DPRK

United Nations Development Programme
Food and Agriculture Organization of the United Nations
Ministry of Agriculture, Govt. of DPR Korea

Project: Reduction of Post Harvest Losses for Food Security

FAO, DRK/10/005//01/99
UNDP Atlas ID: 00078554

Project Terminal Report
(April 2011 – October 2014)

Compiled by

Bir C. Mandal
Chief Technical Advisor
DRK/10/004 and 005 Projects

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

November 2014

A. OVERVIEW

A.1. PROJECT PROFILE

Country:	Korea, Democratic Peoples' Republic of
Project Symbol:	DRK/10/005/01/99
Project Title:	
Resource Partner:	UNDP
Reporting Period:	Project Terminal Report
EOD:	29 April 2011 (LoA between FAO and UNDP signed)
Actual EOD:	15 August 2011
Original NTE:	28 April 2014
Revised NTE:	31 October 2014
Budget Holder (name):	Mr. Percy W. Misika, FAO Representative in China, DPR Korea and Mongolia
Lead Technical Officer (name):	Ms. Rosa S. Rolle, Sr. Agro-Industry and Post Harvest Officer, FAO-RAP
Participating Organizations:	Mechanization Department, Seed Management Department and External Cooperation Department, Ministry of Agriculture; and Pyongyang Agricultural Campus.
Implementing Partner:	Seed and Post-harvest Projects Management Unit in the Ministry of Agriculture, GoDPRK
Contribution to Programmatic Framework Indicate the reference number and title of each higher level result to which project contributes	
FAO's Strategic Objectives (SO)	SO 1. Contribute to the eradication of hunger, food insecurity and malnutrition.
Country Programming Framework Outcome	The priority # 1 of the CPF: Strengthening national food and nutritional security.
UNDAF Outcome	UN-DPRK strategic priority # 2: Improved nutritional status and enhanced resiliency of communities through food security.

A.2. FINANCIAL DATA in USD (FPMIS)

Budget: US$ 1,705,586
Cash received: US$ 1,705,548
Total delivery: US$ 1,609,679 = 94.37 % of the total FAO budget – US$ 1,705,586

CONTENTS

Acronyms

AAS	Academy of Agricultural Sciences
BH	Budget Holder
CFSAM	FAO/WFP Crop and Food Security Assessment Mission
CPF	Country Programming Framework
DPRK	The Democratic People's Republic of Korea
EUPS	European Union Programme Support Units
FAO	Food and Agriculture Organization of the United Nations
FAO-RAP	Regional Office for Asia and the Pacific
FAO-SOs	FAO Strategic Objectives
FAO-RP	FAO Regional Priorities
GDP	Gross Domestic Product
GNP	Gross National Product
GoDPRK	Government of DPRK
HYV	High Yielding Varieties
IRRI	International Rice Research Institute, Philippines
Juche	Self Reliance
LPC	Local Procurement Committee
LTO	Lead Technical Officer
LTU	Lead Technical Unit
M&E	Monitoring and Evaluation
MDGs	Millennium Development Goals
MoA	Ministry of Agriculture
MOV	Means of Verification
NC	DPRK National Committee for FAO
NMDGs	National MDGs
NPC	National Project Coordinator
NPD	National Project Director
NTE	Not to Exceed (end date)
PAC	Pyongyang Agricultural Campus
PB	Project Board
PDS	Public Distribution System
PhT	Post-harvest Technology
PMU	Project Management Unit
RPFAP	Regional Priority Framework for Asia and the Pacific 2010-2019
SRI	System of Rice Intensification
TCP	Technical Cooperation Programme
TCSR	Donor Liaison and Resource Mobilization Team
TF	Trust Fund
TOR	Terms of Reference
TR	Terminal Report
TSS	Technical Support Services
TWG	Technical Working Group
UN	United Nations
UNDP	United Nations Development Programme

Acknowledgements: FAO would like to acknowledge and thank UNDP for funding the project DRK/10/005//01/99 – Reduction of Post Harvest Losses for Food Security, which enabled us to carry out the activities documented in this report. The keen interest taken by UNDP in the implementation and monitoring progress under this project, warrants special appreciation and thanks.

A.3. EXECUTIVE SUMMARY

Every grain is precious.

A.3.1. Prelude: This is the Terminal Report (TR) of the project, "Reduction of Post Harvest Losses for Food Security (PHL project)", funded by United Nations Development Programme (UNDP) and executed by Food and Agriculture Organisation of the United Nations (FAO) in the Democratic People's Republic of Korea (DPRK). The project was, operationally closed effective 31st October 2014. This report closes the project in a formal way with a statement about project activities which reflect on its performance over the past more than three years using the commonly accepted evaluation criteria (relevance, coherence, effectiveness, efficiency, impact and sustainability), and finally drawing out some conclusions, and making recommendations for the future.

A.3.2. The Problem: The DPRK has been suffering from post-harvest losses for a long time due to various reasons such as:

i. Lack of modern farm equipment, machinery and infrastructure.
ii. Inadequate attention to post-harvest handling activities.
iii. Inefficient bartering/marketing system.
iv. Inadequate government support for applied research and extension.
v. Inadequate processing and preservation facilities all over the country particularly for fruits and vegetables.
vi. Poor transportation practices.
vii. Poor handling during loading and unloading.
viii. Bruising, puncturing, and crushing due to improper packing.
ix. Absence of grading especially for fruits and vegetables.
x. Lack of awareness on what constitutes post-harvest losses.

The DPRK's effort towards food security has been constrained by several factors notably the high level of losses in farm produce after harvest. The high rate of post harvest losses has been identified to have serious dampening effect on the country's efforts for increased food security.

In order to achieve food security, the DPRK has implemented a number of measures toward increasing national crop production. However, an additional strategy remains to be actively pursued, that of maximizing agricultural production by mitigating pre- and post-harvest losses, which are estimated to account for losses in the following commodities: approximately 15.56 % in rice, 16.65 % in maize and 16.35 % in wheat and barley.

Problems in the post-harvest sector span a wide range of functions and disciplines. Their causes are complex as is cost-efficient strategy needed to overcome them. Causes of post harvest (PH) losses are also technological in nature - use of out-dated mills that result in a high percentage of broken grains, inadequate threshing machines that result in lost grain and badly paved, open lawns used for drying. Non-technological constraints also lead to losses. For example paddy is, left on the field over extended periods after harvest; resulting in the unnecessary movement and handling of the harvested grain; and also loss due to lack of availability of transport.

