Objective

The capacities of the QI-institutions in Latin America and the Caribbean for the provision of new and innovative services in the field of biodiversity and climate protection are strengthened.

Success Indicator

- At least X sector strategies are developed that target the challenges arising for the quality infrastructure with respect to the protection of biodiversity and the climate.
- At least X new and demand-oriented QI services in the field of biodiversity and climate protection are developed.

Individual Activity Proposal

„Quality assurance and metrological traceability of analytical parameters used for the characterization of quinoa”

Date 22/09/2014

Submitting Organisation:

Name of responsible contact person
Hector Laiz
Patricia Gatti
Institution: National Institute of Industrial Technology (INTI)
Phone: (54 11) 47246317
Email: laiz@inti.gob.ar; pagatti@inti.gob.ar

Implementing Partners

Who else is involved in this activity?
Juan Carlos Castillo
Mabel Delgado
Institution: IBMETRO – (Bolivian Metrology Institute)
Phone(+591 2) 2372046 2147945
Cell-phone: (+591) 72038883
Email: jc.castillo@ibmetro.gob.bo – mdelgado@ibmetro.gob.bo
José Dajes
Galía Ticona
INDECOPI (Peru)
Phone: (511) 2247800 ext 1331
Email: jdajes@indecopi.gob.pe; gticona@indecopi.gob.pe

1. Traceability of measurements of humidity (Argentina, Bolivia, Peru, Mexico and others)
2. Characterization of CRM in natural matrix (Argentina, Bolivia, Peru, Brazil and others)

Note: Partners could identify other partners in the region for developing this project.

Colombia and Ecuador confirmed their interest to join the project proyecto:

Luis Alfredo Chavarro Medina
ichavarro@inm.gov.co
Subdirector de Metrología Química y Biomedicina
Instituto Nacional de Metrología de Colombia

Laura González T. lgonzalez@inen.gob.ec
DIRECTORA TÉCNICA DE METROLOGÍA
Regional products and non-traditional foods is an important issue for the region.

**Background**

*What is the motivation to submit this proposal? What topic in the area of biodiversity or climate change is being addressed?*

At the initiative of Japan, recommended to the United Nations General Assembly to declare “2011-2020 as the United Nations Decade on Biodiversity”, the outcomes of recent gatherings of global leaders, indicate a consensus on the need to increase food production to feed a still growing population, but also on the need to ensure sustainability of that increase. The main challenge in this decade is feeding the world, coping with climate change and controlling the impact of agriculture on the environment. Agricultural production practices need to change. They need to become increasingly sustainable at the same time as meeting societal goals of access to sufficient, safe and nutritious food.

To carry out the challenge of providing enough food for population and to allow “non traditional economies” to grow up, there are great interest of providing support to regional and local production of “non-traditional foods” based on the sustainability and biodiversity of the countries.

Climate change affects the availability and characteristics of foods, that has to be preserved and ensured their safety and nutritional properties. It is important to mention that this year was declared by the General Assembly of United Nations "International Year for promotion of Quinoa" (IYQ). Quinoa is a pseudo-cereal considered one of the most balance food, for the high content of vitamins, minerals and proteins. The IYQ constitutes the first step in an ongoing process to focus world attention on the role that quinoa’s biodiversity and nutritional value play in providing food security and nutrition and in poverty eradication, in support of the achievement of the internationally agreed development goals including the Millennium Development Goals. (source: Master Plan for the international Year of Quinoa).

There is a need for research on the differences between the different varieties of quinoa, furthermore build confidence in the international market for quality control of this product, which so far, there are not reference materials and proficiency testing activities are reduced. The
cultivation of quinoa has remained a very small scale in some Andean communities and intended primarily to family consumption. There are some initiatives to rescue and enhancement of some Andean crops included the quinoa and reports about the benefits of consumption.

The kahiwa, amaranto and yacon for example, are Andean crops with beneficial properties from the standpoint of nutritional and therapeutic point of view. Argentina is interested in developing a quality criteria approach to be used in sustainable production of these crops in the region. As Quinoa is a local/regional product (Andean region) there are not standards of quality harmonized, and reference materials for the quality assurance of measurements are not available. The fact of having measurements capabilities available in the countries involved, can help in commercial issues related to quality products also, giving support to sustainable production for farmers. For that purpose, developing metrological traceability, proficiency tests and certified reference materials are the main aspects of this project.

