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IMPROVING RICE PRODUCTIVITY IN BHUTAN TO ENHANCE RICE SELF-SUFFICIENCY

May 2019

SDGs:



Countries:

Bhutan

Project Codes:

TCP/BHU/3602

FAO Contribution:

USD 208 000

Duration:

16 November 2016 – 31 March 2019

Contact Info:

FAO Representation in Bhutan

FAO-BT@fao.org

Implementing Partner

Ministry of Agriculture and Forests (MoAF).

Beneficiaries

Farmers, research and extension staff.

Country Programming Framework

Outcome 2 - Improved multisector participation, coordination, and value chain development in food and nutrition security.



BACKGROUND

In Bhutan, mountainous terrain limits agricultural land to just over three percent of the country, of which paddy cultivated area comprises 23 000 hectares, and is farmed by 28 000 households. There are three distinct rice ecosystems in the country, which are defined by three altitudes: low, mid and high. Rice yield is dependent on altitude, with the highest yields being produced in the high-altitude areas. However, as the altitude grows steeper, the terrain gets rougher; and most paddy fields are on narrowly terraced slopes. This limits farm mechanization, and the construction of irrigation infrastructures is costly. There is potential for increasing yield in low altitudes, with a more stable irrigation system and drought-tolerant rainfed rice varieties. Against this background, the project aimed to support development in the different agro-ecological zones (AEZs), to contribute to the Government's goal of achieving a higher level of rice self-sufficiency, through increased rice productivity and production.

IMPACT

The project contributed directly to enhancing rice production and increasing rice self-sufficiency. This will help to reduce poverty by generating greater income, as well as enhancing the nutrition and food security of the people of Bhutan.

ACHIEVEMENT OF RESULTS

The major outputs of the project were the introduction of improved rice varieties, a wider choice of farm machines, Good Agricultural Practices (GAP), and capacity building.

More than 20 short-duration, high-yielding rice varieties were introduced and evaluated in different AEZs in three research centres of Yusipang, Bajo and Bhur; and three high-altitude rice varieties were formally released. The National Seed Centre (NSC) developed the concept for rapid certified seed multiplication, and established seed villages in three AEZs, by training the farmers in quality seed production. These interventions will contribute to increasing overall rice production in the country. In addition, the Government of Bhutan signed a Memorandum of Understanding (MoU) with the International Rice Research Institute (IRRI), for the smooth flow of germplasm. This will help to access new rice varieties and associated technologies and expertise.

New labour-saving farm machinery was procured, tested and demonstrated to farmers. This included drum seeders for direct seeding and reapers for mechanized rice harvesting. The demonstration and promotion of new technologies, especially labour-saving ones, will improve the conditions of farmers, and make farming more efficient and productive. In addition, laboratory equipment was introduced for rice grain analysis, which will help to strengthen capability to identify appropriate varieties.

The capacities of researchers, extension staff and farmers were significantly enhanced through training and the demonstration of new technologies and modern rice farming technology. In terms of GAP, a number of site-specific nutrient management demonstrations for high, mid and low-altitude rice ecosystems were conducted, to create awareness among farmers. Nutrient management using inorganic fertilizers and green manuring was demonstrated, and new weed control methods using mechanical methods and herbicides were piloted. Integrated Pest Management (IPM) training was conducted for a total of 170 farmers.

IMPLEMENTATION OF WORK PLAN

A six-month no-cost extension was requested and approved, in order to complete all project activities. Following this extension, all the planned activities were implemented on time. There was a slight delay in the procurement and distribution of equipment and machinery. However, adjustments were made, and the overall implementation of activities was not held up. Most of the activities were implemented within the allocated budget.

FOLLOW-UP FOR GOVERNMENT ATTENTION

It is recommended that the Government actively seek funding to: i) assist in developing rapid certified seed multiplication through seed village schemes, to support certified seed for rice farmers in the three AEZs; and ii) demonstrate/promote new improved rice varieties and certified seed multiplication in sufficient quantities to support rice farmers in project sites/AEZs.

Regarding Activity 2.2 (promoting and strengthening the mechanization of tillage operation, as well as post-harvest technology for double rice cropping for rice farmers at each site/AEZ), it is advised that the Government: i) collaborate with key farmers (from Dagana, Samtse and Chhukha Dzongkhag); and ii) plan to disseminate the technology/drum seeder; and expand a total area of more than 100 acres. In addition, given that Bhutan has a small population, mechanization is very important; therefore, it is recommended that funding be sought in order to continue with the introduction of new technologies.

With regard to insect pest management (Activity 3.2), it is recommended that: i) Sunrice herbicide be released for farmers' use; ii) the efficacy of liquid butachlor against rice weeds be evaluated; and iii) the use of insect pheromone traps in paddy farming be promoted.

SUSTAINABILITY

1. Capacity development

The project activities were embedded as part of the research and extension activities of the implementing agencies, thus ensuring their sustainability beyond the project.

