



SVALBARD GLOBAL SEED VAULT

# Annual Progress Report 2021

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NordGen report on the agreement on the funding, management and operation of the Svalbard Global Seed Vault.

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Front page photo: The first seed deposit from the Latvian State Forest Research Institute "Silava" on October 26<sup>th</sup> 2021 was attended by the Latvian ambassador to Norway Martins Klive, Ministers counsellor at the Latvian Ministry of Agriculture Egils Helmanis and researcher Agnese Gailite from the Latvian genebank. Photo: NordGen

## 2021 at a glance

- In total 50,926 safety duplicates from 22 depositors were added to the Seed Vault collection in 2021. By the end of the year the total holding of seed accessions in the Seed Vault was 1,125,419 samples deposited by 89 genebanks/institutes.
- Two gene banks deposited seeds for the first time in 2021; the national genebanks in Serbia and in Latvia. Delegations from the two countries were present in Svalbard and accompanied their seed deposits at the Seed Vault Opening in October.
- The second set of seeds belonging to the 100-year seed germination experiment in the Seed Vault produced by IPK, Germany and INIAV, Portugal was prepared and packed at NordGen in Alnarp and put in place in the Seed Vault in 2021
- Nanofilm labels displaying data on seed samples stored in the seed boxes in the Seed Vault were produced in 2021. The film labels will be fixed to all seed boxes in the Seed Vault in 2022.

## Foreword

NordGen manages and operates the seed deposits at the Svalbard Global Seed Vault in partnership with the Norwegian Ministry of Agriculture and Food (LMD) and the Global Crop Diversity Trust (Crop Trust) and in accordance with the Three Party Agreement between the partners, signed for ten years and valid from 1<sup>st</sup> of July 2017.

The objective of the Seed Vault is to provide a safety net for the international conservation system of plant genetic resources, and to contribute to securing the maximum amount of plant genetic diversity of importance to humanity for the long term. The success of the Seed Vault has continued this year both measured in terms of participation from the global genebank community and in terms of public interest and awareness about the purpose of the Seed Vault. By the end of 2021, the Seed Vault holds 1,125,419 safety duplicates representing wide inter- and intra-specific crop diversity deposited by 89 genebanks from around the world.

The Svalbard Global Seed Vault is a flagship project for NordGen, and 2021 was the fourteenth year of operation. We take great pride in the role we play in this project and I take this opportunity to thank our partners LMD and the Crop Trust for the good collaboration. I would also like to thank Statsbygg for the cooperation and the excellent working relationship we have at Svalbard.

It is with great satisfaction we see that the confidence and global interest for the Svalbard Global Seed Vault and for depositing seeds has remained on a high level also in 2021, despite the severe difficulties that many genebanks and the global seed conserving community faced due to the global covid-19 pandemic.

Lise Lykke Steffensen  
Executive director NordGen

## 1. Introduction

This annual progress report for the Svalbard Global Seed Vault gives an overview of the NordGen operation of the Seed Vault and related activities in 2021. NordGen's responsibilities are stated in the Three-Party Agreement providing for the long-term funding, management and operation of the Svalbard Global Seed Vault. The annual progress report is prepared by NordGen in accordance with obligations in the Three-Party Agreement Article 3.19.a).

The overall guidelines for the NordGen mission is to fulfil the objectives for the Svalbard Global Seed Vault as they are expressed in the standard deposit agreement between depositors and the Royal Norwegian Ministry of Agriculture and Food, saying that the Seed Vault was established with the *"objective to provide a safety net for the international conservation system of plant genetic resources, and to contribute to the securing of the maximum amount of plant genetic diversity of importance to humanity for the long term in accordance with the latest scientific knowledge and most appropriate technique"*.

The operation of the Seed Vault is a collaborative endeavour at several levels. At the management level NordGen collaborates closely with LMD and Crop Trust. At the facility operation level NordGen cooperates with Statsbygg in Longyearbyen. At the seed logistics level, we cooperate with the institutions sending safety duplicates as well as the chain of logistics and security partners involved in shipment and transport to the Seed Vault. The partnerships at all levels have worked very well also in 2021.

## 2. Seed deposits and depositors in 2021

After a very active year regarding participating genebanks in 2020, 2021 turned out to be a fairly average year as regards depositing genebanks and deposited seed samples. In total, 22 genebanks deposited 50,926 seed samples in 2021, among these two genebanks that deposited seeds for the first time.

As in 2020, this year was also strongly affected by the global covid-19 pandemic. Three Seed Vault openings were organized, as scheduled and pre-announced. At two opening occasions, only NordGen staff living in Norway was allowed to go to Svalbard for handling the seed deposits. Needed assistance was provided by Pole Position Logistics and Statsbygg.

Despite difficult working conditions in most countries, a number of genebanks deposited significant numbers of seed samples at all three Seed Vault openings that were organised during 2021. Two genebanks deposited seeds for the first time in 2021, located in Serbia and Latvia.

Table 1. Seed Vault deposits and dates in 2021

<b>Depositor / Date of deposit</b>			
<b>17th of February</b>	<b>Acronym</b>	<b>Inst. Code</b>	<b>Accessions</b>
Africa Rice Center	AfricaRice	CIV033	1023
Julius Kühn Institute	JKI	DEU451	4
International Crop Research Institute for the Semi-Arid Tropics	ICRISAT	IND002	3700
Institut d'Economie Rurale	IER	MLI002	324
SADC Plant Genetic Resources Centre	SPGRC	ZMB030	1442
<b>1st of June</b>			
Crop Research Institute	CRI	CZE122	204
International Centre for Agricultural Research in Dry Areas	ICARDA	LBN002	16363
Centre for Genetic Resources	CGN	NLD037	1465
Centro Internacional de la Papa	CIP	PER001	136
Agricultural Plant Genetic Resources Conservation and Research Centre	APGRC	SDN002	351
The World Vegetable Center	AVRDC	TWN001	11771
Seed Savers Exchange	SSE	USA974	129
<b>26th of October</b>			
Austrian Agency for Health and Food Safety	AGES	AUT001	901
International Livestock Research Institute	ILRI	ETH013	176
John Innes Centre, Germplasm Resources Unit	JIC	GBR247	1412
World Agroforestry Centre	ICRAF	KEN023	365
National Institute of Agricultural Sciences. Rural Development Genebank	RDI	KOR011	3695
Latvian State Forest Research Institute 'Silava'	LMVI	LVA009	153
Centro Internacional de Mejoramiento de Maíz y Trigo	CIMMYT	MEX002	4051
Centro Internacional de la Papa	CIP	PER001	37
Plant Breeding and Acclimatization Institute	IHAR	POL003	1215
Institute of Field and Vegetable Crops	IFVCNS	SRB002	96
National Rice Seed Storage Laboratory for Genetic Resources	NRSSL	THA012	195
SADC Plant Genetic Resources Centre	SPGRC	ZMB030	1718