Types of PH losses:

i. Quantitative losses – Losses in weight, resulting from physical loss of the commodity through, paddy falling to the ground during reaping or spillage during transportation.
ii. Qualitative loss that directly impacts the efficiency of processing steps further down the chain. Changes in paddy quality, resulting from prolonged holding of the crop in the field after harvest, in threshing and in storage. This affects the percentage of whole grain obtained after threshing.

iii. Qualitative loss owing to an irreversible change in the smell, taste, or appearance of rice maize, or wheat during storage.

Post harvest practices undertaken at the farm, work team and sub-work team levels result in unnecessary and preventable losses. In most cases, there is limited awareness among farmers of the financial and economic implications of losses. Awareness of the potential solutions as well as management skills and technology required to effect improvements is mainly, absent or not clearly understood. While physical losses are perhaps more readily identifiable, the qualitative losses are not easily understood. Farmers are often not aware of the impact of prolonged holding of crops after harvest in the field. Management skills and the application of technology to efficiently implement the various steps in the post-harvest chain is often either deficient or not available. Where equipment is employed to assist with the relevant post-harvest handling and processing operations, often the design or operational parameters are not entirely conducive to best means of processing the crop. Low threshing efficiency of farm built threshers for example results in grain loss. In some areas the required management and technology is not available. Substantial losses are evident at all points in the post harvest chain from harvest to storage.

In this context, a post harvest loss assessment study was carried out in collaboration with the Pyongyang Agricultural Campus (PAC), Kim Il Sung University.

Major findings of post-harvest loss assessment in paddy, corn and wheat & barley:

Rice:
i. Total pre-harvest loss: 2.59 %
ii. Total post-harvest loss: 15.56 %
iii. Loss components across the rice post-harvest system, include: Harvesting: 14 %, field stacking: 10 %, transportation: 10 %, drying in threshing centre: 13 %, threshing: 14 %, drying before storage: 8 %, storage: 15 %, and milling: 16 %.

Maize:
i. Total pre-harvest loss: 1.91 %
ii. Total post-harvest loss: 16.65 %
iii. Loss portions of maize post harvest steps: Harvesting: 14 %, transport: 15 %, crib drying: 18 %, shelling: 18 %, drying: 11 %, storage: 13 %, and processing: 11 %.

Wheat & Barley:
i. Total pre-harvest loss: 2.9 %
ii. Total post-harvest loss: 16.35 %
iii. Loss portions of wheat post harvest steps: Harvesting: 13 %, transport: 15 %, drying before threshing: 8 %, threshing: 24 %, drying before storage: 11 %, storage: 14 %, and processing: 15 %.

In general, farmers (on the farms visits) in North Hwanghae, South Pyongan and Pongyang City receive their annual grain allowance in two tranches (October or November) shortly after harvest (often as un-milled grain) and in December after the final harvest calculation (milled grain). Farmers take responsibility for transporting the family allowance to their homes and for subsequent storage of that allowance. This system presents a number of problems for farmers, such as the practicality of physically transporting large quantities of rice to their homes, and access to mills. Household food security issues arise if families cannot manage their grain supply. Such circumstances result in grain shortfalls in the months prior to the next harvest. Farms in South Hwanghae store rice in a central location and distribute to the farmers on a monthly basis.

A.3.3. Response:
Strategy indentified to solve the problem:

a. Triangle Approach: The project practiced 'Triangle Approach' which is very successful in many developing countries including DPRK. Triangle Approach means three angles are composed of International Organizations (FAO and Donor), concerned Government Departments (Local Authority and Technical Departments) and Community (Members of targeted cooperative farms).

b. Participatory Process: Project implementation was based on people's participatory approach so that they were included in the project and developed ownership of it. Planning, implementation, monitoring and evaluation of project activities were based on a participatory approach. The project carried out community mobilization using a participatory, gender-sensitive and community-based approach. The project envisaged ownership of the development efforts to evolve and take root at the level of cooperative farmers and their institutions through the involvement of the key stakeholders. Farmers responded enthusiastically to new initiatives and accepted advice based on successful experience, provided they were given the opportunity to participate freely and make their own judgements and choices. Attention was placed on developing self-reliance amongst Work Teams of cooperative farms through an effective social mobilisation process and introduction of appropriate management procedures aimed at strengthening the capacity of its members to resolve problems generated during implementation.

c. Equity: The needs and opportunities of vulnerable groups were specifically considered in the context of improved access to resources, information, inputs and services. The project aimed to provide women with equal access to training and inputs within project activities.

d. Participatory Learning Action: The project experts and the beneficiaries introduced the location-specific, low-level and low-cost technologies for post-harvest management based on participatory learning actions that allowed them to learn from each other about the merits of traditional and scientific knowledge. It also utilized the knowledge and experience of international professionals to train and improve the capacity of the national counterparts in the selected areas through training and demonstrations, information, experience exchange, and consultancy services.

e. Harmonization of Development Efforts: Complementary collaboration among all partners (in particular with EUPS Units 2, 3 and 4 involved in agriculture) was fostered. The project strived to harmonize its interventions with other international efforts, the government's broader plans and programmes and other international organizations' projects and activities. This directly benefited the government in terms of savings from preventing duplication of efforts and ensuring efficiency of programmes related to agriculture.

f. Flexibility: The project in its design, partnerships and working methods had a built-in flexibility to enable the stakeholders to experiment, learn and adapt to their specific needs and opportunities. The project focused on suggestions received from local governments, project staff and the beneficiary groups during the annual planning activities and Project Board meetings. Therefore, the activities currently mentioned in this Terminal Report were refined and improved in the course of its implementation with kind approval of the Project Board.

Expected Results (key outputs and outcome): The project has achieved approximately 90 - 95 % of the following major outcomes:

i. Enhanced capacity of professionals engaged in planning and implementation of a coordinated post-harvest management.

ii. Capacity development in post-harvest management at the cooperative farm levels to reduce losses, and upgraded farm level post-harvest technology.

iii. Enhanced capabilities of professionals in post-harvest loss assessment.

iv. Raised farmers' awareness.

v. An improved awareness and knowledge base on on-farm losses, post harvest losses, on-farm storage, on-farm logistics, and distribution system in DPRK owing to publication of the 'Post-harvest Loss Assessment Report'.

vi. Distributed findings of assessments to concerned staff members and international organizations for better programme and policies.

vii. Report on "Post-harvest Loss Assessment" in Korean language printed and distributed to the concerned Korean staff members.

viii. Ensured to the extent possible that DPRK's procedures are in harmony with global trends in post-harvest management. However, lack of equipment, machinery and infrastructure continue major constraints.

ix. Six demonstration farms have been established, each capable of reducing current post harvest losses by at least 50 percent.

x. Interim recommendations on reducing post harvest losses were prepared and shared with concerned Government officials.

xi. Extension materials detailing methods and techniques for reducing on-farm post harvest losses were prepared and distributed among county officials and cooperative farmers.

xii. Supported 'Evaluation of Seed and Post-harvest Projects' by an external independent International Consultant.

xiii. Reduced the time from harvest to storage, and particularly the time for which paddy is left in the field following harvest. This was achieved by reducing the quantity of material removed from the field and introducing small scale mechanization to enhance the efficiency of post harvest activities and substantially reduce post harvest losses.

xiv. Improved threshing technology and maize shelling for loss reduction.

xv. Improved storage facilities and equipment for reducing losses and boosting productivity.