It is essential to ensure the quality of this “new-foods” and for that purpose, reference materials in food matrices are needed to demonstrate metrological traceability in analytical measurements. The reference material production has to be targeted considering aspects like “commutability and comparability”.

The National Metrology Institutes (NMIs) have to give metrological support in the development of the analytical techniques used to characterize these foods and reference materials. Among other parameters water content is essential because affects the physical, chemical characteristics, it is relevant to determine composition and quality properties in foods. It is important to assure the metrological traceability of the water content analysis for legal and labeling requirements, economically important requirement, shelf life of the food or food products, food quality measurements and food processing operations. It is also considered to establish parameters of genuineness or absence of adulteration in origin. In some cases is used to establish some commercial conditions of payment to farmers.

Despite having the same chemical formula (H₂O) the water molecules in a food may be present in a variety of different molecular environments depending on their interaction with the surrounding molecules. The water molecules in these different environments normally have different phyiochemical properties: Many analytical procedures developed to measure moisture content are more sensitive to water in certain types of molecular environment than to water in other types of molecular environment. This means that the measured value of the moisture content or the measurement of its characteristics in a particular food may depend on the experimental technique used to carry out the measurement.

In the agenda of the 17th CCQM meeting (2011) http://www.bipm.org/utils/common/pdf/CCQM17.pdf the topic was included and accepted that “the issue is of interest not only to COOMET countries but to many others around the world. It is recognized that the measurand is method dependent and thus a globally accepted measurement procedure must be developed and applied. This is recognized by the CCQM as necessary to move forward, and a reference level methodology is needed, not a field method, but the
connection between the two must be readily evident. Dr Kaarls emphasized that there is a need to find a solution to this issue and that the purpose of this presentation is to propose a way forward, through the development of a standard methodology. Dr Kaarls summarized once again that a number of NMIs had some interest in this measurand and he recommended that these NMIs discuss and consider the development of parallel work on potential suitable measurement procedures”. Although the coulombimetry has been defined as a primary method in chemical metrology, the measurement of the water content depends on the method used and the conditions involved, there is not direct traceability to SI units in most of cases. There are different methods commonly used to determine water content in analytical laboratories (Karl Fischer, drying in a stove at fixed conditions etc) depending of the material and the purpose of use. It is a decision to use one of the other. In regulations and technical recommendations it is not always included the method that has to be used. There are some “moisture testers/meters” used in the food chain (based on NIR or conductivity principles) that has to be calibrated and their traceability demonstrated also. Water activity (aw) and the microbiological growth. It is used for establish microbiological conditions and in consequence the preservation of the material involved. Some measurements (AW) requires instrumental devices that has to be calibrated and traceability has to be demonstrated.

**Objective(s)**

*What benefit is aimed to be achieved for BioDiv and Climate Change actors?*

The objective is the improvement of the quality assurance tools and metrological traceability in measurements needed for characterization for quinoa. Those tools also may be used for other cereals and pseudocereals depending on the needs of the countries involved, in the future (Moisture Measurement Traceability, proximal and nutritional parameters, and organic contaminants), and developing a reference material. With the support of NMIs that has experience in the development of reference materials in the food sector, the Project will contribute through technical activities considering the terrestrial biodiversity where the “Quinoa food are “produced”, the development of reference material that help to establish a reference in nutritional composition measurement for the more important varieties “grain” of quinoa.

**Target Group**

*Who will benefit from the support?*

The benefits are related to the internal consumption and the exportations of these products. The direct users of the developed metrological services will be testing laboratories.

- Food industry
- Regulation bodies
- Standardization bodies
- Consumers
- Producers, farmers
Expected Results

**Which new or enhanced QI products or services you are expecting?**

- Technical basis for the standardization / certification of local products
- Analytical measurements harmonized,
- proficiency tests and certified reference materials developed
- accreditation of testing laboratories involved
- Protect farmers activity and a fair price for transactions

**Contribution to indicator**

**How does the activity contribute to achieve the success indicators of the fund?**

- At least X sector strategies are developed that target the challenges arising for the quality infrastructure with respect to the protection of biodiversity and the climate.

