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TECHNICAL SUPPORT FOR VEGETABLE SEED PRODUCTION

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SDGs:



Countries:

Democratic People's Republic of Korea

Project Codes:

TCP/DRK/3603

FAO Contribution:

USD 324 000

Duration:

1 December 2016 – 31 December 2018

Contact Info:

FAO Representation in Democratic People's Republic of Korea

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Implementing Partners

The Ministry of Agriculture (MoA).

Beneficiaries

Farm households, farmers working in four cooperative seed production farms, farm technicians, research institution and officials of the Seed Management Department of MoA.

Country Programming Framework

CPF Output 1.1: Capacity to research, develop and utilize quality seed of improved varieties is enhanced.
CPF Output 2.1: Enhanced capacity to develop and produce high-quality produce, with emphasis on fruit and vegetables.



BACKGROUND

In the Democratic People's Republic of Korea, current vegetable production of about 1.50 million tonnes falls short by about one million tonnes of meeting the requirement of 2.5 million tonnes, based on the recommended consumption of 300 g of vegetables per day per individual, excluding potato. This is reflected in the inadequate intake of fresh and processed vegetables by a large number of the population; and its impact on public health is visible in significant levels of undernutrition and malnutrition prevailing among children of less than five years of age and breastfeeding women. Against this background, the project aimed to improve vegetable seed production by introducing superior quality seed in the major vegetables in the country, enhancing technical knowledge and skills, and identifying and using innovative production practices, in order to support sustained increase in vegetable production.

IMPACT

The introduction of superior quality seeds in the 11 major vegetables of the country, innovative nursery techniques, and best practices for seed and fresh vegetable production led to a substantial increase in high-quality vegetable seeds production in the four beneficiary farms, resulting in enhanced vegetable production and productivity. This contributed to improving the nutritional security of communities in the project areas; and directly benefited a total of 2 965 farm households with 5 562 farmers, and indirectly rural/urban households in the neighbouring areas.

ACHIEVEMENT OF RESULTS

The capacities of seed production cooperative farms and the Seed Management Department of the Ministry of Agriculture (MoA) were significantly strengthened to produce better quality seed. The project trained a total of 219 farmers, managers and officers in improved vegetable seed production, hi-tech nursery management mulching, integrated nutrient management, seed multiplication technologies and disease control measures. Farm-level technical personnel were also trained in varietal improvement, using locally adapted seeds; as well as being sensitized about the role of improved imported lines from other sources, for a vibrant vegetable breeding programme. In addition, an overseas study tour to Nepal for four senior officers was organized, to improve leadership skills and managerial capacity for improved seed production.

The project successfully implemented innovative agricultural practices in the four beneficiary farms (Sukchon Foundation Seed Farm, Sukchon County; Joyang Farm, Hamju County; Ripsong Farm, Ryonggang County; and Madu Farm, Unchon County). These included hi-tech nursery management techniques, consisting of raised and sunken-bed planting, and mulching using organic degradable biomass, among others; which helped to economize on irrigation water, retain moisture, stabilize soil temperature, minimize weed infestation, and improve soil health. Other innovative agricultural practices included protected vegetable seed production using plastic tunnels, net houses and greenhouses. These facilities contributed to increasing vegetable seed production to 16.31 tonnes in 2018, from the baseline production of 12.12 tonnes in 2016. Species-specific innovative hybridization technologies were also introduced for hybrid seed production. In addition, pest infestations were controlled using available chemical measures.

IMPLEMENTATION OF WORK PLAN

Timely implementation of project activities was affected by current geopolitical issues in the country. Thus, a four-month no-cost extension was requested and approved in order to complete the activities.

Owing to the above-mentioned issues, the introduction of diversified chemical pest control options was limited; and Pyongyang Crop Genetic Resources Institute was unable to establish a close link with the World Vegetable Center, Taiwan Province of China (previously known as the Asian Vegetable Research and Development Center [AVRDC]), as planned, in order to collect germplasm lines and import advanced breeding lines of several of the country's major crops.

FOLLOW-UP FOR GOVERNMENT ATTENTION

It is recommended that the Government actively seek donor funds in order to: i) establish a seed certification agency with legal status, in accordance with internationally accepted norms; ii) develop and enact a seed certification act to enforce laws for quality seed production; iii) diversify vegetable species and introduce more varieties and hybrids; iv) collect promising varieties of seed from the World Vegetable Center, Taiwan Province of China; v) explore more vegetables, cultivars, varieties and genetic lines for breeding, quality seed production and multiplication; vi) select progressive farmers of cooperative farms to expand quality seed multiplication, using advanced, innovative nursery and horticulture techniques; vii) organize extensive training programmes on innovative multiplication techniques and related technologies; and viii) provide further assistance for technical support and agro-inputs.