The project has achieved the following major outputs:

i. Project farms harvest losses reduced by 50 percent.
ii. A validated set of recommendations and guidelines for reducing national post harvest loss made available.
iii. Improved post harvest technology and management interventions promoted to a wider agriculture community.

In general, most of the outputs were achieved as per project's targets.

Eventual Changes:

a. The Project was initially approved and signed in November 2006, but never started implementation due to suspension of all UNDP programmes in the DPR Korea in March 2007. In line with Executive Board directives the project was resumed, with a reformulation and re-approval in 2011, aligned with the priorities set in UNDP Country Programme Document (CP). In the contemporary context, the project is also aligned with the Country Programming Framework (CPF), 2012-2015 agreed upon by the FAO and the Govt. of DPR Korea as well as with the FAO's Strategic Objectives (SO) to contribute to the eradication of hunger, food insecurity and malnutrition.

b. The project formally commenced in April 2011. The project was officially launched in September 2011 with the inception workshop held in Pyongyang and its operations gained momentum with the positioning of the project manager, its Chief Technical Adviser, in December 2011.

c. No major changes were made in project design. However, the numbers of trainees per training were decreased from 100 to 50 as approved by second Project Board meeting. The saving from training sub-heading was used to construct farm infrastructures and procure farm equipments/machineries as approved by Project Board meetings.

A.3.4. Results Achieved: The relevant text of 'Project Evaluation Report, April 2014' is quoted. **Quote:** The stated aim is an overall reduction of losses by some 50% from the recorded pre-intervention total loss levels of 15.56% in rice, 16.65% in maize and 16.35% in wheat and barley. Improved infrastructures and equipments, including threshing yards, threshers, harvesters and two complete rice milling plants supplied through the project, are expected to play a particularly important role for reaching those goals. Based on preliminary figures recorded at one of the six demonstration farms, the envisaged 50% reduction of post-harvest losses to around 7.5% seemed feasible.

A total of 6,804 cooperative farmers are expected to directly benefit from the achieved results under the Post Harvest project. **Unquote**

Review:

a. In DPRK, the post-harvest management has made impressive progress particularly in project areas, but still there is still long way to go to decrease the post-harvest losses significantly.

b. The monitoring and evaluation of the project was undertaken regularly at different levels, involving project management, regular periodic project review by UNDP, technical support from Lead Technical Unit from FAO Regional Office, Office of FAO Representation (FAOR) and the Project Board (PB) that held five meetings for critical review of the project.

A.3.5. Follow-up Actions: The relevant text of the 'Evaluation Report, May 2014' is quoted. **Quote:** In supporting further post harvest related programming substantial additional benefits are for example possible through an even wider use of threshing -cum- seed drying floors, combine harvesters, mobile threshers, maize shellers and improved crop storage, whereby the sustainability of the adoption of technological innovations is primarily dependent upon their profitability in the local setting. **Unquote**

Required follow up actions for further improvement of the post harvest system are as follows:

i. Introduction of high capacity mobile field threshers;
ii. Improvement of on-farm storage facilities at threshing centres of cooperative farms by modifying the indigenous storage bins presently used by farmers;
iii. Improvement of existing on-farm grain milling facilities by introducing a grain pre-cleaner, de-stoner and a paddy/rice separator; and

iv. Training of farmers and staff on improved post harvest management practices.

Second Phase of the Project: The project was completed on 31st October, 2014. Many positive things are happening in post-harvest management sector. However, these successes are not enough, there is still long way to go. FAO and MoA will not be in a position to carry out the most needed activities related to post-harvest management after closure of the project. In order to carry forward the efforts of this completed project to a logical conclusions and also to provide a basis for sustainability as well as a good exit strategy for both the donor and FAO, Phase II should be designed as soon as possible to cover actions required for sustainable development of post-harvest management.

B. GOVERNMENT ATTENTION

Specific Findings and Recommendations for Government Attention:

a. Sequencing of Programme: Careful sequencing of programme activities is essential. In particular, it is essential that pilot-based testing of models be carried out prior to using the models as demonstrations, since only suitable models that are technically, financially and economically viable should be promoted.

b. Hypothetical Pre- and Post-harvest Losses in DPRK: The relevant text of CFSAM Report – 2013 is quoted. **Quote:** A total of 5.98 million tons of food output (including paddy, cereals, soybeans, and cereal equivalent of potatoes) from cooperative farms, plots on sloping land, and household gardens for 2013/14 is expected. This estimate includes the 2013 main season harvest that was concluded and the forecast for 2014 early season crops. When paddy is converted to milled rice and soybeans to cereal equivalent, total food production is estimated at about 5.03 million tons. **Unquote**

In order to achieve food security, the Democratic People's Republic of Korea has implemented a number of measures toward increasing national crop production. However, an additional strategy remains to be actively pursued, that of maximizing agricultural production by mitigating pre- and post-harvest losses, which are currently estimated to account for approximately 15 percent of national production. The problem is even more acute when considering losses for other links in the postharvest chain.

i. Total staple food production in 2011/12: 5.9 million tones
ii. Estimated pre- and post-harvest losses: 16 % of national production = 5,900,000 x 16/100 = 944,000 MT (un-milled) = 794,000 MT (in terms of milled rice) = cereal for 3,780 persons for one year (calculated @ 210/person/year). 944,000 MT cereal = production from 178,113 ha of paddy field (calculated @ average paddy yield 5.3 ton/ha).
iii. Achievable reduction in pre- and post-harvest losses: 50 % of current losses = 794,000 MT (milled rice)/2 = 397,000 MT = cereal for 1,890 persons for one year. 944,000 MT/2 = 472,000 MT (un-milled) cereal = production from 89,056 ha of paddy field (calculated @ average paddy yield 5.3 ton/ha).

