm
OPERATIONS	Disruption	Neglible or brief disruption affecting 1 system.	Brief disruption affecting more than 1 system.	Partial shut-down affecting one service or processing line to total shutdown.
	Cost of repair	US$ 0-500	US$ 501-5,000	More than US$ 5,000
LEGAL	Policy level	Institute	Reporting, audit and inspection requirements by external stakeholders: customer, host community, industry (ISTA).	Legal requirements in reporting, inspection, monitoring by national government and NGOs, and clearance from international bodies or treaties such as FAO, SGRP, ITPGRFA, CBD
	Ownership	No limits on global ownership or vulnerable to claims by a country.	Vulnerable to ownership claims by a community.	Vulnerable to ownership calims by a tribe or private company.
	Liability	Short, temporary ban on genebank staff at fault. No fines.	Short, temporary cessation of genebank operations. Below $1M fines.	Extended to permanent cessation of genebank operations. Over $1M fines.
REPUTATION	Coverage	Damage confined within genebank unit or department, or requesting laboratory.	Damage confined within center or requesting institute.	Damage beyond center or requesting institute to country/national and international sphere

For example, for regular implementation of this rating scheme, low is loss of seed viability by 0-1%, medium by 2-5% and high by above 5% per year. For an initial,

simpler implementation, low could be loss of seed viability by 0-1%, and high could be loss by more than 1% per year.

The total impact score can then be the sum of the scores in all the aspects considered. Note that 1 point should be given to any of the abovementioned aspects that are not affected by the risk as a normalization step for computing for relative weights of the risks.

One suggested rating scheme, taking account of the multiple aspects reflected in Table 4, is to award an overall Low impact rating where there is an aggregate total of 8 points, a Medium rating where this a total of 9 points (with 2 points in at least one area) and a High rating where this is a total of 10 points (with 3 points in at least one area) under High impact. Hence, risks with an impact score of 2 points each (Medium) in two or more areas will have a total greater than 9 points and subsequently fall under High impact.

For example:

If the risk indicator is "Misidentification of germplasm" during collecting, the impact may be assessed in the various categories from germplasm to reputation using Table 4, as follows:

Impact/Consequence *Use Table 4*		Germplasm	Information	People	Environment	Operation	Asset/ Facility	Legal	Reputation
	Score:	3	2	1	1	1	1	1	1
Total Impact:	11								

Germplasm – 3 if the misidentified germplasm is in terms of diversity "recoverable from only 1 to 3 sources to total loss." This can happen if the material is grown only in one location that is undergoing conversion or becoming inaccessible.

Information – 2 if this risk indicator results in "6-10% gap in data or 6-10% loss in data accuracy or 30-90% usefulness".

People, Environment, Operation, Asset/Facility, Legal and Reputation - 1 since this risk source does not affect any aspect in these categories.

In this case the total score comes to 11, and so the risk is rated "High" impact.

The above rating scheme can be changed to more accurately reflect local conditions and standards.

Adjustment Factor

Existing controls or strategies to mitigate the risks should then be identified and described. These controls or other mitigations can be in three areas: personnel; facility and equipment; and procedure/methodology. Table 5 provides further information on these three areas.

Table 5. Areas of control.

Personnel	Staff performing the activity receives competency through training or actual experience. Dedication and enthusiasm through adequate compensation.
Facility & Equipment	Machine or equipment used is of correct specification, capability, and good condition, and is available
Procedure	Appropriate procedure developed and communicated on conduct of activity

Tables1a and 1b provide examples of controls, classified according to these three areas, for the risks listed in the tables. As illustrated in these Tables, there are risks that need controls in all three areas, while some risks can be addressed in only one or two areas.

The documented references to these controls should be linked to the supporting documents such as policies and procedures, and the evidence(s)/proof(s) that the control measures described are being implemented should be checked through analysis of operating measurements and periodic audits.

Based on adequacy of controls, the risk likelihood rating may be adjusted. Table 6presents an Adjustment Factor scheme for this purpose. For a simpler, initial adoption, moderate to Full control, worth 1 point, means there are existing controls in at least 1 of all applicable areas during the time of risk assessment. No control, worth 2 points, indicates there is no mitigation at all.