SUSTAINABILITY

1. Capacity development

The project contributed to capacity development in terms of the training of human resources, the provision of equipment for seed laboratories, and the introduction of best practices for seed and fresh vegetable production. The adoption of a participatory and inclusive approach, which involved farmers and communities in the design and implementation of the project, fostered a sense of ownership, contributing to the sustainability of project results.

2. Gender equality

The women farmers involved in the production of improved and hybrid seeds of 11 vegetables were around 2 933, accounting for 52.73 percent participation. Gender equality was well promoted by emphasizing equitable or considerable participation of women in all project interventions, such as the training programmes, dialogues and other events.

3. Environmental sustainability

Hi-tech nursery management techniques, consisting of raised and sunken-bed planting and the use of mulching, and effective disease and insect-pest control measures, were implemented during the project. The project activities on vegetable seed production contributed to local and global environmental sustainability.

4. Human Rights-based Approach (HRBA) – in particular Right to Food and Decent Work

A total of 16.31 tonnes of vegetable seeds were produced during 2018, compared with 12.12 tonnes in 2016, giving an overall increase of 34.57 percent. Improved food and nutrition security, based on increasing vegetable production and productivity through the use of quality seed and innovative production practices, lay at the core of the project.

5. Technological sustainability

Hybrid seeds have additional value addition in terms of increased productivity and resistance to biotic stresses, as well as better quality and better shelf life, leading to reduced post-harvest losses. The improved production technology included cost-effective management practices, such as raised and sunken beds, and the introduction of mulching and integrated nutrient management. This has enabled stakeholders and beneficiaries to continue project activities upon the termination of external technical assistance.

6. Economic sustainability

The introduction of superior quality seeds; the multiplication of best quality seeds in bulk, using hi-tech nursery technologies; and the introduction of integrated nutrient management and pest control measures contributed to an exponential production increase between 2016 and 2018.

DOCUMENTS AND OUTREACH PRODUCTS

- ❑ Vegetable Seed Production and Certification Draft Manual/Training Material for Democratic People's Republic of Korea.

ACHIEVEMENT OF RESULTS - LOGICAL FRAMEWORK

Expected Impact	Nutritional security of communities in project areas improved as a result of increase in vegetable production and productivity mainly due to use of good quality seeds		
Outcome	The production of high quality vegetable seeds is increased		
	Indicator	<ul style="list-style-type: none"> – CPF Output 1.1: Capacity to research, develop and utilize quality seed of improved varieties is enhanced. – CPF Output 2.1: Enhanced capacity to develop and produce high-quality produce with emphasis on fruit and vegetables. 	
	Baseline	<ul style="list-style-type: none"> – Lack of good quality seeds. – Lack or limited knowledge and capacities for seed and fresh vegetable production. 	
	End Target	<ul style="list-style-type: none"> – 30% increase in quantity of locally multiplied seed. Improved capacity for breeding, quality seed identification and multiplication, and vegetable seed production schemes established. – Technologies introduced or developed by the project for seed and fresh vegetable production. 	
Comments and follow-up action to be taken	<ul style="list-style-type: none"> – Improved seed production from all four farms increased to 34.57%. Total production was 16.31 tonnes in 2018, from a cropping area of 327 ha. – Vegetable Seed Production and Certification Draft Manual for Democratic People's Republic of Korea was published. Technologies to improve seed quality, physical and genetic purity of seeds, seed testing and quality assurance, seed germination, seed tags, among others, were introduced. 		
Output 1			
	Capacity of seed institutions enhanced		
Output 1	Indicators	Target	Achieved
	Strengthen seed production cooperative farms and Seed Management Department, MoA	30% increase in quantity of locally multiplied seed	Achieved
Baseline	Lack of good quality seed		
Comments	The capacities of seed production cooperative farms and the Seed Management Department, MoA were strengthened to produce better quality seed, including hybrid seed. Seed producing agencies were better equipped with knowledge on quality seed production through several training sessions. It is recommended that promising varieties continue to be collected.		