But, it needs a stronger commitment on the part of the GoDPRK and international community to make it happen rather than to let it happen.

There have often been demands for simplified loss figures. This for example has led to the postharvest losses of maize for a country or region being reduced to just a single figure representative of many years. However, such an approach is likely to be misleading since as noted by Tyler (1982) "postharvest losses may be due to a variety of factors, the importance of which varies from commodity to commodity, from season to season, and to the enormous variety of circumstances under which commodities are grown, harvested, stored, processed and marketed." It is therefore important not

only to work with figures that are good estimates at the time and in the situation they are taken but to be aware that at other times and situations the figures will differ. This necessitates regular recalculation of loss estimates with the best figures available.

c. The Importance of Technological Progress in Agriculture: The issue of the precedence that agriculture should be given over industry in the initial stages of economic development is a crucial one for DPRK. Accordingly, on numerous occasions, Government renewed its commitment to agriculture and underlined the objective to achieve self-sufficiency in basic cereals.

C. Major Activities Carried Out by the Project

C.1. Introduction:

C.1.1. Background: A major issue in the post harvest system that has to be addressed is allowing the harvested crop to remain in the field for around three to four weeks prior to threshing, drying and storage, thus exposing the produce to deteriorative agents such as adverse weather conditions, grain shattering, heating of grains leading to discoloration, mould damage etc. causing serious grain losses. This practice of keeping the grain in the field is adopted by farmers mainly due lack of adequate transport facilities to move the crop from the field to the centralized farmer cooperative threshing centres, which are located within a radius of 4 to 5 km from the fields, and also due to inadequate threshing, drying and storage facilities at the threshing centres. In order to alleviate these problems and improve the prevailing post harvest practices the FAO project has provided improved post harvest machinery/equipment to six identified demonstration cooperative farms with the aim of encouraging the farming community to adopt improved technologies that would significantly reduce post harvest losses in grains and improve the prevailing post harvest system.

C.1.2. Agriculture in DPRK, a Snapshot: Agriculture sector, including forestry and fisheries, is the mainstay of the national economy of DPR Korea. With its contribution to the total GDP of the order of 20 percent and engagement of 36% its workforce (Source: Terminal Report of DRK/10/003 project), the agriculture sector holds prominent importance for food and livelihood security and socio economic well being of the people. However, the sector is seized with many challenges. Its inconsistent and vulnerable performance and the resultant impact on the economic and social distributive gains in terms of food and nutrition security of the people is a cause of concern. The main factors leading to this concerning situation are adverse topography, inclement weather, climatic aberrations and restricted farming opportunity in the country.

Based on the Crop and Food Security Assessment Mission's (CFSAM, 2013) estimate, total food requirement of DPR Korea stands at 5.37 million tonnes of cereal equivalent (rice in milled terms). Further, Mission estimates a cereal import requirement of 340,000 tonnes for the 2013/14 marketing year (November/October). Assuming the official import target of 300,000 tonnes of cereals is met, the Mission estimates an uncovered food deficit of 40,000 tonnes for the current marketing year. This food gap is the narrowest in many years, and is mainly due to the higher 2013 production. Despite the improved harvest, the food security situation remains similar to previous years with most households having borderline and poor food consumption.

The estimated vegetable production comes to 0.45 million tonnes assuming average productivity of 15 tonnes/ha from an area of 30,000 ha against the requirement of 2.50 million tonnes of vegetables based on minimum dietary requirement of 300 g vegetables/day/individual. Obviously, there is a gap of 340,000 tonne in food demand and supply, and 2 million tonnes in case of vegetables.

As per the latest estimates/statistics available, total land area of DPRK is 122,543 square kilometres of which an estimated 17% i.e. approximately 2 million hectares is arable land under cooperative farms. Rice, maize and potato constitute the major food crops of DPRK. Of these rice and maize,

DPRK's major staple food crops, contribute respectively 45 and 34 percent to country's food grain production (Source: CFSAM 2013). Self-sufficiency in food production is a national priority. To achieve self-sufficiency in food production a major share has to come from rice and maize crops.

There has been degradation in the natural resource base. DPR Korea is one of the countries experiencing the impact of climatic changes. DPRK's agriculture today is at the crossroads from ecological, economic, and equity standpoints. Thanks to tools continuously being provided by modern technology, there is a unique opportunity to build a new agricultural production system, based on harmony among the different goals and components of the system. Considering the future challenges, alternatives need to be thought of and devised to address them adequately. Accordingly, the options should be sustainable i.e., economically viable and ecologically sound in nature, to qualify for selection and subsequent adoption. Thus increasing the food production per unit of land through better natural resource management is perhaps one of the best options and the ways to salvage the food, nutrient and livelihood security. The conclusion is clear that fighting food and nutritional insecurity makes sense not only as an expression of a basic human right, but also because it is a good economic investment.

C.1.3. Planting and Harvesting Time:
Cereal crops:

S. No	Crop	Planting/sowing time	Harvesting time
01	Rice	June	October/November
02	Maize	April	September
03	Wheat	November	June
04	Barley	November	June/July

Vegetable crops:

Crop	Nursery Sowing	Transplanting	Harvesting time	Yield potential (tons/ha)
Cabbage	Middle of Feb	Mid-March	End of May to early June	40
Eggplant	Early Feb	End of April to end of May	Middle of July to end of October	30
Cucumber	End of April	End of May	Middle of June to end of July	50
Spinach	-	Direct sowing-end of Sep	Early May	40

Source: Farm Managers, Cooperative Farms

For vegetable seed crops:

Crop	Nursery sowing	Transplanting	Seed harvesting	Seed yield (kg/ha)
Cabbage	Middle of Feb	End of March	Early June	650 (hybrid seed)
Spinach	-	Direct sowing-end of Sep	End of June	700 (OP seed)
Radish	Early Feb	End of March	Early July	500)hybrid seed)
Cucumber	Early April	Early May	Early August	100 (OP seed)
Pumpkin	Early April	Early May	Early August	100 (OP seed)
Lettuce	Early Feb	End of March	Middle July	200 (OP seed)

Source: Farm Managers, Cooperative Farms

C.1.4. Cooperative Farms under the Project: Farming in DPR Korea is carried out on a cooperative basis and each cooperative comprises of around 1000 farmers. A cooperative farm cultivates, on an average, 400 ha of paddy and 150 ha of corn (maize) and, with an average yield of 3 to 4 tons per ha, produces around 1500 tons of paddy and 500 tons of maize. The crop after harvesting is transferred to threshing centres of the cooperative farm where it is threshed, cleaned, dried and stored until distributed. The number of threshing centres per farm varies from 6 to 10 and each centre is managed by farmer sub groups, referred to as Work Teams.