Table 6. Adjustment factor.

Rating	*Points*	*Description*
Full Control	1	Consistent control in all applicable areas
Moderate Control	2	Existing controls in 1 or 2 areas during the time of risk assessment
No Control	3	No control at all during the time of risk assessment

Total Risk Rating

The total level of risk (risk rating) is determined by the product of the ratings for impact, intrinsic likelihood, and the adjustment factor to reflect the contribution of existing controls or other mitigating factors to decrease the level of risk. The products of all the combinations of likelihood, impact and control levels are in Table 7. The ultimate goal is to have full control in order to reduce the total risk rating to Low Risk wherever possible, while acknowledging that some external risks may only be addressed by contingency plans.

Table 7. Total risk rating.

		Total Impact				
		Low (8)	Medium (9)	High (10)		
Intrinsic Likelihood		8	9	10	Full (1)	Control
	Low (1)	16	18	20	Partial (2)	
		24	27	30	No (3)	
		16	18	20	Full (1)	
	Medium (2)	32	36	40	Partial (2)	
		48	54	60	No (3)	
		24	27	30	Full (1)	
	High (3)	48	54	60	Partial (2)	
		72	81	90	No (3)	

Low Risk: 8 - 27 points (scores in green cells)
Medium Risk: 28 – 54 points (scores in yellow cells)
High Risk: > 54 points (scores in orange cells)

Medium and high risks are then further addressed through risk evaluation and risk treatment.

Step 5 – Risk Evaluation

Once the current total risk rating is determined, the risk owners and higher levels of management should consider whether the level of risk is acceptable. This will determine if additional control efforts or contingency planning should be made. Current technical or financial feasibility will be a factor in making decisions in this regard. However, such constraints should be explicitly considered and flagged so that they can be revisited either when new or cheaper technologies become available, or additional funding can be found to implement them.

Step 6 – Risk Treatment

Future course of action should be identified to deal with those risks where the current total risk rating is considered unacceptable, giving top priority to the highest assessed residual risks. The action plan comprises mitigation measures designed to reduce the risk level from High to Medium or Low total risk, by lowering the likelihood and/or cushioning the consequences through contingency planning such as provisions of safety backups of collections or information. Potential preventive controls are suggested in Tables 1a and 1bthat are by no means exhaustive, nor fully and directly applicable to all centers. They can be amended, enhanced and tailored to each genebank to comprise a set of measures deemed adequate.

Possible contingency measures, for external risks which the genebank cannot implement preventive controls and in case risks do happen despite controls being put in place should also be considered. In Tables1a and 1b provide suggested controls and contingency measures that can be considered for particular risks.

To present an overall picture of the unacceptable risks and mitigation measures that are relevant to the subject genebank, these can be entered in a worksheet (Annex 1) for a quick monitoring guide.

Step 7 – Monitoring and Review

Monitoring and review is concerned with analyzing and learning lessons from risk events or trends that do occur, from changes in the external environment since this was last assessed, and for the results of ongoing surveillance and periodic auditing that controls for mitigating risks continue to be appropriately designed and implemented as intended. Responsibilities for monitoring and review should be clearly defined and the results of monitoring and review activities should be documented. There should be a systematic consideration of the results to determine if changes to the risk management framework are required.

Annex 1

Activity	Risk Sources/ Indicators	Risk/Consequence	Action Plan					Contingency	Responsible Unit
			People	Facility	Procedure	Resource requirement	Timetable of implementation		
ACQUISITION									
Collecting									
Donation									
CONSERVATION									
Registration									
Sample Processing									
Storage									
Testing									
Regeneration									
Characterization and Evaluation									
DISTRIBUTION									
Policies									
Seed or Explant Preparation									
Dispatch									
INFORMATION MANAGEMENT AND DISSEMINATION									
Labelling									
Data Handling									
Back-up									
Data Quality									
Data Sharing									
INFRASTRUCTURE/PHYSICAL FACILITY									
Functionality									
Security									
PERSONNEL AND SUPPORT SERVICES									
Personnel									
Working environment									

Support Services									
Financial									