Two genebanks deposited seeds for the first time in 2021, located in Serbia and Latvia. By the end of 2021 NordGen has on behalf of LMD, signed Deposit Agreements (DA) with 97 institutions. Out of these 89 are active depositors, and by the end of the year the total holding of seed accessions in the Seed Vault was 1,125,419.

Three depositors are not included in the publicly accessible part of the Seed Portal interface. These are institutions that have deposited seed samples with special permissions from the Norwegian Ministry of Agriculture and Food. These deposits are not belonging to the main seed deposit policy and the design of the publicly available part of the Seed Portal which is based on PGRFA crop species and single accessions as basic units. These are the Millennium Seed Bank, Kew (depositing seed mixture samples), the Forest Research Institute, Myanmar depositing non-PGRFA orchid seeds and the University Centre in Svalbard (depositing non-PGRFA seeds from the wild flora in Svalbard).

Six depositors have made organizational changes as mergers, name changes and shift of views codes. After a formal procedure, the changes have been implemented in the Seed Portal database and the ownership has been transferred to the new institute designated as the valid owner. Details about the genebanks in question can be found in the table in Annex 1. By the end of 2021, three genebanks have signed the DA, but not yet deposited seeds.

*Table 2. Deposited and withdrawn seed accessions pr year and in total for the years 2008-2021. Figures showing status at the end of each year.*

<b>Year</b>	<b>Deposited pr year</b>	<b>Deposited in total</b>	<b>Withdrawals</b>	<b>Current holdings</b>
2008	320549	320549		320549
2009	169505	490054		490054
2010	111101	601155		601155
2011	113364	714519		714519
2012	58078	772597		772597
2013	29155	801752		801752
2014	38052	839804	3 <sup>1)</sup>	839801
2015	36130	875934	38073 <sup>2)</sup>	837858
2016	42979	918913		880837
2017	64403	983316	54354 <sup>2)</sup>	890886
2018	92638	1075954		983524
2019	32572	1108526	24064 <sup>2) 3)</sup>	992032
2020	82501	1191027	40 <sup>4)</sup>	1074533
2021	50926	1241953		1125419
<b>Totals</b>	<b>1241953</b>	<b>1241953</b>	<b>116494</b>	<b>1125419</b>

<sup>1)</sup> Three *Hordeum* accessions withdrawn by NordGen for regeneration

<sup>2)</sup> ICARDA withdrawals in 2015, 2017 and 2019

<sup>3)</sup> Seven *Secale* accessions withdrawn by Agroscope, Switzerland for regeneration

<sup>4)</sup> 40 samples withdrawn from the 2020 seed deposit before departure from ICARDA. The figure is registered in the Seed Portal.

A complete list of signatories and deposited seed samples are shown in Annex 1. Further details and key figures for the years 2014 to 2021 for seed deposits, stored boxes, depositors and seed deposit events are shown in Annex 3.

Twelve of the current 89 depositors are International Agricultural Research Institutes (IARCs), 69 are national gene banks and universities, two are regional genebanks and five are NGO gene bank collections. One of the depositors is a private company that has deposited seeds in cooperation with the country's government (Singapore).

Figure 1 shows the proportion and numbers of safety duplicates deposited by different categories of genebanks by the end of 2021. The largest share (59,3%) of the current holdings in the Seed Vault is deposited by IARCs represented by institutes belonging to the Consultative Group of International Agricultural Research Centres (CGIAR), the Asian Vegetable Research Centre (AVRDC) and the Tropical Agricultural Research and Higher Education Centre (CATIE), all holding collections of PGRFA in trust for the UN Food and Agriculture Organisation (FAO).

Two depositors are regional genebanks, SPGRC and NordGen, standing for 3,45% of the total number of deposited accessions, while 36,8% of the seed samples in the Seed Vault have been deposited by national genebanks and universities.