C.1.5. Major Problems / Prevailing Post Harvest Practices: The main post harvest operations in grains consist of harvesting, threshing, cleaning, drying, storage and milling. It has been reported previously that serious losses occur in the grains during these post harvest operations due to adoption of improper post production techniques. Harvesting of the crop is done manually, using sickles, and the stage of maturity for harvesting is identified objectively by the colour and appearance of the flag leaves and the panicles. The harvested crop is spread on the field to dry for about one to two days.

Field drying of harvested paddy crop

The crop is then stacked in the field for periods ranging from 1 to 6 weeks until it is taken to the threshing centres for threshing and subsequent processing operations.

Field stacking of harvested paddy crop

Drying and stacking in the field lead to serious losses due to shattering of grains, and also due to bird and rodent damage. Keeping high moisture paddy in heaped condition also leads to grain 'yellowing' or discoloration due to temperature build up (heating) caused by increased rate of respiration in the living grain. Further, the crop is exposed to adverse weather conditions such as sudden rains, which can cause serious damage to grains. The main reason for keeping the harvested crop in the field for long periods is due to inadequate transportation facilities to move the crop to the threshing centres, located with a radius of 4 to 5 km, and also due to inadequate threshing capacity at the threshing centres. Hence, in improving the present post harvest system there is an urgent necessity to reduce the time period from harvesting up to drying and storage by increasing the transportation and threshing capacity in cooperative farms.

The crop is transported from the field to the threshing centres in trailers attached to tractors and the number of tractors per cooperative farm varies from 10 to 25. Since the whole plant mass that is harvested, comprising of paddy and straw is transported, the transportation capacity is considerably

reduced whilst increasing grain losses due to shattering and spillage. In this context, introduction of high capacity mobile field threshers and combine harvesters where the crop is threshed in the field and the threshed grain enclosed in bags is transported, instead of the whole plant mass, will greatly assist in alleviating this problem.

Transportation of paddy crop to threshing centres

Unloading of paddy crop at the threshing centres

Threshing, which involves separation of grains from the rest of the plant mass, is carried out at the threshing centres of cooperative farms by using mechanical threshers operated by electric motors.

Threshing of paddy at the threshing centres

The threshing capacity of the mechanical threshers available at the threshing centres is 1 ton per hour and, assuming that 16 tons of grain is threshed per day at a threshing centre, a cooperative farm having eight threshing centres will take 20 to 30 days to complete the threshing operation. Introduction of high capacity mobile field threshers and combine harvesters will certainly assist in overcoming this problem of inadequate threshing capacity at the threshing centres.

Drying, which involves removal of moisture from the grains, is an important operation prior to storage because high moisture grain will deteriorate rapidly due to following reasons: induce respiration and

heating, causing grain discoloration and dry matter loss; germination of grains; mould (fungal) growth and subsequent incidence of aflatoxin; and insect activity. The moisture content of paddy, rice, corn and wheat has to be brought down to a moisture content of 14% or less for safe storage. Sun drying is the normal method adopted for drying of threshed grain at the threshing centres of cooperative farms. In this method the grains are spread on sun drying yards paved with cement and allowed to dry for 1 to 3 days depending on weather conditions.

Sun drying of grain at the threshing centres

The advantage of sun drying is its low energy cost; however, several disadvantages are associated with sun drying such as: slow drying rate and hence, longer drying time; dependence of drying time on prevailing weather conditions; interruption in the drying process during night time when the crop becomes susceptible to microbial damage etc. On the other hand, introduction of mechanical dryers, where heated air is blown through the grain mass has the following advantages: continuous process; drying under controlled conditions; shorter drying time; and drying during adverse weather. However, since the energy cost in mechanical drying is higher than in sun drying, the use of a combination of sun drying and mechanical drying, where the grain is initially sun dried to a moisture content of around 16 - 17% followed by mechanical drying to 14% moisture, can save energy whilst improving quality and safety of the produce.

In DPR Korea, on-farm storage occurs at two levels; temporary storage at the threshing centres of cooperatives for periods ranging from 1 to 3 months until the grain is distributed and storage by farmers at household level extending up to one year, until the next harvesting season. At a threshing centre, about 150 to 200 tons of grain is stored and at household level, assuming that 100 kg of grain is consumed per person per year in a household comprising of 5 persons, approximately 800 - 1000 kg has to be stored. Serious losses in grains can occur if improper storage practices are adopted. The main causative agents of grain deterioration during storage are inherent metabolic activities of the grain such as respiration and germination and also, external agents such as insects, moulds, rodents and birds. Inadequate storage space at the threshing centres compels the farmers to store grains in an unscientific manner thus leading to serious losses. At some threshing centres grain is stored in indigenous outdoor storage bins constructed from paddy straw.

Storage of threshed paddy in indigenous storage bins at threshing centres of cooperative farms

Some disadvantages associated with the indigenous storage bin are: exposure of grains to rain water percolating through the straw roof and wall; seepage water from the ground reaching the stored grain; and susceptibility of the grains to damage by rodents entering through straw wall and roof. Structural modification of the bin to overcome these problems would assist a great deal to overcome these problems and increase storage capacity at the threshing centres.

Some threshing centres of cooperative farms store paddy inside buildings. It was observed that correct storage practices to prevent losses and ensure produce safety and quality are not adopted when storing grains inside buildings such as the use of pallets to keep the grain stored in bags above ground to prevent seepage moisture from reaching the grains, use of a stack plan to ensure adequate ventilating and inspection of the grains and proofing of the store against rodent and bird attack. Hence, it is important to create awareness among farmers on good practices when storing grain to minimize losses and ensure quality and safety of the produce.

Storage of threshed paddy inside buildings at threshing centres of cooperative farms

Each cooperative farm has 1 to 2 rice mills for milling of paddy belonging to the farmers. The mills consist of a rubber roll sheller for de-husking of the paddy grains and a friction type polisher for polishing or bran removal of the de-husked rice. It is important that a cleaning machine, to remove all impurities from paddy before feeding into the rubber roll sheller, is introduced to these mills not only to improve the quality of milled rice but also to reduce ware and tare of the milling machines Inclusion of a de-stoning machine in the process line, in addition to the pre-cleaner, for removal of stones which are of the same size and weight as the grains, will greatly improve the quality of the processed rice

and performance of the milling machines. In addition, introduction of a 'paddy separator' in between the rubber roll sheller and the polisher, which removes paddy grains from the unpolished rice, would greatly enhance the quality of milled rice and increase the rice milling capacity and reduce milling cost. Further, having a paddy separator will ensure that the rice bran, which is a valuable by-product as an animal feed, is not mixed with powdered husk.