Partnerships and alliances were strengthened with and among the agencies involved in implementing the project. Major partners were district agricultural and extension officers, researchers of different centres, and central programmes of the Department of Agriculture, such as the Agriculture Machinery Centre, the National Seed Centre and the National Soil Services Centre (NSSC).

2. Gender equality

The project activities equally met the needs and priorities of both men and women farmers. The farm machines that were procured and tested were gender-friendly. Capacity-development programmes involved participants of both genders. Both men and women benefited from the project in terms of participation, decision-making, access to goods and services, etc.

3. Environmental sustainability

Environmental sustainability is a top priority of the Government of Bhutan. Overall, the environment of Bhutan, including its agricultural land, is pristine, and the project activities did not give rise to any negative impacts.

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

The project contributed to increased rice production, and thus to the right to food and employment. As mentioned above, the demonstration and promotion of new technologies will improve the conditions of farmers.

5. Technological sustainability

New rice varieties will increase production without incurring additional costs; direct seeding will reduce labour, and other farm machines will make farming more efficient.

Stakeholders and beneficiaries will carry on the activities and new technologies that they have been exposed to. Local research and extension staff will provide necessary assistance.

6. Economic sustainability

Given the relevance of the project activities, it is expected that support will be forthcoming from local and central governments.

Products and services emanating from the project are affordable to the beneficiaries. They are provided with free seeds of new varieties, which they can further multiply and keep on using. Some of the farm machines may be a little expensive for them, but they will be able to obtain loans locally.

DOCUMENTS AND OUTREACH PRODUCTS

- ❑ Training Report on Data Analysis, Scientific Writing and Effective Presentation for researchers, Bhur. N. Chogyel and M. Ghimiray, ARDC Bajo. 11 July 2017. 3 pp.
- ❑ Report on study visit to Viet Nam. M. Ghimiray, Ngawang Chogyel and P.L. Giri. 25 September 2017. 8 pp.
- ❑ Technical report on high-altitude rice research. D. Lhamo, ARDC Yusipang. 15 January 2018. 11 pp.
- ❑ Report on Review and Planning Workshop: Improving Rice Productivity in Bhutan to enhance Rice Self-Sufficiency, Samtenling, 8 and 9 January 2018. M. Ghimiray, ARDC Bajo. 26 January 2018. 7 pp.

ACHIEVEMENT OF RESULTS - LOGICAL FRAMEWORK

Expected Impact	The country's level of rice self-sufficiency increased, improving income and nutrition of people	
Outcome	The use of improved rice varieties, its certified seeds and innovative technology is being promoted across various agro-ecological zones	
	Indicators	<ul style="list-style-type: none"> – Level of rice self-sufficiency (%). – Increase in rice production (MT).
	Baseline	<ul style="list-style-type: none"> – 50%. – 78 000 MT paddy.
	End Target	<ul style="list-style-type: none"> – 55%. – 86 000 MT.
	Comments and follow-up action to be taken	<p>The project was led by the Department of Agriculture and executed by Agriculture Research Development Centres (ARDCs), NSSC, National Plant Protection Centre (NPPC), National Seed Centre, Agricultural Machinery Centre and Dzongkhag Agriculture Offices. All these agencies worked together to reach the common project goal. The Government took ownership of the project, and will ensure long-term sustainability of the project interventions.</p> <p>The project succeeded in increasing rice self-sufficiency by one percent during the project. The total rice production target of 86 000 MT was exceeded by 385 MT. There was an error in the initial baseline of 50% of rice self-sufficiency, as it was only 45%. Thus, present rice self-sufficiency level is 46%. In addition, the envisaged end target of improving rice self-sufficiency in the country by five percent (to reach 55%) was very ambitious, and not possible to achieve through this small project.</p>
Output 1	Three improved and short-duration, high-yielding rice varieties appropriate for double cropping in different agro-ecological zones (AEZs) identified, and improved rice seed support system developed	
Achieved	Yes	
Activity 1.1	Identify availability of improved and high-yielding varieties suitable for double rice cropping in rice growing AEZs for evaluation and adaptation	
	Achieved	Yes
	Comments	More than 20 short duration, high-yielding rice varieties were evaluated in different AEZs in three research centres of Yusipang, Bajo and Bhur; and three high-altitude rice varieties, YPS-7 and PP4 (38-4), and BRRI dhan 28 for double cropping were formally released. Seed production of these varieties is in progress, in collaboration with the NSC.
Activity 1.2	Strengthening the seed support systems (breeder's seed, basis seed, foundation seed, certified seed and seed certification schemes) for the three AEZs in order to facilitate smooth flow of genetic materials in the regions	
	Achieved	Yes
	Comments	Breeder seeds are supplied to the NSC by the research centres, which release new varieties. NSC then further multiplies the different classes of seeds. Such a system was established and strengthened. For the smooth flow of germplasm, Bhutan signed an MoU with the IRRI, which will help to access new rice varieties and associated technologies and expertise.
Activity 1.3	Develop rapid certified seed multiplication through seed village schemes to support certified seed for rice farmers in the three AEZs	
	Achieved	Yes
	Comments	The NSC developed the concept for rapid certified seed multiplication, and established Seed Villages in three AEZs by training farmers in quality seed production. It is advised that funding be sought to demonstrate/promote new improved rice varieties and certified seed multiplication, in sufficient quantities to support rice farmers in project sites/AEZs.
Activity 1.4	Demonstrate/promote new improved rice varieties and certified seed multiplication with enough quantity to support rice farmers in project sites/AEZs	
	Achieved	Yes
	Comments	<ul style="list-style-type: none"> – High-altitude paddy seed: Paro - produced improved paddy (certified seeds); Khangma Maap and Yusiray Maap – 12 MT; and Yusiray Maap foundation seed supplied – 90 kg (farmers, Nemjo area). – Mid-altitude paddy seed: Bajo - produced mid-altitude paddy seeds- Bajo Maap 2 – 6 MT (certified seed). – Low-altitude paddy seed: Samtenling - Bhur Khambja- 1 - 13.5 MT (certified seed).