Sector strategies can give support to the production of quinoa under quality standards harmonized in the region. These standards might be focused under reliable measurements. The main areas of interest are: the primary production of quinoa preserving the local consumption and biodiversity criteria-practices. Regulators and control and standardization agencies giving support to the National Quality Infrastructure for the development of quality standards quinoa

- At least X new and demand-oriented QI services in the field of biodiversity and climate protection are developed.

New services may be referred to:

1.- Development and production of CRM Certified Reference MATERIALS in quinoa as a tool of quality assurance (QA) for laboratory measurements. This CRM will improve the analytical methods used for reliable measurements on quinoa, and the standardization process involved in the production with high standards of quality.

2.-Provision of proficiency testing (EA) as a tool for quality assurance laboratories. These services are currently being needed by laboratories, we understand it is an "unmet demand"

3.-Development of calibration services (humidity, temperature measurements, etc) in all the steps of quinoa production to give support the “traceability chain”

Methodology

**What is the approach you propose to achieve the objectives?**

Trainees, seminars, workshops among other NMIs and reference institutes.

The metrological services (proficiency tests and certified reference materials), involving the NMIs of the region and conformity assessment bodies to improve the capabilities of measurement and their reliability of
testing laboratories to analyse different proximal, nutritional components and organic contaminants composition.

**More details about planning in the excel file “LAC FundQI-MethChem-Grains INTI”**

<table>
<thead>
<tr>
<th>What?</th>
<th>Who?</th>
<th>When?</th>
<th>Input required?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop a survey to request information to determine the state of the art in traceability in water measurements, and standards available used for the characterization.</td>
<td>NMIs</td>
<td>March 2015</td>
<td>none</td>
</tr>
<tr>
<td>First meeting to share information and define the “baseline level” among participants in fields like: analytical capabilities, quality assurance tools, scientific background in quality properties etc</td>
<td>NMI participants in the project</td>
<td>May 2015</td>
<td>Financial resources travelling for participants</td>
</tr>
<tr>
<td>Harmonization of standards</td>
<td>IBMETRO, INTI and standardization bodies</td>
<td>July 2015</td>
<td>meeting workshops</td>
</tr>
<tr>
<td>Training in the methods of measurement (Moisture Measurement Traceability, proximal and nutritional parameters, and organic contaminants) and Preparation of reference materials</td>
<td>The training is for Metrology Institutes and also for some other identified collaborating institutions Reference institution</td>
<td>August 2015</td>
<td>Training, Expert, Travel support Financial resources for organizing the workshop and travelling for participants</td>
</tr>
<tr>
<td>Second Monitoring to develop an intercomparison</td>
<td>NMIs</td>
<td>Oct 2015</td>
<td>Financial resources travelling for participants</td>
</tr>
<tr>
<td>Event</td>
<td>Responsible Organization</td>
<td>Dates</td>
<td>Support Provided</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Proposal and reference material production proposal (protocols)</td>
<td>NMI's</td>
<td>December 2015</td>
<td>Consultancies, Expert, Travel support</td>
</tr>
<tr>
<td>Training for the reference materials production</td>
<td>NMI's</td>
<td>February 2016</td>
<td></td>
</tr>
<tr>
<td>Preparation of some reference materials for quinoa, Homogeneity studies, stability studies</td>
<td>NMI's</td>
<td>May 2016</td>
<td>Financial resources for the preparation of samples and sending the samples to participants</td>
</tr>
<tr>
<td>Intercomparison exercise (2 groups intercomparisons: instrumental devices an analytical methods)</td>
<td>NMI's, Targeted reference laboratories</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd meeting to evaluate the intercomparison results Feedback to participants intercomparisons and proposals</td>
<td>NMI's</td>
<td>June 2016</td>
<td>Financial resources travelling for participants</td>
</tr>
<tr>
<td>Peer review evaluations and CMC submissions</td>
<td>Andean Metrology Institutes</td>
<td>October 2016</td>
<td>Peer review, Expert, Travel support</td>
</tr>
<tr>
<td>4th meeting to develop the final document of the reference materials production and design a protocol of standards harmonized and a protocol of certification of this material</td>
<td>Metrology Institutes, Normalization bodies, Certification bodies, Accreditation bodies</td>
<td>January 2017</td>
<td>Consultancies, Expert, Travel support Expert metrology institutes for confirmation of assigned values</td>
</tr>
</tbody>
</table>