C.2. Prioritized Post-harvest Activities in DPRK Context: Based on the information available and from interviews with farmers and government officials, it is evident that efforts to reduce losses should be prioritized as follows:

i. Build capacity in post-harvest technology and post-harvest management at the cooperative farm levels to reduce losses;
ii. Reduce the time from harvest to storage, and particularly the time during which paddy is left in the field following harvest. This can be achieved by reducing the quantity of material removed from the field and introducing small scale mechanization to enhance the efficiency of post harvest activities and substantially to reduce post harvest losses;
iii. Improve threshing technology and maize shelling for loss reduction;
iv. Improve storage facilities and equipment for reducing losses and boosting productivity;
v. Introduce Drying Facilities designed to improve drying of the first harvest crops, rice and maize; and
vi. Increase awareness of links between post-harvest losses and productivity level.

C.3. Co-ordination/Consultation Process with Cooperative Farms and Stakeholders: An essential guiding principle for the implementation of the Project was the full involvement of cooperative farms and concerned stakeholders, through all stages from conception and planning to implementation and monitoring. Such participation is important, not only as a globally accepted best practice, but also because the cooperative farms in DPRK demand a local approach. The Project therefore emphasizes on appropriate approaches that: (i) ensure that cooperative farms are involved at all stages of the project management cycle; (ii) build trust within cooperative farmers' communities through transparency and equity; (iii) listen to the views of farmers; (iv) "build back better" to reduce farmers vulnerability to future long dry spell and floods; and (v) sustain participatory self-monitoring and evaluation systems.

Beside this project, few International Organizations are also involved in agricultural programme. The multiplicity of donor agencies dealing in such a vital aspect of agriculture is certainly to be welcomed. It would be difficult to lay down rigidly the precise task of each agency and to enforce the same. However, to avoid overlapping of activities and wastage of resources, it was necessary to demarcate the roles of these agencies in agricultural development programme and adhere to such demarcation as far as possible. For this purpose an Agriculture and Food Security Thematic Group has been constituted. This group is associated with UN Agencies and EUPS Units. Food security information and assessment is undoubtedly a domain where FAO is recognized to have a comparative advantage. The project CTA always provided technical inputs for the benefit of the group. The meetings were held regularly to discuss the agricultural and food security activities being carried out by each agency.

C.4. Action Plan: Project supported in preparation of most cost-effective and practically feasible action plan at cooperative farm levels. The first step in any systematic attempt to decrease post-harvest losses is to prepare useful action plan based on local farmers' needs. The development of action plan that harmonize with the local needs – as the farmers see them and with national interest with which the country as a whole is concerned – is an important responsibility of concerned staff members at all levels national, province, district, county and Ri.

C.5. Meetings of the Committees: The following meetings were held on need basis until the completion of the project to carry out the project's activities smoothly, nicely and transparently:

i. Local Procurement Committee (LPC),
ii. Technical Working Group (TWG) mainly among concerned staff members of the MoA, PAC, and AAS,
iii. Agriculture and Food Security Theme Group, and
iv. Seed & PHL Consultations Meeting/Discussion with FAO Bangkok.

C.6. Services of National and International Experts: FAO brought in international experience and expertise from its diverse Post-harvest programmes around the world so as to help the project in achieving the best results in technology transfer, offering solutions to problems to be addressed, and ensuring that DPRK's post-harvest management technologies are in line with global trends in technology development. Senior Agro-Industry and Post Harvest Officer as well as LTO of the PHL project, FAO RAP Bangkok provided technical backstopping support. In addition, project utilized the services of technical staff members from the MoA and PAC.

C.7. Field Visits / Field Observations: A working knowledge and understanding of the technical factors that impact on the safety, quality and value of agricultural produce, an appropriate infrastructural support base, proper logistical arrangements, good stakeholders interaction within post-harvest value chains and effective government support services are prerequisites to reduce post-harvest losses and increasing returns to producers.

During field visits, project assisted direct (primary) beneficiaries in meeting these goals by:

i. Building the technical capacity of farmers and other stakeholders in good post-harvest handling practices;
ii. Developing, consolidating and disseminating information on post-harvest operations through brain storming discussion, printout, and on job-training;
iii. Strengthening the capacity of public sector organizations to provide appropriate post-harvest services to their cooperative farms and concerned staff members; and
iv. Providing advice and training on the design and proper management of post-harvest specific infrastructure.

It might be prudent to think that the higher the crop yields of cereals, i.e. bigger the harvests, bigger are the post-harvest losses but this effect is likely to be small compared with other factors such as adverse climate at harvest. With very big harvests it is possible that in some locations there is insufficient manpower to bring in the crop or it would be harvested with a reduced efficiency but it would be unusual since the same manpower was available at sowing. Good harvests are accompanied by a slower flow in the public distribution system (PDS) leading to longer storage periods for grain. In this situation there may be an increase in loss due to attack by insects and rodents, but still savings in absolute terms will be higher

Serious losses do sometimes occur and these may have resulted from agricultural developments for which the farmer is not pre-adapted. These include the introduction of high yielding cereal varieties that are more susceptible to pest damage, double cropping seasons that result in the need of harvesting and drying when weather is damp or cloudy or rainy.

C.8. Monitoring the Use of Farm Machineries provided by the Project: With limited land, increasing population and food insecurity exacerbated by the lingering effects of the global financial crisis and climate change, a viable option is to increase land productivity and reduce post-harvest losses through the introduction of efficient and adaptable small-scale machinery.

In general, adoption of post-harvest technologies in the DPR Korea is beset with several constraints and challenges. Most of the cooperative farmers still rely on traditional farming techniques and manual labour and draft animal power. Agricultural extension services have traditionally focused mainly on production but not post harvest technologies, and extension services and training programmes provided by the Ministry of Agriculture are not sufficient. Because of a weak information system nationwide to disseminate proper knowledge of post-harvest technologies and good agricultural practices, farmers have little information on proven technologies and machineries. Underdeveloped rural infrastructure and limited research and development and manufacturing capacity also restrict mechanization.