Output 2	Wider choice of tillage and post-harvest machines available to farmers: at least five new machines (tiller, dryer, thresher and reaper) demonstrated and recommended for adoption by farmers or service providers	
Achieved	Yes	
Activity 2.1	Import (FAO) of gender-friendly machines/tools for testing and demonstration (procure machineries)	
	Achieved	Yes
Activity 2.1	Comments	Reapers, drum seeders, rice mills, moisture meters, weighing balances, rice testing mill, grain counter, plough, threshers, etc. were procured and provided to the stakeholders, which strengthened their capacity to implement the project.
	Promote and strengthen mechanization of tillage operation, as well as post-harvest technology for double rice cropping for rice farmers at each site/AEZ	
Activity 2.2	Achieved	Yes
	Comments	<ul style="list-style-type: none"> – The project introduced drum seeders for direct seeding for the first time in Bhutan, and provided 20 drum seeders to three Dzongkhag. Technical training sessions on how to use the drum seeders were organized for 65 farmers. Despite some challenges, such as sudden rainfall, which could wash off the seeds, and bird attack, drum seeders reduce cultivation costs, require fewer seeds for higher yield and early maturity, and allow easy weeding. – Ten sets of hedge cutters for paddy and wheat harvesting were provided to farmers in three regions, and technical demonstration training was organized for 80 farmers. It emerged that hedge cutters were quite similar to reapers and combine harvesters. However, modified hedge cutters are appropriate for harvesting paddy and wheat for small and terraces fields; they can be used at up to around 100 cm, and are not suitable for tall varieties. – The project provided five mini-rice mills. These need to be tested to confirm that they meet Bhutan standards of rice mills, as well as the basic requirements.
Output 3	Good agricultural practices and new technologies which are location-specifically demonstrated for possible adoption by smallholder rice-growing farmers	
Achieved	Yes	
Activity 3.1	Implement site-specific nutrient management on balanced use of fertilization, with based green manure application, update farmers training manual	
	Achieved	Yes
Activity 3.1	Comments	A number of site-specific nutrient management demonstrations for high, mid and low altitude rice ecosystems were conducted, to create awareness among the farmers. These demonstrations included appropriate levels of major nutrients, such as nitrogen (N), phosphorus (P) and potassium (K), supplemented with organic sources, such as green manure and compost.
	Demonstration of Integrated Pest Management (IPM), particularly weed management, using herbicides, blast disease and insect pest management	
Activity 3.2	Achieved	Yes
	Comments	The NPPC evaluated the efficacy of three different herbicides and developed recommendations for farmers. Main pesticides were identified and pheromone traps were promoted.
Activity 3.3	Implement site-specific nutrient management on balanced use of fertilization (Urea Deep Placement Technology), with based green manure application; update farmers training manual	
	Achieved	Yes
Activity 3.3	Comments	The NSSC established a demonstration plot with chemical fertilization and green manure, and conducted IPM training for 170 farmers.

Output 4	Developed capacity of stakeholders, partnerships and linkages	
Achieved	Yes	
Activity 4.1	Training of rice researchers on rice seed technology/seed support systems for the country	
	Achieved	Yes
	Comments	
Activity 4.2	Training of extension staff and progressive farmers on application of best practices to improve rice yield of improved varieties at pilot sites/AEZs by Research and Development Centres (RDCS)	
	Achieved	Yes
	Comments	
Activity 4.3	One-day training for relevant lab staff in three RDCs in proper use of protein analysers and in other lab technologies and protocols	
	Achieved	Yes
	Comments	
Activity 4.4	Study visit for three relevant officials, one from each AEZ, to a regional rice institute for seven days	
	Achieved	Yes
	Comments	A week-long study visit to Viet Nam was undertaken from 10 to 18 September 2018. Viet Nam is one of the leading exporters of rice in the world (the third), and is considered to have some of the best rice technologies. The main objective of the visit was to develop technical linkages with the relevant centres/institutes, as well as to see rice advances in research and development in the country. The visiting team comprised a rice specialist (RDC Bajo); a rice coordinator (RDC Bajo); and a senior research assistant (RDC Yusipang). Good contacts were established through the study tour.

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