Equipment List - Summarized

Updated: 10 October 2018

	Laboratory	Item Name	Key Specifications	Item Details
	Animal Production and Health			
1		Flow Cytometer	Laser based system for cell analysis & biomarker detection; include 3 excitation lasers with 10 colour spectra, capable to detect submicron particles	To study the immune cell response to pathogens by flow cytometric phenotyping assays. Fluorescence detection of cells with different morphology, cell sorting, and intracellular cytokine assays also aid in study of multiple biological parameters such as cell type, size, DNA content and the effect of irradiation on parasites, such as trypanosomes, as well has the effect or irradiated microbes on host cells.
2		Next Generation Sequencer	Massively parallel sequencing platform for mammalian genome & transcriptome with high coverage and sequence output (10 GB - 1 TB), read length (250 bp - 10 000 bp)	Next generation sequencing, a high throughput platform, can increase the sequencing efficiency more than 100,000 times, greatly reduce the cost per genome, and enable quick response towards disease management during outbreaks. NGS technology offers a wide range of applications including whole genome sequencing, transcriptome sequencing, targeted sequencing, methylation studies, ChIP sequencing, BAC sequencing, etc. NGS technology will also be beneficial to genetic characterization of indigenous livestock genomes of indigenous species for meat and milk production, disease resistance, etc.

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3		High throughput SNP genotyping system	Dynamic array based system for SNP genotyping, integrated fluidic circuits that automatically combines reactions and perform endpoint measurements	High throughput SNP genotyping tools are required to screen and detect novel genetic variants in indigenous livestock of various member states. The endpoint genotyping platforms (e.g. Fluidigm) based on allele specific PCR system offers the most efficient way for high sample throughput SNP genotyping and other applications, including gene expression down to single cell, digital PCR, mutant detection, real-time PCR to qualify and quantitate samples prior to next-generation sequencing, etc. This platform will be cost-effective for multiplex SNP genotyping and can help in generating high quality genotype data for genetic association as well as animal health studies. Additionally, such a platform has the advantage of being integrated with robotic liquid handling system to improve the precision and speed of the experiments.
	Food and Environmental Protection			
4		UHPLC high resolution QToF mass spectrometer	Ultra high performance LC coupled to QToF MS, exact-mass, ion-mobility or equivalent, mass range (up to 16.000)	For replacement of current instrument in 2017
5		Biological oxidizer	Suitable for combustion of food and soil sample material for LS counting	Research and development with radiolabelled pesticides/compounds
6		Molecular spectroscopy	Laser-induced breakdown spectrometer (LIBS)	Research and development of cost-effective, transferrable methods for food traceability/authenticity.
7		Nuclear magnetic resonance spectrometer	1.4 Tesla, 60 MHz, 1H, 13C	Fingerprinting and structural elucidation of foods and food components for authenticity testing

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	Insect Pest Control			
8		Cryopreservation Equipment	One chemical hood, one bacteriological cabinet, one transmitted light dissection microscope, two liquid nitrogen containers, one pressurized liquid nitrogen container, one 4-liters Dewar, five True North® Cool Containers, five Liquid Nitrogen-Cooled Mortar, three Robot (Cryobot IV) components	A technology where insect eggs are preserved by cooling to very low temperatures and can be revived at a later time, Fruit fly strain maintenance
9		Bioclimatic chamber for specific experiments on fruit fly rearing (2)	Two bioclimatic chambers, temp. range: -10-50°C, 20-95% RH, light: 100-1000 lux	An incubator for the preparation of the biological materials used for specific experiments on fruit fly rearing.
10		Ultra-centrifuge	Standard device that can spin at a very high speed to sediment very small particles such as viruses and protein components.	Molecular work on fruit flies, tsetse and mosquitoes
11		Quantitative PCR	Standard QPCR equipment	Molecular work on fruit flies, tsetse and mosquitoes
12		COPAS FP-500 Large Particle Flow Cytometer	The COPAS FP-500 is capable of analyzing small (40-300 microns) and large quantities of objects using five parameters: size, optical density and up to three channels of fluorescence.	To be used for the sorting of eggs, larvae and pupae of mosquitoes
	Nuclear Science and Instrumentation			
13		Transportable large area 2D fast-scanning macro-XRF spectrometer	Moveable Exc/detection Head (tr. span 60 x 60 cm) 2 x (50 w) X-ray tubes (Rh, Cr) with collim (0.5 to 2 mm) Digital MCA & control unit for measuring 'on the fly' mode	To incorporate capabilities for fast large-area 2D elemental analysis and imaging at sub-millimetre scale of medium to large size objects. Allows the inspection of easel paintings, electronic circuits and other samples where elemental distribution is of concern
14		High power rotating anode X-ray tube source	Max. power 9 kW; HV 20-60 kV adjustable in steps; Current 10-60 mA, adjustable in steps; Anode Mo/Cu, x-ray window 0.2 mm Be, available ports: 2, Shutter type: Line Focus / circular focus High speed rotary, one per port Take off type: Horizontal point focus, focal spot ~ 70 microns	The mirror chamber installed at NSIL for training scientists before measurement campaigns are executed in the IAEAXspe chamber installed at Elettra requires of a high brilliance x-ray source for effective operation