Human, animal, diesel engine, electric motor, tractor, power tiller, truck, combine harvester are the major power sources for field operations related to post-harvest management. Modernization of post-harvest management requires appropriate systems of mechanization for ensuring timely post harvest operations. It also requires machinery for reducing drudgery in agriculture. Traditionally, farmers in DPRK have been using animal power-operated farm equipment, but due to increased cropping intensity, this power is no longer adequate to ensure timeliness. Research institutions and industries together have helped the farmers in developing suitable machineries to mechanize various field operations. The Namnong Thresher is one of the most popular items of farm machinery manufactured in DPRK. However, most of the farm machinery is still imported mainly from China.
The following major items of equipment/machinery were provided to 6 cooperative farms under the project.

S.N.	Item Description	Unit
1.	Tractor, 4 WD, 20 HP	6
2.	Tripping Trailer, 4 wheeled	6
3.	Truck, 10 ton capacity	6
4.	Combine Harvester	7
5.	Corn Combine Harvester	1
6.	Maize Sheller	4
7.	Rice Milling Plant	2
8.	Moisture Meter	42
9.	Electric Transformer	6
10.	Namnong Thresher	8
11.	Knap-sack Sprayer	100

Most of the cooperative farms have Mechanical Engineers who provide support to service, maintenance and repair of farm equipment and machinery. Most of the cooperative farms have cash constraints which precludes the procurement of spare parts.

Harvesting: Delayed and staggered harvesting lead to significant losses in grains in the country. Realizing that mechanization of the operation is one important way of overcoming this problem, the project introduced Corn harvesting machines to the project sites with the aim of popularizing the technology. The Harvesting machine has a capacity of 2 ha per day.

Corn harvesting machine

Combine harvesters for paddy were also introduced to the farms, under the project, which has a capacity of harvesting and threshing and cleaning around 2 ha/day. Introduction of this machine greatly assisted in overcoming the problem of allowing the harvested crop to remain in the field for longer duration causing serious losses in grains.

Combine harvester for paddy and wheat

Manual harvesting using sickles is a laborious operation and, on an average, a team comprising of 10 to 12 farmers takes 2 days to harvest one hectare of grain. On the other hand, the mechanical harvesters introduced under the project can harvest one hectare in half a day (4 hours), thus appreciably reducing the harvesting time and hence the time period from harvesting to subsequent threshing and drying by almost 5 to 6 days. Also, the combine harvester for paddy and wheat, in addition to harvesting, has a threshing capacity of 1 ton per hour. Reducing the time period the crop is kept in the field is critically important to minimize the serious post harvest losses that occur due to shattering, mould, rodent and bird damage and damage due to adverse weather conditions.

Field transportation: On an average, nearly 1500 tons of harvested paddy and 500 tons of corn have to be transported from the field to the threshing centres of a cooperative farm. With the available transportation capacity it takes 10 to 30 days to transport the crop and during this period serious qualitative and quantitative losses occur in grains. The project has provided 20 hp tractors and trailers, of appropriate size, to the project sites to overcome this serious problem of inadequate transportation capacities.

Tractor and trailer for field transportation of harvested crop

Truck for distribution of grain from Cooperative farm

Impact of Mechanization: Although mechanization inputs as mentioned in the above table have been introduced to facilitate post-harvest operations, the level of mechanization introduced is still very low. Based on the investment in use of machinery and limitations in availability of human work force and draught-animal power, mechanization has become almost mandatory rather than a matter of choice. However, increasing cost of spare parts and fuel, and poor yields are the main constraints that reduce the margin of profit from mechanization.

Constraints: Improved farm machinery is not available on custom-hire basis. The resource-poor cooperative farmers could get the benefit of modern agricultural engineering equipment through custom hiring.

C.9. Supporting Drying System: There is less loss of paddy if combine harvester is used. However, the potential shortcoming is that the paddy must be harvested at high-moisture content, i.e., >28%. This high moisture content is conducive to rapid deterioration in quality such as discolouration, yellowing, germination, and damage to milling quality. The only practical means of preventing grain quality deterioration is immediate drying of high moisture paddy. Mainly due to energy constraint, so far shade drying and sun drying are the most popular practices in most farmers' communities.

Shade Drying: Shade drying is the process of removal of water from grain to ambient air at low temperature. Shade drying is not used for commercial purpose, as it needs larger area and longer drying time making it inefficient.

Sun Drying: Sun drying at commercial level can produce good quality grains if recommended practices and proper tools are used. These tools are less capital intensive and can be used with unskilled labour. Basic requirements for sun drying are:

i. Paved even area (as big as a basketball court) without trees and big buildings in vicinity.
ii. Moisture meters and thermometers to check moisture content and grain temperature frequently.
iii. Power mower and hand mowers for mixing and spreading the grains.
iv. Plastic sheets and fences for covering during (a) over heating, (b) raining and heavy wind, (c) mixing with other materials, and, (d) contamination from birds and animals.
v. Spread the grains in thin layers, ideally 2-4 cm.
vi. Turn the grain at least once per hour.

C.9.1. Threshing Yard with Shed: Construction of 13 threshing yards with shed, each having size of 333 square meters at threshing centres of cooperative farms have become useful, not only to protect the machinery and equipment but also to protect the crop from rain and adverse weather conditions.

i. Jangsuwon Cooperative Farm, Samsok District, Pyongyang – 2 yards,
ii. Up Cooperative Farm, Yonan County, S. Hwanghae Province - 2 yards,
iii. Osin Cooperative Farm, Daean District, Nampo City – 2 yards,
iv. Soho Cooperative Farm, Mundok County, S. Pyongan Province - 3 yards,
v. Pyongam Cooperative Farm, Koksan County, N. Hwanghae Province - 2 yards, and
vi. Daepyong Cooperative Farm, Singye County, N. Hwanghae Province – 2 yards.

C.9.2. Construction of Drying Facilities: Newly harvested high moisture paddy (20-28%) must be dried down to a level of 14%, wet basis, to reduce its susceptibility to mould infestation, prevent sprouting, prolong its shelf life, and at the same time, preserve its quality. Drying the paddy within 24 hours after harvest is the best means of controlling mould infestation. Each day of delay in drying increases the risk of paddy deterioration. Moreover, maintaining the grain quality and ensuring high milling recovery of paddy depend to a large extent, on the optimum moisture content levels.

The moisture content of harvested corn grains is normally high. The excess moisture must be removed quickly before deterioration sets in. Drying is an effective method of preserving grain quality. It also permits timely scheduling of harvest to make better use of labour and avoid field losses caused by shattering, insect infestation, and aflatoxin contamination. It also prolongs the shelf life of the grain and, at the same time, maintains seed viability. Corn drying is done in two operations, regardless of the drying method used. These are drying the cobs with or without husk, and drying the shelled grains.

