Cluster annual report - 2017

Po2.5 – Agile Potato for Asia

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RTB Cluster Report


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1. MAIN ACHIEVEMENTS

In contribution to achieve 2017 Flagship FP2 milestones, the cluster worked on two major outputs to develop potato varieties for incorporation into rice-based systems and sustainable cropping practices. A new potato variety, named Kufri Lima, was released from an introduced CIP clone in India. The variety is heat and virus tolerant, two important traits for sub-tropical potato production regions and integration into rice cropping systems. Due to its high heat tolerance, it can be planted 20-30 days earlier than other local varieties, which provides farmers more flexibility of planting, achieving higher market prices through earlier harvest, and opening the cropping window for an additional crop after harvest. Further, a red skin tuber clone (CIP 4393) was introduced into all India multi-location trials. The release of this variety will further support the intensification of potato in rice based systems of northern India. In Tajikistan, CIP potato clones (720090, 396311.1, and 394034.7) tolerant to heat, drought, and viruses had been tested with farmers for variety release.

At least 30 new candidate varieties (elite clones) from CIP’s potato biofortification breeding program with 100% more iron (30-45 mg/kg) and zinc (26-35 mg/kg) than currently locally used varieties have been sent to national programs (e.g., Kenya, Rwanda, Bhutan, Nepal, and Peru) to be included in national Participatory Variety Selection (PVS) trials. The consumption of biofortified potatoes could meet between 20-40% of the estimated average requirement of iron and zinc for children and for women of childbearing age. A nutrient dense potato variety (CIP392797.22) was released in Bhutan as Yusi Maap in June 2017. It has also a high yield potential of 27-42 t/ha.

Seed quality is a major issue in Asia potato production regions. A diagnostic study on “Seed potato systems in Maharashtra and Karnataka and options for the future” was conducted supporting the use of innovative potato multiplication technologies (aeroponics, use of temporarily installed net houses) to develop local potato seed systems thus reducing the import of seed of unknown resources and quality. In this respect, also the introduction of Integrated Seed Health approaches to local potato seed systems is an important cluster objective. An expert elicitation workshop was conducted in Georgia to share knowledge about the local potato production and seed system as basis for designing interventions as part of a newly ADA-funded project.

In many Asian potato cropping system late blight and potato viruses are major constraints. Major advances had been made on marker-assisted potato breeding. A user-friendly protocol was developed for application of marker assisted selection for late blight resistance in CIP B3 population. SNP markers for a major QTL for late blight resistance in potato chromosome 9 were successfully converted in KASP markers that are amenable for high throughput analysis. Two markers for late blight resistance are available for use in CIP potato breeding program. The simple sampling procedure and rapid turnaround time allows for reliable identification of resistant individuals before next planting season. Multiplex PCR marker to assist selection of resistances to potato viruses (PVY, and PLRV), was validated in a population of hybrid clones from crosses between S. tuberosum andigenum and elite clones with extreme resistance to PVY. ‘RYSC3’ marker for PVY resistance and ‘RGASC850’ for PLRV resistance were used for screening and hybrid clones positive for the markers were identified. The final stages of the PLRV marker validation by phenotypic verification are on-going. Genomic selection for tuberization and bulking of potatoes under warm and long-daylength conditions was validated in selected 177 advanced potato clones. Cross validation (CV) predictions were compared with actual phenotypic observations in several testing sets created at random from the training population resulting in acceptable prediction accuracies (r> 0.3) for early tuberization associated traits.

MAIN ACHIEVEMENTS WITH GENDER AND YOUTH RELEVANCE

Gender is integral part of the cluster. In Central and South Asia in general, more than half of potato producers appear to be women but their involvement in formal value-chain including seed systems and extension trainings are often limited not only due to women’s gender-specific constraints such as norms, language barriers and mobility but also because current intensification does not fully meet women’s interests and needs. In this cluster, particular attention was paid to understanding gender differences in roles, interests,
opportunities and constraints across the potato value-chain. Findings from a study in Meghalaya shows that male potato producers tend to have large farms, investing more in hired male labors, pest control and seed potatoes while their wives’ involvement in production and selling is limited. On the other hand, female potato producers have small farms and their husbands work in non-agricultural sectors. Women producers sustain traditional potato varieties, they are more interested in organic production and they contribute significantly to household food security in this region. Given a lack of male labor and the scale of production, labor-, knowledge- and capital-intensive interventions related to the commercialization of potatoes are not very relevant to them and run the risk of excluding women. To acknowledge and reflect women potato producers’ important roles and interests in future RTB interventions in this cluster, findings were shared with stakeholders such as local agricultural department and extension workers. Gender-responsive interventions will be designed and continue to be monitored in 2018. Research on youth across the potato value-chain will start in 2018.