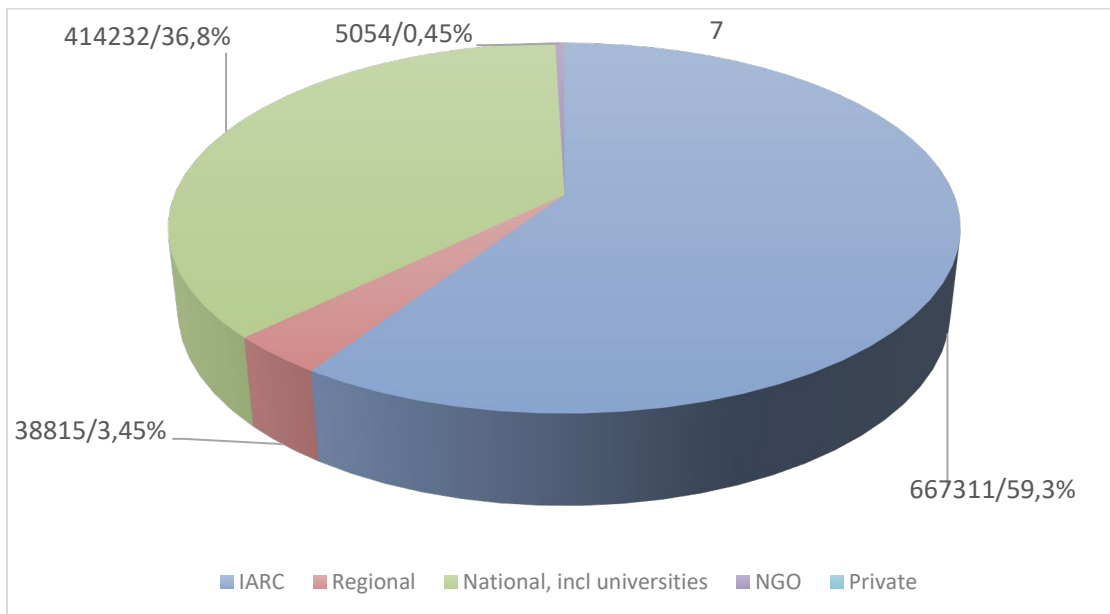
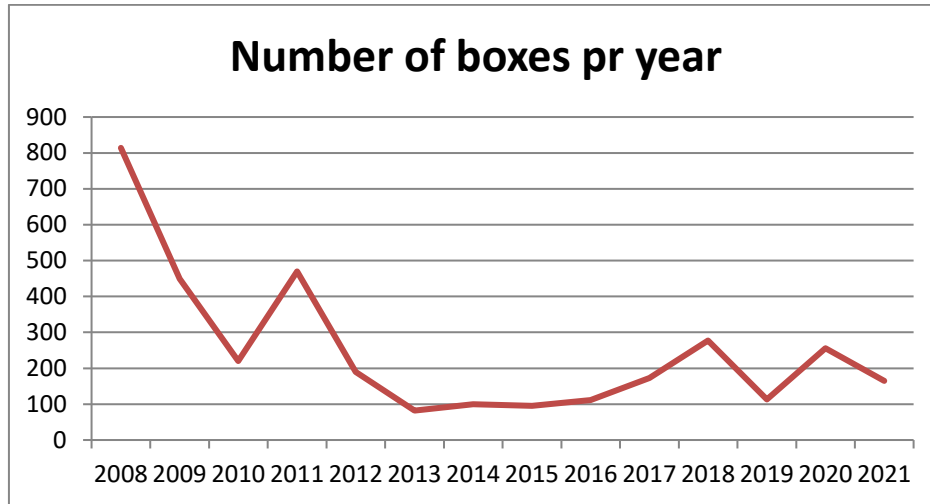


Figure 1. The proportion and numbers of safety duplicates currently deposited in The Vault at the end of 2021 by different categories of genebanks.



In total, 165 seed deposit boxes were taken into the Seed Vault in 2021. Over the years, 3515 regular seed boxes have been deposited in the Seed Vault, while 325 boxes have been taken out. By the end of the year 3190 regular seed boxes are stored in the Seed Vault. Test boxes and boxes with seeds not included in the Seed Portal are not included in this number.



*Figure 2. Numbers of boxes deposited per year 2008-2021. (Withdrawals not shown.) Peaks after the opening in 2008 indicate support schemes (2011) and special events organized in Svalbard (2018 and 2020).*

Seed shipment logistics imply that depositor genebanks send their seeds directly to Svalbard. For a couple of shipments, extra assistance from NordGen for bringing the seeds from Oslo to Svalbard has been needed.

Logistics at Svalbard have been handled in collaboration with the local logistics company PPL. Security screening of seed boxes upon arrival in Svalbard has been handled in collaboration with the authorities at Longyearbyen airport and the security company Avarn Security Aviation AS. Statsbygg has provided support with logistics and technical backstopping in Svalbard and accompanied at all work inside the Seed Vault.

### **3. Data management**

NordGen is responsible for maintaining and updating the internationally publicly accessible electronic database displaying the deposited material in the Seed Vault. During 2019 and 2020 a new version of the Seed Portal database has been developed and is available at <https://seedvault.nordgen.org/>. During 2021, the Seed Portal 2.0 has been fully implemented and updated. Some routines and functionalities have been improved and developed in cooperation with the developer Sopra Steria in 2021.

The Seed Portal 2.0 offers improved routines for quality assurance of information provided in accession lists submitted by depositors. Important functionalities are routines for controlling accuracy of genus and species names. During 2021 the Seed Portal register of genera and species names have been

controlled and corrected, in accordance with internationally agreed taxonomy databases, in particular the GRIN-Global taxonomy that also has been implemented at NordGen in the GENBIS database used for the Nordic seed collection.

Wrongly spelled genus and species names have been corrected and duplicated names have been deleted. The genera and species names registered by the Seed Portal by the end of 2021 are as correct as possible, in a taxonomic world characterized by a diversity of schools and views. Spelling of taxon names reported by the depositors are controlled, but still uploaded according to the practice used at the genebanks and their databases. Obvious misspellings have been corrected in dialogue with the depositor.

By the end of the year, 1115 genera and 5840 species are represented in the Seed Vault. After the cleanup of the genera and species names, these figures reflect the true diversity of plant species conserved in the Seed Vault. In total, 12,498 taxon names are registered. In addition to showing a broad diversity of subspecies, variants and form diversity within species, this figure reflects that different genebanks use different taxonomy practices. It is not possible to decide on one standard that should be implemented by all depositing genebanks.

## Search in the Seed Portal

Search by

Search by

Species ▾

Search
Advanced Search ▾
Export
?

Continent

- All continents -
▾
🗖

Country of collection

- All countries -
▾
🗖

Institute

Nordic Genetic Resource Center ...
▾
🗖

Genus

- All genus -
▾
🗖

Species

- All species -
▾
🗖

Taxon

- All taxons -
▾
🗖

Total of 348 hits or records

Species	Vernacular Name	Depositors	Accessions	Country of collection
Achillea millefolium	milfoil	1	10	4
Aegilops bicornis	goatgrass	1	1	1
Aegilops crassa	Persian goat grass	1	2	1

*Figure 3. The Seed Portal 2.0. advanced search interface where genebanks, media and others can find detailed information about the Seed Vault holdings. The search in this example displays the number of species deposited by NordGen and it lists the number of accessions of the 348 species represented. The list can be exported to an excel sheet for further calculations.*

For the public, the Seed Portal offers advanced options for filtered search on information about the current content of the Seed Vault: about samples and species, depositors, origin the accessions and deposit events (figure 3).

NordGen has handled and uploaded 24 accession datasets in 2021 at three different Seed Vault deposit events (Table 1).

#### **4. The International Advisory Panel**

The second meeting of the International Advisory Panel (IAP) was organized on the 23<sup>rd</sup> and the 24<sup>th</sup> of February 2020. The third meeting was initially planned for in February 2022. Some initial preparations for the 2022 meeting have been conducted during 2021.