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15		Equipment and instrumentation supporting the new neutron laboratory equipped with one DD and one DT generator.	(1) Pneumatic rabit system to complete the Neutron Activation Analysis system. (2) Neutron instrumentation for training activities. This can includes 3He, BF3 or boron lined proportional counters, fission ionisation chanmbers and associated electronics such as dedicated power supply, amplifier, discriminator and counting system.	These items will enlarge the scope of the training provided by NSIL in the field of neutron activation analysis and neutron instrumantation.
16		Components for the development of improved efficiency portable XRF spectrometer	Multisegment SDD detector with anodes surroundiing a central hole, miniature x-ray tube, integrated DSP and microcomputer for operation and spectrum interpretation	Improved efficiency to respond to the needs of in-situ elemental analysis in samples relateds to food safety / authentication of origin, as well as plants in vivo
	Plant Breeding and Genetics			
17		Modular greenhouse (300 m2)	Four compartments; temperature 15-30°C ±5°C; lighting 300 µEm-2s-1 (photosynthetic quality); adjustable day length (12-20 h); automated watering; automated humidity (50-80%); modular design	Environmental control glasshouse compartments for research and training related to tropical and temperate crops. Radio-sensitivity testing, mutant trait screening, research on mutant lines and populations and for training.
18		Equipment for genotyping	One -80 freezer; one lyophilyzer; one liquid handling robot; one fluorescent plate reader for 96 and 384-well PCR plates; one Bioanalyzer Tapestation; one Real Time PCR machine	For R&D and capacity building in the area of mutant trait discovery and genotyping/molecular marker applications to enhance the efficiency of mutation breeding
19		Climate Chamber	Two walk-in crop growth rooms of ca 12 m2 each with shelving and LED light system and, optionally, with a thermal and/or multispectral imaging system for real time monitoring of plant growth and mutant selection	For R&D in the area of plant growth and mutant selection under complete environmental control (temperature, light, humidity). To support crop mutation breeding R&D for increased resilience to climate change (e.g. drought/heat tolerance) and food security.
20		Pathogen testing facility	Filtered air, double door system, controlled conditions for 500 plants with pathogen growth chambers	Dedicated and separate facility for plant disease trials, including containment incubators

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	Soil and Water Management and Crop Nutrition			
21		SWMCN Greenhouse Complex with three compartments	(a) Two compartments with environmental controls; temperature control (18-28°C ±5°C); lighting 300 µEm-2s-1 , photosynthetic quality, adjustable day length (12-20 hours); automated watering and humidity (50-80%); and (a.1) one compartment with 80 m2 (a.2) one compartment with 50 m2, which is specifically targeted and adapted for using radioactive tracers or materials in pot experiments (b) One frost-free compartment for walk-in growth chambers; 90 m2; temperature from +10 to +25°C; room height 5 m; minimum 6 m wide; modular for future expansion; availability of high purity water with conductivity <5 µS/cm; suitable electricity connections for at least 4 growth chambers	Climate controlled (18-28°C) greenhouse complex to study and enhance soil-water-plant synergies in the context of climate-smart agriculture (for tropical and temperate crops) and nuclear emergency response (transfer of radioactive materials from soil-water to crop).
22		Gas chromatography combustion isotope ratio mass spectrometry (GC-c-IRMS)	For measurement of C-13 and N-15 stable isotope signatures of specific organic compounds (e.g. fatty acids); the system consists of a gas chromatograph (GC) with an autosampler for liquid and headspace injection, an oxidation/combustion-system and an open-split system connected to the Isotope Ratio Mass Spectromete	Analysis of specific organic compounds (e.g. fatty acids) to identify hot spots of land degradation, e.g. C-13 and D signatures. Dissemination of this technique has started in Latin America and Asia through regional TC projects to improve soil conservation strategies at landscape level. With the same equipment N-15 and O-18 stable isotope signatures of specific organic compounds can be measured, it is expected that more applications in the field of soil and water management, but as well food tracing and environmental management will be available in the coming years. The IRMS can be coupled as well in parallel with the precon (priority 4), indicated below. It is recommended to procure an advanced IRMS with additional collector arrangements (8 collectors)