MAIN ACHIEVEMENTS WITH CAPACITY DEVELOPMENT RELEVANCE

As part of CIP’s potato breeding program in Vietnam, training to the national agricultural research system (The Potato Vegetable and Flower Research Center, Dalat [22 participants], and the Food Crop Research Institute, Hanoi [12 participants]) was provided on the use of the high interactive data analysis platform (HIDAP) developed by CIP. The training further included collection and quality of data, data management, generation of genotype lists and field books, statistical analysis, bar coding, and the use of CIPcross software to manage crosses. In West Bengal, India, >1100 farmers (men/women) were trained on improved potato production practices and double transplanting of boro rice to bring non-traditional area under potato and to double farmers’ income by 2022. Scientists from Bhutan (BPDP, NPRP) and Nepal (LIBIRD) were trained in a five-day international training course on recent advances in potato breeding and quality seed production at the Central Potato Research Institute, Shimla, in collaboration with CIP. Further, an international exchange change visit had been organized for scientists and farmers of Nepal and Bhutan to visit CIP-HQ and Peru to promote mutual learning on PVS, variety development and partnerships for decentralized variety development, knowledge and benefit sharing. More than 200 stakeholders attended PVS training workshops in Nepal and Bhutan to select potato clones as future varieties of their choice from CIP clones under the project “Biodiverse and Nutritious Potato Improvement” funded by ITGRFA. In Tajikistan, a total of 253 participants improved their skills in potato production innovative technologies by attending field days organized to demonstrate pre-sprouting techniques, breaking dormancy, and technique of potato production in high tunnels covered with insect-proof nets. Further, a five-day training course was provided to IBPPG scientists, CIP partners - TAWA and THAN staff, local consultants, advisors, and farmers on potato production technologies with a total of 92 participants including 56% women.

2. MAIN GAPS AND CHALLENGES

No major deviation from the annual plan of work took place. Earliness of potato with resistance to late blight, viruses and abiotic constraints (heat, drought, salinity), and biofortified are important breeding trait for integrating potato into rice based systems in the Indo-Gangetic plains; however, the Asia potato program must strengthen the research and development work along the entire production and value chain of potato to increase large scale impacts. Productivity of often less than 10t/ha in several Indian states (e.g., Assam, Meghalaya) is far below the national average and yield potential. Further, farmers entrepreneurial capacities need to be strengthened to link better to markets. This also includes providing locally adapted processing varieties to attract the processing industry and to guarantee farmers better prices.
MEASURES TAKEN AND ADJUSTMENTS PROPOSED

To achieve larger impact of the cluster the research and development portfolio of the cluster needs to be strengthened along the entire potato value chain; an aspect which had been only to some extent being considered in the Theory of Change of the cluster. One example on how this is addressed is the new CIP-APART Potato Value Chain Program on “Improving farmers’ livelihoods through sustainable intensification and diversification of agri-food systems with climate-smart potato technologies” implemented in Assam and funded by the Government of India/Assam and the World Bank. The development objective of the Assam Agribusiness and Rural Transformation Project (APART) is to add value and improve resilience of selected agriculture value chains, focusing on smallholder farmers and agro-entrepreneurs in targeted districts of Assam. CIP’s interdisciplinary assignment to this project is to provide technical backstopping, innovations, and capacity building along the entire potato value chain to increase its productivity, competitiveness, and improve the livelihoods of small and marginal farmers, thereby contributing to sustainable intensification and diversification of rice fallow systems, including strengthening market linkages and supporting post-harvest value chain development. This includes the introduction of promising potato varieties for both table and processing purposes, support to the public and private sector to develop a local potato seed system, demonstrating innovations and improvements to cropping practices, best pre- and post-harvest practices and technologies to improve quality of table, seed and processing potato as well as reduce post-harvest losses; provide new methods and approaches to link farmers to markets, and to establish smallholder potato-based enterprises through Farmers Business Schools with a focus on encouraging women’s enterprises.