In addition, NordGen has been in touch with the IAP members through the year and provided updates and information to be used in their outreach; presentations at different occasions and platforms and reaching out to potential new depositor genebanks. Some IAP members have been very active and assisted NordGen, both in dissemination of information and in providing contact information for genebanks. IAP members for communication with NordGen through 2021 have been:

- Yasmina El Bahloul, INRA, Morocco
- Ahmed Amri, ICARDA, Morocco
- Juan Lucas Restrepo, Bioersivity, Italy
- Godfrey Mwila, SPGRC, Zambia
- Rosa Lia Barbieri, Embrapa, Brazil
- Külli Annama, ECRI, Estonia
- Kristin Børresen, Graminor, Norway

NordGen appreciates a lot that IAP members have acted as ambassadors for the Seed Vault during 2021.

#### **5. Public awareness activities**

In accordance with the Three Party Agreement and with the work plan and budget for 2021, NordGen has worked considerably with public outreach activities, in cooperation with the partners. Information about the Svalbard Global Seed Vault has been passed on through several platforms: responding to questions about the operation from the public and from media, presentations and lectures for different

scientific and public audiences, social media posts, written articles and giving press interviews. NordGen has produced information, text and photos for information material and the Seed Vault official web site. Lectures and written articles for 2021 are listed in annexes 4 and 5.

NordGen has through 2021 participated in the Seed Vault Communication Group consisting of the three partners; the Norwegian Ministry of Agriculture and Food, Crop Trust and NordGen organized by the Ministry. Activities have been discussed and responsibilities have been shared between the partners in accordance with the rolling and frequently updated *Svalbard Global Seed Vault Communications Plan 2020-2021*.

Special achievements are an Annual Brief “pop” version of the 2020 report and agreed manuals for joint communication activities. Web posts and updates on social media related to the seed deposits have been produced and coordinated between the three parties. Among the social media, NordGen has been responsible for updates at the Seed Vaults’ Instagram account. The LMD has updated Facebook and Crop Trust has been responsible for the Twitter account.

Parts of the public awareness activities in 2021 have been influenced by the covid-19 pandemic. Despite travel restrictions, NordGen has received media teams and given interviews at the Seed Vault opening occasions in June and October.



*Figure 4. From the 'First-time depositor event' in October 2021. To the left, Geir Dalholt, Deputy Director General at LMD is handing over a Certificate of Deposit to the Serbian Ambassador to Norway Mr. Dragan Petrović. To the right the Latvian delegation and organizers with the first Latvian deposit outside the Seed Vault. From the left, Martins Klive, Latvian ambassador to Norway, Egils Helmanis, Latvian Ministry of Agriculture, Lise Lykke Steffensen, NordGen, Agnese Gailite, Latvian State Forest Research Institute, Edijs*

Vaznis, Latvian Ministry of Agriculture, Åsmund Asdal, NordGen, Dainis Ruņģis, Latvian State Forest Research Institute, Maija Kale, Nordic Council of Ministers' office in Latvia, and Geir Dalholt, Norwegian Ministry of Agriculture and Food. Photo: Kristine Purina.

In October 2021 an event was organized at the occasion of receiving the first seeds from two new depositor gene banks, located in Serbia and Latvia. Their first time seed deposits gained significant media attention in their home countries, and NordGen assisted and provided information and photos for their media outreach.

NordGen has received and responded to a significant number of emails from media, scientists, politicians and the public during 2021. No exact statistics are made, but the number of emails is estimated to be slightly lower than peaks in 2019, when the construction upgrades were finalized and in 2020, when the Seed Summit and the major seed deposit event were organized and attended by around 30 genebanks and several VIPs.

## 6. Long term seed storage experiments

The *100 year Seed Longevity Experiment in the Svalbard Global Seed Vault* started in 2020. The project includes seeds of 13 different crops and six genebanks as project partners producing seeds for the experiment. The plan is that seeds will be produced and deployed in the Seed Vault over the next 4 years, and that identical samples will be taken out and analyzed for germination every tenth year. Partners and crops are shown in table 3.

Table 3. Crops and genebank institutes included in the experiment.

Institute	Providing seeds of crops
National Rice Seed Storage Laboratory for Genetic Resources (NRSSL), Thailand	Rice ( <i>Oryza sativa</i> )
Leibniz Institute of Plant Genetics and Crop Plant Research (IPK), Germany	Barley ( <i>Hordeum</i> ), pea ( <i>Pisum</i> ), wheat ( <i>Triticum</i> ), lettuce ( <i>Lactuca</i> ) and <i>Brassica oleracea</i> <sup>1)</sup>
The International Crop Research Institute for the Semi-Arid Tropics (ICRISAT), India	Groundnut ( <i>Arachis</i> ), chickpea ( <i>Cicer</i> ), pearl millet ( <i>Pennisetum</i> ) and pigeon pea ( <i>Cajanus</i> )
Instituto Nacional de Investigação Agrária, INIAV, Portugal	Maize ( <i>Zea mays</i> )
Empresa Brasileira de Pesquisa Agropecuária (Embrapa), Brazil	Soybean ( <i>Glycine max</i> )
Nordic Genetic Resource Centre, Sweden	Timothy ( <i>Phleum pratense</i> )

The first seeds for the experiment were produced by IPK in 2019 and placed in the Seed Vault in August 2020. The second set of seeds from IPK and the first set of seeds from INIAV, Portugal were produced by the genebanks, dried and packed by NordGen and placed in the Seed Vault in October 2021.

During 2021, first sets of rice from NRSSL, Thailand and timothy grass seeds produced by NordGen are dried at NordGen and will be packed and placed in the Seed Vault in 2022. The second sets of *Brassica* (IPK) and maize (INIIV) have been produced in 2021 and will be sent to NordGen in the beginning of 2022. Seed material from the two remaining partners, ICRISAT in India and Embrapa in Brazil have been produced, but the partners have faced significant difficulties regarding the shipment, both due to the pandemic but also due to problematic bureaucratic procedures in their home countries. NordGen and partners have plans to overcome these difficulties in 2022.