NOTE: the input of resources required has not been quantified in this first proposal. It is needed to define the other partners first, to determine the costs associated.
Annex I - Key Questions (results from the appraisal mission, August 2013)

- Which are the Rio+20 agenda items covered by the topics of the project proposal?
- Which are the current national policies, regulations/standards relating to biodiversity and climate Change in countries participating in the project and how will the project proposals support their implementation?
- Which other organizations should be taken into account for the implementation of the project?
- Which are the most relevant QI services deficiencies relating to biodiversity and climate change in the countries concerned and in the region?
- How does the proposal contribute to eliminate these deficiencies?
- How will the project strengthen the links among the region to support the development of quality infrastructure?
- Which are the feasibility and the risks of the project proposal?

<table>
<thead>
<tr>
<th>Question</th>
<th>Rio+20 agenda items covered</th>
<th>Current national policies, regulations/standards</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- Diversidad biológica, Seguridad alimentaria y nutrición y agricultura sostenible</td>
<td>“Master Plan for the international Year of Quinoa”, y planes nacionales en los países que adhieren a esta iniciativa.</td>
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<td></td>
<td>- Promoción de agricultura sustentable y desarrollo rural</td>
<td>LEY MARCO DERECHO A LA ALIMENTACIÓN, SEGURIDAD Y SOBERANÍA ALIMENTARIA</td>
</tr>
<tr>
<td></td>
<td>- Cambio en los modelos de consumo y producción no sustentables</td>
<td><a href="http://www.fao.org/fileadmin/templates/...m/.../Ley_Marco_DA_Parlartino.pdf">www.fao.org/fileadmin/templates/...m/.../Ley_Marco_DA_Parlartino.pdf</a></td>
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<td></td>
<td>- Reducción del hambre</td>
<td>Biodiversidad en America Latina y Caribe: <a href="http://www.biodiversidadla.org/Portada_Principal">http://www.biodiversidadla.org/Portada_Principal</a></td>
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<td>FAO Cumbre Mundial de la Alimentación, Roma 1996 y siguientes</td>
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<td><a href="http://www.fao.org/docrep/003/w3613s/w3613s00.htm">http://www.fao.org/docrep/003/w3613s/w3613s00.htm</a></td>
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<tr>
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<td>BOLIVIA: Agenda Patriótica 2025, a través de 2 pilares</td>
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<td>SOBERANÍA PRODUCTIVA CON DIVERSIFICACIÓN Y DESARROLLO INTEGRAL</td>
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<tr>
<td></td>
<td></td>
<td>Este pilar de la Agenda establece entre otras 2 metas para el 2025:</td>
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<tr>
<td></td>
<td></td>
<td>• Bolivia dejará de forma progresiva la herencia colonial y republicana de ser solamente un país hidrocarburífero y minero. Bolivia al año 2025 será un país productor y transformador de alimentos, productor y exportador de energía eléctrica aprovechando plenamente su potencial hidroeléctrico y desarrollando exitosamente proyectos de energías renovables de gran capacidad de generación (como energía eólica, aprovechamiento de biomasa, geotérmica, solar, entre otras), un país turístico, artesanal y manufacturero, productor y exportador de productos alimentarios únicos y otros de consumo masivo y con alto valor agregado, articulador de servicios de comunicación y transportes y contará con valiosos recursos humanos con conocimientos científicos y tecnológicos que aportan a la construcción de la patria.</td>
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<tr>
<td></td>
<td></td>
<td>• Bolivia ya no será un país agropecuario con productores que usan tecnologías obsoletas o que reproducen las recetas productivas</td>
</tr>
</tbody>
</table>
contaminantes, dañinas a la salud y destructoras de los derechos sociales de las transnacionales de los países desarrollados. Bolivia habrá incrementado el volumen total de la producción agrícola donde por lo menos la mitad de la producción corresponderá al aporte de los pequeños productores y organizaciones económico comunitarias. **SOBERANÍA ALIMENTARIA A TRAVÉS DE LA CONSTRUCCIÓN DEL SABER ALIMENTARSE “PARA VIVIR BIEN”:** Este pilar establece como meta

- Bolivia logra producir los alimentos que consume su población respetando la diversidad cultural y sus preferencias alimenticias, incluyendo diversidad de cereales, tubérculos, hortalizas y frutas.