Activity 1.1	Support innovative seed production technologies.		
	Achieved	Yes	
Comments	<p>i. Identify and describe the nature of crop varieties and seed-related problems Nature of crop varieties: the country grows Chinese cabbage, cabbage, radish, spinach, carrot, cucumber, pumpkin, eggplant, tomato, hot pepper (chili), watermelon, welsch onion, onion, crown daisy, and melon, among which eight vegetable crops, namely Chinese cabbage, cabbage, radish, cucumber, spinach, chili, tomato and eggplant were considered important in terms of area and consumption. In order to further boost productivity, it was decided to expand the use of hybrid seeds in those vegetables, and to add new crops under hybrid seed production, where feasible. The vegetable crops suitable for hybrid seed production were cabbage, radish, cucumber, chili, tomato and eggplant. Seed-related problems: fruit rotting and fruit shoot borer in seed crop of eggplant, fruit rot and fruit borer in chili, collapse of flowering stalk in onion, were the serious diseases and insects damaging vegetable seed crops in the country, and their control measures were suggested by FAO.</p> <p>ii. Review available information, results and experience to identify promising varieties, which would be suitable for field scale trials and finally release for wider cultivation All available information with the MoA and Pyongyang Crop Genetic Resources Institute was reviewed to identify promising varieties for field trials.</p> <p>iii. Collect promising varieties from AVRDC – The World Vegetable Center The project suggested that germplasm conservation and utilization be carried out through the collection of germplasm lines, including indigenous and imported ones from potential donors, such as AVRDC-World Vegetable Centre, Taiwan, which has a huge repository of germplasm and advanced breeding lines of tomato, chili, sweet pepper and Chinese cabbage, the country’s major crops. However, it was not possible to undertake this activity, owing to sanctions and other issues.</p> <p>iv. Introduce innovative seed production technologies Hi-tech nursery management and hybridization technologies were introduced.</p> <p>v. Improve capacity of seed researchers and producers The evaluation and documentation capabilities of the existing vegetable units at the Academy of Agricultural Sciences (AAS) and the Seed Management Department were strengthened to ensure the flow of good materials and information.</p> <p>vi. Strengthen evaluation and documentation capabilities of the existing vegetable unit at AAS, PAU and Seed Management Department to ensure flow of good material and information This activity was partially carried out</p>		
Output 2	Farmers’ capacities in seed multiplication improved		
	Indicators	Target	Achieved
	Number of farmers and officers’ capacities in seed multiplication increased through training and demonstrations at the field level, and an overseas study tour	200	Yes
Baseline	Limited knowledge in quality vegetable seed production		
Comments	219 farmers and officers were trained in vegetable seed production through training sessions and demonstrations held at the field level, and a 19-day overseas study tour to Nepal was organized for four government senior officers. It is recommended that government funding be sought to implement further training sessions/extension services.		
Activity 2.1	Training needs assessment		
	Achieved	Yes	
Comments	A training needs assessment was carried out by the MoA		
Activity 2.2	Designing and implementing the training programme		
	Achieved	Yes	
Comments	Based on the training needs assessment, a training manual, Vegetable Seed Production and Certification Draft Manual/Training Material for Democratic People’s Republic of Korea was developed. It dealt with seed quality, seed vigour, release and notification of varieties, seed multiplication chain, seed certification, field and seed standards, seed multiplication ratio, grow-out test, hybrid seed production technologies, and plant protection in vegetable crops.		