*Figure 5. The seed samples for the 100 year experiment have preliminary been placed in standard black plastic boxes in storage hall 1. Towards the end of the establishment period, NordGen will move the experimental seed samples to smaller boxes that clearly distinguish the experiment from regular seed deposit boxes in the Seed Vault. Photo: Jonatan Jacobson*



No activities have taken place in the *100 year Seed Storage Experiment in the Coal Mine* in 2021. Only rent for the storage in the mine has been charged to the Seed Vault budget in 2021.

From 2022 and onwards NordGen has suggested that the project is removed from the Seed Vault budget and is considered as a pure NordGen project, managed and funded by NordGen, as it also was during the first more than twenty years. Germination results will still be shared with Seed Vault partners.

## **7. Printing accession data on nanofilm**

It has been decided to increase the security and integrity of the data about seed samples that are deposited in the Seed Vault by printing data on nanofilm. Preparing the data was completed in 2021 and film has been produced towards the end of the year. Placing film in the Seed Vault and fix film labels to seed boxes will be done in 2022.

## 8. Financial result

Key figures for funding and the financial result and account wise budget and spending for 2021 are shown in Annex 2. The financial result as the difference between funding and spending for 2021, adjusted for currency fluctuations shows a surplus of SEK 177,803. The reasons for the surplus are related to reduced travel activities due to the covid-19 pandemic, postponed IAP meeting and delayed deliveries of seed to the establishment of the 100 year experiment in the Seed Vault. More details account wise below.

### Directing and interaction with partners

Total spending on this activity area has been in line with the budget. Meetings have mostly been organized on digital platforms, however, by the end of the year, it was possible for the parties to meet in Svalbard.

### Administration, planning and documentation

Administrative staff at NordGen takes care of annual budgets, financial statements and bookkeeping, and assists in the Seed Vault operations with document handling, archive and organizing events and travels. Consumption in 2021 is quite in line with the budget.

### Liaising with depositors and handling of seeds

Total spending for 2021 accounts for 93% of the budget. Due to travel restrictions, handling seeds in Svalbard has, for the two first Seed Vault openings in 2021 been carried out without assistance from NordGen staff located in Alnarp, Sweden. The travel costs have, however, stayed on a high level due to higher air fares during the pandemic and high accommodation costs.

### Data management

The accounts show overspending of about 20% in the data management activity area. The overspending relates to testing, documentation and improvement of the new Seed Portal, which also in 2021 has required more working hour inputs from both NordGen IT-staff and the Seed Vault coordinator.

### Communication attracting new depositor genebanks

Spending on this activity area has been quite in line with the budget. Less travels have been compensated by increased and consolidated online communication with a significant number of potential depositor genebanks.

### Public awareness activities

Public awareness activities in 2021 involved the NordGen Communication Manager and the Seed Vault Coordinator. Total spending during the year has been around 88% of the budget. The lower spending is explained by reduced travel costs and more working hours spent on handling seed deposits by the Coordinator.

### International Advisory Panel

The third meeting of the International Advisory Panel was initially planned for February 2022, implying that preparations partly had to be conducted in 2021. It was, however, decided to plan for organising the IPA meeting in October 2022, and the cost on the account has consequently been lower than budgeted. NordGen has, through the year, stayed in touch with the IAP members and provided updates and information for their use as acting as ambassadors for the Seed Vault in their fora.

### Long term storage experiment

Due to the pandemic, parts of the new project *Long Term Storage Experiment in the Seed Vault* have been delayed. The main reason for this is that participating genebanks outside Europe have not been able to send seeds for the experiment as planned. Seeds are produced, but the final shipment part has been problematic. Labour costs have been lower than budgeted. On the other hand, postponed chemical analyses have been performed by IPK in 2021.

Total spending has been 70% of the budget. Unspent budget due to delayed activities will be needed for project activities during the coming years.

### Conserving data on long-term storage medium

Nano film reel and film labels to seed boxes in the Vault have been printed in 2021. Spending has been approximately 30,000 SEK lower than the budget. Unspent budget will be needed for purchase of film label holders in 2022.

### Core activities vs. project activities

In total, the accounts for 2021 (Annex 2) shows a surplus of SEK 177,803 in comparing the actual funding against expenditures for the year. Lower spending compared to the budget on core activities amounts to SEK 151,702 and the corresponding savings for the two projects are SEK 107,011. Due to unfavourable exchange rates SEK / Euro in 2021, the result actual to funding was reduced to the above-mentioned SEK 177,803.



Reasons for this surplus have been explained activity area wise above. Savings in the two projects are related to delayed project activities and unspent budget will be included in the budgets for subsequent years.

#### Working Capital Fund

Up to 2020, the difference between total spending and funding each year has been added and accumulated to the Working Capital Fund (WCF) which balance has increased in years with an account surplus. In 2021, and valid for budgets for 2022 and onwards, it has been decided to include yearly surpluses in the funding basis for the following years' management and operation. It is therefore not relevant to report on the year-by-year changes in the WCF in this report.

The surplus of SEK 177,803 from 2021 will be included in the funding basis for the 2023 budget. As agreed, NordGen suggests budgeting for a reserve of SEK 200,000 to compensate for the fluctuations in exchange rates.

## Annex 1.

### List of depositors to the Svalbard Global Seed Vault listed in order of Deposit Agreement signature. Updated pr 31. Dec. 2021.

Acronym	Country	Institute name	Wiews code	SDA	Accessions end 2021
WARDA	International, Benin	Africa Rice Center	CIV033	2007/2008	19477
CIAT	International, Columbia	Centro Internacional de Agricultura Tropical	COL003	2007/2008	57534
CATIE	International, Costa Rica	The Tropical Agricultural Research and Higher Education Center	CR1001	2007/2008	1314
ILRI	International, Ethiopia	International Livestock Research Institute	ETH013	2007/2008	6282
ICRISAT	International, India	International Crop Research Institute for the Semi-Arid Tropics	IND002	2007/2008	117713
ICRAF	International, Kenya	World Agroforestry Centre	KEN023	30.01.2008	1536
CIMMYT	International, Mexico	Centro Internacional de Mejoramiento de Maiz y Trigo	MEX002	2007/2008	177830
IITA	International, Nigeria	International Institute of Tropical Agriculture	NGA057	2007/2008	23333
CIP	International, Peru	Centro Internacional de la Papa	PER001	2007/2008	9615
IRRI	International, Philippines	International Rice Research Institute	PHL001	2007/2008	126447
ICARDA	International, Syria	International Centre for Agricultural Research in Dry Areas	SYR002/ LBN002	2007/2008	97083
AVRDC	International, Taiwan	The World Vegetable Center	TWN001	2007/2008	29147
NORDGEN	Regional, Sweden	Nordic Genetic Resource Center	SWE054	30.01.2008	26820