En Bolivia se reconoce y fomenta la diversificación de la producción, la diversidad de los productos en los mercados y en los platos de comida, la protección a las variedades locales y el fomento a las culturas y tradiciones alimentarias.

**Argentina**

**Plan Estratégico Agroalimentario y Agroindustrial 2010-2020 DESAFIOS CREcientes PARA UN DESARROLLO RURAL SUSTENTABLE**

Initiatives of the Instituto Nacional de Tecnología Agropecuaria (INTA):

\[\text{http://inta.gob.ar/documentos/la-quina-en-la-region-del-noroeste-argentino/}\]

**Initiatives of the Ministerio de Ciencia y Técnica (MINCyT):**


Red de laboratorios fiscalizadas por el SENASA de Argentina:


**PERU**

- Decreto Supremo N° 004-2011-AG, Reglamento de Inocuidad Agroalimentaria
- Codex Alimentarius
- Decreto Supremo N° 034-2008-AG, Calificación de organismos públicos de acuerdo a lo dispuesto por ley N° 29158
- Plan Anual de monitoreo de residuos químicos y otros contaminantes en alimentos agropecuarios Primarios y piensos Resolución Dictatorial N° 0096-2012-AG-SENASA-DIAIA

**BRASIL**

- Ministerio de Agricultura y MAPA

**How the project will help to implement current national policies**

- Provee base técnica para comercializar productos
- Mejora penetración de productos en el mercado.

**Other organizations to be involved**

- Organismos de Normalización
- Organismos de Acreditación (Ampliación de alcance)
- Cámaras Industriales
| PERU: Servicio Nacional de Sanidad Agraria - SENASA  
- Centro Nacional de Alimentación y Nutrición - CENAN  
Argentina: Ministerio de Agricultura –Servicio Nacional de Calidad y Sanidad  
Agroalimentaria (SENASA)  
Ministerio de Salud-Instituto Nacional de Alimentos (INAL)  
ANVISA y MAPA (Brasil) |
| Most relevant QI services deficiencies | Falta de Metodologías específicas para el análisis composición al de quínoa  
Falta de CRM, Trazabilidad, faltan actividades en ensayos de aptitud, debido a esta falta, no hay elementos para el cumplimiento de requisitos técnicos para laboratorios interesados en lograr acreditación la determinación de parámetros en estas matrices.  
Falta de procedimientos armonizados para la caracterización de la quínoa en los códigos alimentarios de los países y a nivel de Codex Alimentarius |
| Contributions to eliminate these deficiencies | Desarrollar CRM’s, Más métodos |
| Contribution to regional cooperation | Transferencia de conocimientos/expertise entre los INM.  
Intercambio de expertos  
Armonización de métodos |
| Feasibility | Demanda por servicios en el mercado en todos los sectores de la cadena productiva, desde el productor hasta el consumidor, pasando por los laboratorios de ensayo y comercializadores  
Proveedores de Instrumentos  
Existen capacidades desarrolladas en INM en temáticas similares |
| Risks | Interés sectorial de grandes actores |
| Other initiatives started or planned in the participant countries related with the topic | 1-Agenda de CCQM agenda of the 17th CCQM meeting (2011)  
http://www.bipm.org/utils/common/pdf/CCQM17.pdf, necesidad de avanzar desde los NMIs y organizaciones regionales en la armonización de la medición de agua en alimentos  
2-IBMETRO iniciativa en proficiency test sobre quínoa (desde año 2011 primer ejercicio: 6 participantes y segundo ejercicio 16 participantes).  
3-INTI, incluyo un proyecto para el desarrollo de materiales de referencia en alimentos y cereales en el Plan Nacional de Metrología y en el Programa de Metrología en Alimentos en curso.  
4-INMETRO tiene proyectos de MRC para cereales en curso |

**Annex II.-Tentative Operational Plan** (see separate file)