Implementing field programme of activities	
Achieved	Yes
Activity 2.3	<p>i. Development of technology for growing vegetables under controlled conditions, namely greenhouses and plastic tunnels The project successfully mitigated the lack of necessary knowledge and skills to implement innovative agricultural practices, including protected vegetable seed production, using plastic tunnels, net houses and greenhouses. Of the 20 greenhouses, eight were provided to the beneficiary farms by the project. The area under protected seed production was 4 800 m² in Sukchon Foundation Seed Farm, 1 400 m² in Joyang Farm, 1 050 m² in Ripsong Farm and 1 050 m² in Madu Farm.</p> <p>ii. Introduce innovative technologies in seed multiplication Species-specific hybridization technologies, namely the use of self-incompatibility and male sterility in Chinese cabbage, cabbage and radish; and manual emasculation and pollination in tomato, eggplant, chili and cucumber, were explained and demonstrated in the beneficiary farms.</p> <p>iii. Demonstrations on the use of biofertilizers, bioorganic wastes, along with other chemical fertilizers, such as integrated nutrient management (INM) in selected vegetable crops INM was demonstrated in growing radish, cabbage, hybrid Chinese cabbage, crown daisy, eggplant, hot pepper, spinach, onion, pumpkin, tomato and cucumber as seed crops at the target farms. The biofertilizer, bioorganic waste and chemical fertilizer in kg were used at the given proportions as radish 100: 1000: 150; cabbage 150: 1000: 250; hybrid Chinese cabbage 150: 1500:180; crown Daisy: 120: 1000: 50; eggplant 100: 1200: 80; hot pepper 100: 1200: 80; spinach 50: 1000: 80; onion 100: 800: 80; pumpkin 50: 800: 50; tomato 150: 1500: 100; and cucumber 50: 1000: 50 kg/ha.</p> <p>iv. Demonstrations on raised beds, mulching, nursery management in the form of frontline demonstration Innovative vegetable production practices followed in the target farms were: i) hi-tech nursery (grafting, protecting the seedlings from insects and diseases, and use of starter solution when planting seeds directly), ii) raised-bed (7-10 cm) cultivation and use of organic/degradable biomass for mulching. This proved effective for water conservation, weed control and improvement of soil health.</p> <p>v. Refinement of agrotechniques to minimize cost of production and increase profitability Existing methods of vegetable seedlings raising were refined, and protected vegetable seed production in plastic tunnels and greenhouses was introduced and refined to minimize costs of production and increase profitability.</p> <p>vi. Development of vegetable nurseries for production and distribution of healthy seedlings Training was provided to farmers and technicians, as well as necessary input support to develop vegetable nurseries in the participating cooperative farms.</p> <p>vii. Disease management This activity was undertaken to support activities v and vi. The major diseases observed in vegetable crops were black rot and alternaria leaf spot in cabbage; purple blotch and stemphylium blight in onion; cercospora leaf blight and alternaria blight in carrot; white rust and alternaria blight in radish; downy mildew and anthracnose in spinach; early blight, late blight, fusarium wilt and tomato yellow leaf curl virus in tomato; powdery mildew and leaf curl in chili; little leaf and phomopsis blight in eggplant; and powdery mildew, downy mildew, fusarium wilt and cucumber mosaic virus in cucumber. Major insects causing significant damage in vegetables were diamond back moth in cabbage; maggots and thrips in onion; leaf-eating caterpillars in spinach; aphids in radish; jassid, aphids and fruit borer in tomato; aphids, thrips and fruit borer in chili; aphids, jassid and fruit and shoot borer in eggplant; aphids and fruit fly in cucumber. The control measures suggested were: carbon sulphate: water in 1:400, 1:500: and 1:700 proportions for controlling diseases in vegetables. Deltametrin: water 1:800, 1:1000, 1:1500 ratios were used for all the above-mentioned diseases. If the symptoms of pest attacks were mild, biocides locally made with tobacco extract, red pepper, and plants from family Solanaceae and other ingredients were used.</p>
Comments	

Activity 2.4	Awareness building and documentation		
	Achieved	Partially	
Comments	<p>i. Forge linkages with partner organizations engaged in complementary activities, including government, reputed international vegetable seed companies and donor agencies</p> <p>It was advised that Pyongyang Crop Genetic Resources Institute, which was engaged in plant genetic resources management and equipped with long-term seed storage facilities, establish a close link with the World Vegetable Center, Taiwan, to import advanced breeding lines of tomato, hot pepper, cucumber, and Chinese cabbage for breeding in the country. However, this activity could not be carried out, owing to the above-mentioned geopolitical issues.</p> <p>ii. Hold two workshops at national level</p> <p>An inception workshop was held on 23 February 2017 at Pyongyang, which was attended by 30 participants (farmers and officers). A two-day final workshop was held to conclude results and achievements with the beneficiaries and stakeholders.</p> <p>iii. Prepare training and information, education and communication (IEC) materials on technical topics</p> <p>Training and information materials were prepared for conducting in-country training activities. A vegetable seed production manual in English was also prepared.</p>		
Output 3	Improved quality control in seed production		
	Indicators	Target	Achieved
	<ul style="list-style-type: none"> - Varietal improvement in 11 cultivars of vegetables. - Hybrids and innovative nursery techniques, raised beds, mulching. - Integrated Nutrient Management. - Pest control. 	11	Yes
Baseline	Limited use of hybrid and innovative nursery management techniques		
Comments	<p>Together with improved quality control in seed production, farm-level technical personnel were trained in varietal improvement in 11 cultivars of vegetables, using locally adapted ones, and were sensitized about the role of improved imported lines from other sources.</p> <p>i. Assess capacity of seed certification agency</p> <p>A Seed Certification Agency (SCA) does not exist at present. A recommendation has been made to the Government to take steps to establish an SCA.</p> <p>ii. Improve management capacity of seed certification agency</p> <p>Selected key personnel received intensive training in all aspects of vegetable seed production and certification, as it was crucial to develop specialized human resources through training, for knowledge empowerment of vegetable seed production experts.</p> <p>It is recommended that the Government seek donor funding to: i) expand areas for quality vegetable seed multiplication; ii) implement alternative pest control mechanisms; and iii) develop and enact legal seed certification.</p>		

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