IPK	Germany	Leibniz Institute of Plant Genetics and Crop Plant Research	DEU146	30.01.2008	59516
CGN	Netherlands	Centre for Genetic Resources	NLD037	30.01.2008	21703
PGRI-NARC	Pakistan	Plant Genetic Resources Institute, National Agricultural Research Centre	PAK001	30.01.2008	4932
SSE	USA	Seed Savers Exchange	USA974	30.01.2008	4111
NGBK	Kenya	Kenya Agricultural & Live-stock Research Organisation (KALRO): Genetic Resources Research Centre	KEN015	26.02.2008	1314
NAC / RDI	South Korea	National Agrobiodiversity Center	KOR043	06.05.2008	Transferred to KOR011
IAS	North-Macedonia	Institute of Agriculture Skopje	MKDxxx	11.06.2008	0
NBPGR	India	National Bureau of Plant Genetic Resources	IND001	04.07.2008	225
VIR	Russia	N.I. Vavilov All-Russian Scientific Research Institute of Plant Industry	RUS001	04.07.2008	6082
RAC	Switzerland	Station Federale de Recherches en Production Vegetale de Changins	CHE001	27.10.2008	10377
EMBRAPA	Brazil	The Brazilian Agricultural Research Corporation	BRA008	06.11.2008	4757
AFT	Ireland	Oak Park Research Centre	IRL001	16.01.2009	577
DAFF	Ireland	Department of Agriculture, Food and Rural Development	IRL029	22.01.2009	435
TARI	Taiwan	Taiwan Agricultural Research Institute	TWN006	26.02.2009	10503
UAAS	Ukraine	Institute of Plant Production n.a. V.Y. Yurjev of UAAS	UKR001	03.03.2009	2782

PGRC	Canada	Plant Gene Resources of Canada, Canadian Genetic Resources Program	CAN004	05.11.2009	31955
ILRF	Georgia	I. Lomouri Research Institute of Farming.	GEO001	23.02.2010	305
AAS	North Korea	Pyongyang AAS	PRK013	18.03.2010	5700
UNALM	Peru	Universidad Nacional Agraria La Molina	PER002	25.05.2010	1296
ICCI	Israel	Institute of Cereal Crop Improvement, Tel Aviv University	ISR003	23.06.2010	900
DELEP	USA	Desert Legume Program. University of Arizona	USA971	24.08.2010	134
ARC	Sudan	Agricultural Research Corporation	SDN034	18.10.2010	Transferred to SDN002
SPGRC	Regional, Zambia	SADC Plant Genetic Resources Centre	ZMB030	09.11.2010	11995
NAGREF	Greece	National Agricultural Research Organization	GRC035	02.02.2011	25
ICABIOGRAD	Indonesia	Indonesian Center for Agricultural Biotechnology and Genetic Resources	IDN179	02.02.2011	1050
MPGRPPD	Myanmar	Department of Agricultural Research	MMR003	23.02.2011	718
INIAP	Ecuador	Instituto Nacional Autónomo de Investigaciones Agropecuarias	ECU076	12.04.2011	168
NARO	Uganda	National Agricultural Research Organization	UGA031	26.05.2011	777
BARI	Bangladesh	Plant Genetic Resource Centre, Bangladesh Agricultural Research Institute	BGD164	10.06.2011	0
LSB	Italy	University of Pavia, Department of Earth and Environmental	ITA411	23.06.2011	2

		Sciences, Lombardy seed bank			
NACGRAB	Nigeria	National Centre for Genetic Resources and Biotechnology	NGA010	06.09.2011	800
IRAG	Guinea	Institut de Recherche Agronomique de Guinée	GIN020	07.10.2011	0
RNGRC	Tajikistan	Republican National Genetic Resource Center	TJK027	14.11.2011	1646
AGRI	Azerbaijan	Genetic Resources Institute of the Azerbaijan National Academy of Sciences	AZE015	17.02.2012	1522
INRB	Portugal	Instituto Nacional de Recursos Biológicos	PRT005	05.03.2012	Transferred to PRT001
ISABU	Burundi	Agricultural Research Institute of Burundi	BDI003	19.06.2012	829
IER	Mali	Institute of Rural Economy	MLI002	19.09.2012	758
PSARTI	Mongolia	Plant Science Agricultural Research Institute	MNG030	02.10.2012	360
INIA La Platina	Chile	Unidad de Recursos Genéticos -INIA La Platina	CHL002	03.10.2012	Transferred to CHL044
AUG	Georgia	Georgia State Agrarian University	GEO028	15.10.2012	120
NPGR	Philippines	National Plant Genetic Resources Laboratory	PHL129	18.10.2012	2254
ASAU	Armenia	Armenian State Agrarian University, Laboratory of Plant Gene Pool and Breeding	ARM035	16.12.2012	175
CN FCRC	Thailand	Chai Nat Field Crops Research Center	THA214	01.03.2013	150
UzRIPI	Uzbekistan	Uzbek Research Institute of Plant Industry	UZB006	01.03.2013	2038

SARDI	Australia	South Australian Research and Development Institute	AUS006	12.06.2013	Transferred to AUS167
AGG	Australia	Australian Grains Genebank/Australian Tropical Crops Collection	AUS165	26.11.2013	16769
BWPRC	Japan	National University Corporation Okayama University	JPN009	26.11.2013	5268
NRSSL	Thailand	National Rice Seed Storage Laboratory for Genetic Resources, Rice Department	THA012	14.08.2013	694
AGES	Austria	Austrian Agency for Health and Food Safety, Dept. for Plant Genetic Resources	AUT001	17.03.2014	2358
BGRIPGR	Bulgaria	Institute for Plant Genetic Resources "K.Malkov"	BGR001	17.03.2014	933
NCGRP	USA	National Center for Genetic Resources Preservation, USDA	USA996	SIGNED 18.01.2015	135237
NFSC	Norway	The Norwegian Forest Seed Centre	NOR056	08.01.2015	208
Luke	Finland	Natural Resources Institute Finland	FIN027	21.01.2015	7
CRI	Czech Republic	Crop Research Institute	CZE122	28.08.2015	1467
UCR-CIA	Costa Rica	Universidad de Costa Rica	CRI092	08.09.2015	Transferred to CRI003
PdeP	Peru	Parque de la Papa	PER862	09.09.2015	750
AGRESEARCH	New Zealand	Margot Forde Germplasm Centre	NZL001	11.1.2016	2363
CHAIPATT	Thailand	Chaipattana Foundation	THA513	11.2.2016	34
APG	Australia	Australian Pastures Gene Bank	AUS167	11.3.2016	28493