3. PARTNERSHIPS: ACHIEVEMENT AND CHALLENGES

List of Key External Partnerships

<table>
<thead>
<tr>
<th>FP</th>
<th>Stage of research*</th>
<th>Name of partner</th>
<th>Topic of partnership</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>HZPC, Netherlands</td>
<td>HZPC provides genetic material to be used in crossing program. They also take part in evaluation and selection of the material.</td>
</tr>
<tr>
<td>1,2</td>
<td></td>
<td>Central Potato Research Institute</td>
<td>Evaluation and release of potato varieties resistant to abiotic and biotic stresses and processing quality. One Kufri Lima early heat tolerant and resistant to PVX and PVY variety was released in 2017 from CIP clone. Three CIP elite clones have been introduced in AICRP (All India Coordinated Research Project) testing to release varieties.</td>
</tr>
<tr>
<td>1,3</td>
<td></td>
<td>Department of Agriculture, West Bengal, NGO (Borlaugh Vision) and IRRI</td>
<td>Intensification of potato in rice fallow in North West Bengal. A baseline survey of 120 households was conducted to study and document the cropping systems and socio-economic conditions of farmers in North Bengal to bring rice fallow under potato in lowland, mid-hill and uplands. More than 1100 farmers trained on improved potato production practices and double transplanting of boro rice to bring non-traditional area under potato.</td>
</tr>
<tr>
<td>1,2</td>
<td></td>
<td>University of Agriculture and Horticulture Sciences, Shivamogga, Karnataka, Department of Horticulture, KVK Naryangaon, Maharashtra</td>
<td>Developing sustainable potato seed systems in non-traditional seed potato areas. Farmer achieved tuber yields of 22 t/ha of seed multiplied locally through improved practices in temporary net houses in Maharashtra compared to State average yields of 14 t/ha from seed imported from Punjab.</td>
</tr>
<tr>
<td>FP</td>
<td>Stage of research*</td>
<td>Name of partner</td>
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<tr>
<td>2</td>
<td></td>
<td>Institute of Botany, Plant Physiology and Genetics, Tajikistan.</td>
<td><em>In vitro</em> multiplication of potato clones and production of SSSE seed materials for project needs</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Scientific Research Center of Agriculture, Ministry of Agriculture, Georgia.</td>
<td><em>In vitro</em> multiplication, evaluation of trials.</td>
</tr>
</tbody>
</table>

* Please mark: 1 – for Discovery/Proof of concept; 2 – for Piloting; 3 – for Scaling up and scaling out.

**Status of Internal (CGIAR) Collaborations among Programs and between the Program and Platforms**

<table>
<thead>
<tr>
<th>Name of CRP or Platform</th>
<th>Brief description of collaboration (give and take among CRPs) and value added*</th>
<th>Relevant for RTB FPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTB’s cluster CC2.1</td>
<td>Several methodologies of the “Toolbox for RTB Seed Systems” were used to design the APART project and conduct the diagnostic study of potato seed systems at Karnataka and Maharashtra states, at India.</td>
<td>FP2</td>
</tr>
</tbody>
</table>

*e.g. scientific or efficiency benefits

**4. FUND RAISING**

- APART project: “Improving farmers’ livelihoods through sustainable intensification and diversification of agri-food systems with climate-smart potato technologies” (Government of Assam and The World Bank). (Contract signed on March 18, 2018)
- Diagnostic study: “Seed potato systems in Maharashtra and Karnataka and options for the future” (GIZ). (Finalized, study report submitted to GIZ)
- Project: “Strengthening food system resilience in Asia’s mega deltas with salt tolerant sweetpotato and potato” (BMZ-GIZ). (Started on January 2018).
- ADA supported project in Georgia - Enhancing Rural Livelihoods in Georgia: Introducing Integrated Seed Health Approaches to Local Potato Seed Systems. (Started in July 2017).

**5. INNOVATIONS¹**

<table>
<thead>
<tr>
<th>Title of innovation</th>
<th>Corresponding output in MEL</th>
<th>Phase of research *</th>
<th>Partners involved</th>
<th>Geographic scope: for innovations in phases AV* or USE* only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decentralization of potato seed system in India</td>
<td>Ready for dissemination</td>
<td>KVK (ICAR), CPRI, Department of Horticulture, Maharashtra and Karnataka</td>
<td>India: West Bengal, Maharashtra, Karnataka, Assam</td>
<td></td>
</tr>
<tr>
<td>Early heat tolerant Kufri Lima variety</td>
<td>Seed multiplication of variety</td>
<td>CPRI, AICRP, State Department of Horticulture</td>
<td>India, Bangladesh, Pakistan and others</td>
<td></td>
</tr>
</tbody>
</table>

* Phases: AV - available/ready for uptake, USE - uptake by next users.

¹ Research and development innovations are new or significantly improved (adaptive) outputs - including management practices, knowledge or technologies.