	Laboratory	Item Name	Key Specifications	Item Details
23		Broad energy gamma detector	Broad Energy Ge (BEGe) Detector to covers the Energy range from 3 keV to 3 MeV, combines the spectral advantages of Low Energy and Coaxial HPGe detectors (preferable with no need for calibration through standards)	For measuring radionuclides for soil erosion assessment and nuclear emergency response in food and agriculture.
24		Automatic CO2 flux measurement system	Field deployable, suitable for long-term measurements of CO2 concentrations up to 20 000 ppm, including accessories, such as 16 automatic gas chambers, a multiplexer, and data analysis software	For automatic in-situ CO2 measurements (including accessories, such as 16 automatic gas chambers).
25		Hyperspectral camera system (including light-weight UAV platform) for air-borne soil and plant property screening	Hyper-spectral camera for light-weight UAV aircraft; UAV should be able to be integrated easily with the camera system (plug-in system not blocking solar radiation correction); all needed accessories for full operation from the ground and image analysis (preferably with user-friendly, internet independent software)	Hyperspectral remote sensing is a technology with many applications. It is capable of identifying unique spectral signatures of vegetation types, soil minerals, rock formations, and water quality. Hyperspectral imaging is the most information-rich source of spectral data and provides multiple benefits over multispectral imagery to address different farming issues, such as detection of diseases, pests, NPK deficiencies, identification of weeds, water stress, etc. Systems are now available for integration within UAVs.
26		Cryogenic gas concentration device for IRMS	Automatic cryogenic concentration and purification of trace greenhouse gases (N2O, CH4, CO2) for stable isotope measurements with IRMS	Automatic cryogenic concentration and purification of trace greenhouse gases (N2O, CH4, CO2) for stable isotope measurements with IRMS
27		Mid-Infrared Spectroscopy (including DRIFT + PLS modelling software + autoanalysis mode + other minor accessories)	Besides the need to reduce significantly analytical costs in developed and developing countries, the increasing popularity of site-specific management calls for fast, inexpensive, simultaneous analyses of large numbers of soil and plant variables. These challenges can be met by using DRIFT based MIRS analysis.	Diffuse Reflectance Infrared Fourier Transform (DRIFT) Mid- Infrared Spectroscope (MIRS) with software for Partial Least Square Analysis and Modelling, including auto-analysis mode (optional) and accessories for improving measurement quality

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	Terrestrial Environment			
28		Reference material preparation equipment	Fine milling of large amounts of environmental samples (200 kg amount per sample) with 90 micron particle size	For homogenising large samples. Consisting of several individual equipment steps needed for crushing, milling, sieving and bottling
29		Inductively coupled plasma optical emission dou spectrometer (ICP-OES)	High sensitivity and high precision ICP-OES with dual view option for environmental samples (high concentration dynamics)	For chemical characterization of reference materials to provide full determination in a single analysis.
30		Infrared laser systems for stable isotopes in CO2 and CH4	Laser systems for either pure CO2 and CH4 gas samples, respectively for ambient concentration levels of CO2 or CH4 in atmospheric air with dynamic concentration range of 10	Assignment of reference materials
31		Large-volume homogenizer	High capacity homogenizer for 200 kg samples including replaceable sample containers	For homogenising large samples (>200 kg)
32		Stable Isotope Ratio Mass Spectrometer (IRMS) with sample-preparation peripheral systems, to be used for characterisation of international reference materials.	IRMS for d2H, d18O, d13C and d15N, with dual inlet and continuous flow modes of operation. Sample-preparation peripherals for carbonate-acid preparation and for continuous flow applications (TC/EA and pyrolysis).	The intended use of IRMS and peripheral requires characteristics as following: • high sensitivity and high stability ion optics; • large dynamic range and high precision of detectors; • negligible contribution of high peaks and deflected ions to low intensity peaks; • high stability magnetic field, to perform peak jumping by magnetic field; • low sample size for carbonates (down to 10 micro gram).
33		Carbonate system for IRMS	Acid treatment of carbonate samples for quantitative stable isotope analysis of generated CO2 via isotope ratio mass spectrometry	Reference material preparation
34		Infrared laser spectroscopy system for stable isotopes of water	High precision analysis of δ2H, δ18O, δ17O of water samples by water injection through autosampler for stable isotopic characterization of reference materials and other high quality materials.	High precision and reproducibility required. Automated measurement with included autosampler. Operation by dried air as carrier gas required. Analysis of δ17O mandatory for characterization of new and existing reference materials.

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35		Triple quadrupole - inductively coupled plasma - mass spectrometer (ICP-QQQ-MS, TQ-ICP-MS, ICP-MS/MS)	ICP-MS with quadrupole mass analyser and tandem MS capability, i.e. with an additional quadrupole mass filter and collision/reaction cell for efficient removal of interferences. High sensitivity across the full mass range and limits of detection in solution in the low pg/g range. Demonstrated stability for good within-run precision in external calibration applications, and for precise isotope ratio measurements (<0.1% RSD) for isotope dilution calibration. Dual mode detector for high dynamic range	For characterisation measurements of mass fractions of trace elements (including Cr, Fe, Co, As, Se, Ag, Cd, Hg, Pb, Pt and rare earth elements) and long-lived radionuclides (e.g., U, Th, Am) at environmental levels in diverse reference materials and proficiency test samples, including fresh water and acid digests of vegetation, biological matrix, soil and sediment materials.
36		**Gas handling system and vacuum equipment**	**Equipment for gas mixing, vacuum pumps; gas supplies in the lab**	**A system containing high precision pressure and temperature sensors and calibrated volumes to prepare gas mixtures from pressurized gas cylinders as reference materials - mainly CO2 in synthetic air.**