GRIBL	Bosnia & Herzegovina	Genetic Resources Institute, University of Banja Luka	BIH039	16.6.2016	921
INRA	France	National Institute for Agricultural Research	FRA040	16.6.2016	2
TLL	Singapore	Temasec Life Sciences Laboratories Ltd.	SGP008	19.8.2016	7
JHI	UK	James Hutton Institute	GBR251	09.11.2016	1033
MNREC	Myanmar	Myanmar Ministry of Natural Resources and Environmental Conservation	MMR075	09.11.2016	491
RPCNASBAF	Belarus	Scientific Practical Centre of the National Academy of Sciences of Belarus for Arable Farming	BLR011	17.01.2017	341
ETKI	Estonia	Estonian Crop Research Institute	EST019	25.10.2017	133
SVKPIEST	Slovak Republic	National Agricultural and Food Centre	SVK001	08.01.2018	630
INIAV	Portugal	Banco Português de Germoplasma Vegetal	PRT001	26.02.2018	618
INIA	Chile	Instituto de Investigaciones Agropecuarias	CHL044	06.04.2018	145
DOA	Thailand	Department of Agriculture, Ministry of Agriculture and Cooperatives	THA032	09.08.2018	55
UKVGB	United Kingdom	University of Warwick	GBR006	13.08.2018	1090
LSFRI	Latvia	Latvian State Forest Research Institute "Silava"	LVA009	28.10.2018	153
BDNA	South-Korea	Baekdudaegan National Arboretum	KOR048	03.06.2019	10
APGRC	Sudan	Agricultural Plant Genetic Resources Conservation and Research Centre	SDN002	13.09.2019	2164

JKI	Germany	Julius Kühn Institute	DEU451	30.09.2019	6
IHAR	Poland	Plant Breeding and Acclimatization Institute	POL003	09.10.2019	2857
BRGV	Romania	Suceava genebank "Mihai Christea"	ROM007	23.10.2019	416
MSB, Kew	United Kingdom	Royal Botanic Gardens, Kew	GBR004	18.12.2019	2
UCR	Costa Rica	Universidad de Costa Rica	CR1003	08.09.2015 (as CR1092)	57
LARI	Lebanon	Lebanese Agricultural Research Institute	LBN020	14.01.2020	453
ICGB	Israel	Wild Cereal Genebank, University of Haifa	ISR037	30.03.2020	323
CN	USA	Cherokee Nation	USA1005	21.01.2020	9
INRA	Morocco	Institut National de la Recherche Agronomique	MAR123	24.02.2020	983
JIC	United Kingdom	John Innes Centre, Germplasm Resources Unit	GBR247	10.07.2020	4334
IFVCNS	Serbia	Institute of Field and Vegetable Crops	SRB002	23.08.2021	96



## Annex 2. Budget and spending 2021

### Budget – Svalbard Global Seed Vault NordGens management and operation 2021

Activity area/activity		Budget currency SEK	Actual currency SEK
<b>Directing and interaction with partners</b>	Management and meetings	222 164	267 349
<b>Project no 709513</b>	Management assistance and meetings	120 273	80 304
	Travels	30 000	22 974
	<b>Sub-total</b>	<b>372 437</b>	<b>370 627</b>
<b>Administration, planning and documentation</b>	Administration management	84 074	34 278
<b>Project no 709524</b>	Support accounts, archive & logistics	57 419	95 594
	Support project coordinator	28 875	0
	Documents and background information	420 954	430 439
	Travels	0	9 866
	<b>Sub-total</b>	<b>591 322</b>	<b>570 177</b>
<b>Liaising with depositors and handling of seeds</b>	Communication & Seed handling	300 682	362 677
<b>Project no 709515</b>	Seed handling in Svalbard	72 940	0
	Travel	80 000	68 628
	Contracted services	30 000	18 635
	<b>Sub-total</b>	<b>483 622</b>	<b>449 940</b>
<b>Data management</b>	Maintenance and updates of databases	56 314	87 464
<b>Project no 709514</b>	Preparing datasets	120 273	150 092
	Contracted services	50 000	52 406
	Travel	12 000	0
	<b>Sub-total</b>	<b>238 587</b>	<b>289 962</b>
<b>Communication attracting new depositor gene banks</b>	Communication activities	120 273	152 004
<b>Project no 709525</b>	Travel	40 000	120
	<b>Sub-total</b>	<b>160 273</b>	<b>152 124</b>
<b>Public awareness activities</b>	Respond to enquiries, lectures/articles, website	340 818	302 574

<b>Project no 709516</b>	Serve media, produce material, website & SE	215 984	217 540
	Travel	50 000	16 482
	<b>Sub-total</b>	<b>606 801</b>	<b>536 596</b>
<b>International Advisory Panel</b>	Secretary	106 263	92 191
<b>Project no 709517</b>	Secretary assistance	28 875	0
	Logistics arrangements	19 140	0
	Travel	0	0
	Meeting costs	0	0
	<b>Sub-total</b>	<b>154 277</b>	<b>92 191</b>
<b>Long term storage experiment</b>			
<b>Coal Mine #3</b>	Location hire (coal mine #3)	6 000	0
<b>Project no 709519</b>	<b>Sub-total</b>	<b>6 000</b>	<b>0</b>
<b>Totals – Basic budget</b>		<b>2 613 319</b>	<b>2 461 617</b>

<b>Long term storage experiment in the Seed Vault</b>	Coordination	0	0
<b>Project no 709529</b>	Preparing and handling of test samples	82 820	10 944
	Seed technician	40 000	5 587
	Contracted seed analysis program	86 000	148 910
	Shipment costs	40 000	7 861
	<b>Sub-total</b>	<b>248 820</b>	<b>173 302</b>
<b>Conserving data on long-term storage medium</b>	Administration	0	0
<b>Project no 709523</b>	Compiling data	0	0
	Contracted services	150 000	118 507
	<b>Sub-total</b>	<b>150 000</b>	<b>118 507</b>
	<b>Sub-total</b>	<b>398 820</b>	<b>291 809</b>
			0
exchange rate Dec 2021 1 EURO=10,2269 SEK	<b>Total SEK Budget and Result</b>	<b>3 012 139</b>	<b>2 753 426</b>
	<b>Total SEK Funding 2021</b>		<b>2 931 229</b>
		Crop Trust	1 341 446
		LMD	1 483 662
		NordGen	106 121
	<b>Result actual to funding</b>		<b>177 803</b>

## Annex 3. Key figures - deposits and depositors

Seed deposits, depositors, seed boxes in the Seed Vault and seed deposit events for 2017-2021, actual numbers for each year and accumulated figures.

Year	2017	2018	2019	2020	2021
<b>Seed accessions</b> <sup>1) 2)</sup>					
Accessions deposited	64403	92638	32572	82501	50926
Deposited accessions in total, by 31.12	983316	1075954	1108526	1191027	1241953
Withdrawals	54354		24064	40	
Withdrawals in total by 31.12.	92430	92430	116494	116534	116534
Seed Vault collection by 31.12	890886	983524	992032	1074533	1125419
<b>Depositors</b>					
Depositors	15	30	7	42	22
New depositors	3	3	3	8	2
Depositors in total by 31.12	74	77	80	87	89
New signatories	2	6	6	5	1
Signatories in total by 31.12	79	85	91	96	97
Number of deposit events	4	3	4	3	3
<b>Seed boxes</b> <sup>1)</sup>					
Number of deposited boxes	173	277	113	256	165
Deposited boxes in total	2704	2981	3094	3350	3515
Number of retrieved boxes	161		36		
Retrieved boxes in total	289	289	325	325	325
Boxes in Seed Vault by 31.12	2415	2692	2769	3025	3190

<sup>1)</sup> Test seed samples and test boxes are not included.

<sup>2)</sup> Deposited seed samples not registered in the Seed Portal database are not included. These are seeds from Svalbard native flora, orchid seeds from Myanmar and pasture seed mixtures deposited by Royal Botanical Gardens, Kew in the UK.

## Annex 4. Lectures and presentations 2021

Åsmund Asdal:

- 1.2. Conserving plant genetic resources in genebanks and in the Svalbard Global Seed Vault. The International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM). Online lecture at The International Master on Plant Genetics, Genomics and Breeding 2021, Zaragoza, Spain.
- 1.2. Seed longevity experiments in Svalbard: Results from the ongoing investigations in the coal mine and plans for a new experiment in the Seed Vault. The International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM). Online lecture at The International Master on Plant Genetics, Genomics and Breeding 2021, Zaragoza, Spain.
- 17.2. Conserving plant genetic resources in genebanks and in the Svalbard Global Seed Vault. Online lecture at elective course Svalbard and the Arctic at Architecture School Cooper Union, US.
- 3.6. The Svalbard Global Seed Vault. Conserving plant genetic resources in the Arctic. Lecture at the maintenance building at the Seed Vault for visiting staff from the Kazakhstan Embassy in Oslo.
- 11.9. Food, seeds and genetic resources in the Arctic. Lecture at ArktiskMat festival 2021, New pastures, Mosjøen, Norway. <https://arkmat.com/>
- 26.10. The Svalbard Global Seed Vault. Conserving plant genetic resources in the Arctic. Lecture in the maintenance building at the Seed Vault for visiting delegations from Latvia and Serbia at the occasion of depositing seeds for the first time by genebanks in these countries.
- 9.11. Management and operation of the Svalbard Global Seed Vault. Online presentation to the NordGen board at their November board meeting.
- 18.11. Svalbard Globale Frøhvelv – Noahs ark for frø i Arktis. Presentation Foreningen Norden, Lillehammer.
- 29.11. Fra ville rips i Jotunheimen til en halv milliard frø i Platåfjellet på Svalbard. Online presentation for members of KVANN (Norwegian branch of Seed Savers)

6.12. The Svalbard Global Seed Vault. Conserving plant genetic resources in the Arctic. Online lecture on Workshop 'Conservation and Sustainable Use of Plant Genetic Resources', organized by the Croatian Agency for Agriculture and Food.

14.12. Svalbard Global Seed Vault. 10000 Jahre Evolution konserviert in der Arctis. Expertstunde organized by voestalpine Steel Division, Linz, Austria. Online presentation, simultaneously translated to German.

Åsmund Asdal and Elisabetta Tola

3.10. Lunga vita ai semi. Online lecture and discussion at the Food & Science Festival, Mantua, Italy October 1.-3. [www.foodsciencefestival.it](http://www.foodsciencefestival.it). Simultaneously translated to Italian.

## Annex 5. Publications 2021

### Publications about the Svalbard Global Seed Vault by NordGen staff

Asdal, Å. 2021. The role of the Svalbard Global Seed Vault in preserving crop genetic diversity. In: Dulloo, M. E. (ed.), *Plant genetic resources: A review of current research and future needs*, Burleigh Dodds Science Publishing, Cambridge, UK (ISBN: 978 1 78676 451 5; [www.bdspublishing.com](http://www.bdspublishing.com))

Asdal, Å. 2021. Datemi un Seme e salver il mondo. Italian magazine Focus, weekly magazine LEFT, Cultura & Scienza section. Pagine 60-63, Italy. <https://www.focus.it/scienza/scienze>

Brodal, G & Å. Asdal. 2021. Longevity of Plant Pathogens in Dry Agricultural Seeds During 30 Years of Storage. *Microorganisms*, MDPI

Asdal, Å. 2021. Prefácio in *A arca de Noé das frutas nativas brasileiras*, edited by J.F. da Silva Junior, F. Vidigal Duarte Souza and J. Gomes Pádua. Book published by Empresa Brasileira de Pesquisa Agropecuária Ministério da Agricultura, Pecuária e Abastecimento. Brasília, Brazil 2021