Wheat crop suffers severe harvest and post-harvest losses if appropriate technology is not adopted, particularly during harvesting. It faces serious storage-pest problems with both whole grains and its products like flour if not dried properly.

Project constructed 2 Drying Facilities, i.e., pavement of yards and installation of sunlight transparent roofing at two project farms namely Soho, South Pyongan; and Jangsuwon, Pyongyang. Conventional Sun drying was preferred mainly due to the following reasons:

a. Majority of the cooperative farms rely on sun drying. Essentially, it is a natural method of drying since it relies mainly on solar energy and natural air movement. It differs slightly from natural field drying since conventional sun drying involves drying of threshed grains/harvested crops and requires a drying floor and occasional mixing or turning of the grain/harvested crops.
b. It has sunlight transparent roofing, so it allows sunlight as well as protects grains/harvested crops from rain.
c. In DPRK context, the cost of mechanical drying is still much higher than the cost of sundrying probably due to high price of fuel and availability of hard working cooperative farmers.

C.10. Rice Milling Plant: The rice mills presently operating at farm level consist of either a single steel huller or a combination of rubber roll sheller and friction type polisher (jet pearler), which are not so efficient. Project introduced Rice Milling Plants, each with the capacity of 1.3 – 1.5 ton/hr/set. They both contain pre-cleaners in the process line which removes impurities/foreign matter and thereby not only improves the quality of processed rice but also minimizes wear and tear of the machines, and thus enhances their durability. It also contains 'paddy separator' in between the rubber roll sheller and the polisher, which separates paddy grains from the unpolished rice coming from the rubber roll sheller, to enhance the quality of milled rice and increases the rice milling capacity and reduces milling losses. Further, having a paddy separator ensures that the rice bran, which is a valuable by-product as an animal feed, is not mixed with powdered husk.

Losses in rice milling may be qualitative and quantitative in nature. Quantitative or physical losses are manifested by low milling recovery while low head rice recovery or high percentage of broken grains accounts for loss in quality of the milled product. These losses could be attributed to improper adjustment of individual machine, improper selection of the type of equipment used, improper arrangement and combination of the different machine components that make the system, lack of proper training of mill technicians, lack of proper maintenance and other machine factors which the mill owners can possibly control. Losses could also be attributed to the inherent genetic quality of paddy on which the mill owner may have no control.

Impacts: Every grain is precious. Value can be added by processing paddy into rice. One of the major causes of post-harvest losses in rice milling is due to use of poorly maintained or outdated rice mills. The project introduced 2 Rice Milling Plants, each with the capacity of 1.3 – 1.5 ton/hr/set. Currently ratio of milled rice output to paddy input is 50-55 : 100 from existing outdated rice mills and it is easily increased to 60-65 : 100 simply by using above improved rice mills. Cooperative farmers are very much convinced with the performance of these improved rice mills.

C.11. Electric Transformers: The GoDPRK has given high priority to supply electricity to Cooperative Farms to improve food and nutritional security. Unfortunately, most of the time power supply has low voltage and keeps on fluctuating rather frequently. Accordingly, rice milling plants and other equipments do not working properly in absence of right kinds of transformers. Project provided altogether 6 electric transformers to farms under the project.

C.12. Grain Moisture Meter: Cooperative Farm Managers repeatedly requested to procure locally assembled Grain Moisture Meters. Project procured and distributed 42 grain moisture meters to 6 cooperative farms (7units/farm) under PHL project.

Technical specifications:

i. Labelling: DMT-602
ii. Power: Battery 1.5V × 4 Pieces

iii. Display device: Automatic
iv. Temperature Range: -10≈ 40℃
v. Device included with balance scale
vi. Ruggedly designed, easy to operate and provide important statistics about the meter readings
vii. Able to provide moisture measurement of all types of grains quickly and easily
viii. Spare parts and services easily available in the DPR Korea

C.13. Post-harvest Loss Assessment: Detailed knowledge of losses, on-farm post harvest losses, on-farm storage, on-farm logistics, and distribution system were made available in the DPRK context through 'Post-harvest Loss Assessment Report' and available information were used to raise awareness on several occasions to decrease post-harvest losses. Findings of assessments were distributed to concerned staff members and international organizations to formulate and implement better programmes and policies.

In addition, Post-harvest Loss Assessment has three inter-related activities: (a) formal training of extension staff, farm staff and service providers; (b) demonstration of improved post-harvest technologies located at the six demonstration farms; and (c) raising awareness to decrease post-harvest losses.

Even though previous workers have reported that serious post harvest losses, amounting to 15%, occur in DPR Korea, no comprehensive study, designed on a scientific basis, was carried out in the past to quantify the losses that occur at each stage in the post harvest system and to indentify the causes of losses. This assumes importance in any post harvest loss prevention programme to ensure its success. In this context, a post harvest loss assessment study was carried out in collaboration with the Pyongyang Agricultural Campus (PAC), Kim Il Sung University.

Major findings of post-harvest loss assessment in paddy, corn and wheat & barley:

Rice:
i. Total pre-harvest loss: 2.59 %
ii. Total post-harvest loss: 15.56 %
i. Loss components across the rice post-harvest system, include: Harvesting: 14 %, field stacking: 10 %, transportation: 10 %, drying in threshing centre: 13 %, threshing: 14 %, drying before storage: 8 %, storage: 15 %, and milling: 16 %.

Maize:
i. Total pre-harvest loss: 1.91 %
ii. Total post-harvest loss: 16.65 %
iii. Loss portions of maize post harvest steps: Harvesting: 14 %, transport: 15 %, crib drying: 18 %, shelling: 18 %, drying: 11 %, storage: 13 %, and processing: 11 %.

Wheat & Barley:
i. Total pre-harvest loss: 2.9 %
ii. Total post-harvest loss: 16.35 %
iii. Loss portions of wheat post harvest steps: Harvesting: 13 %, transport: 15 %, drying before threshing: 8 %, threshing: 24 %, drying before storage: 11 %, storage: 14 %, and processing: 15 %.

Wheat crop suffers severe harvest and post-harvest losses if appropriate technology is not adopted. It faces serious storage-pest problems with both whole grains and its products like flour. Storage life of milled wheat product is rather low. On infestation, the control of insects in wheat products is not easy, though fumigants like aluminium phosphide can be used. For this reason wheat, by and large, is distributed/bartered as grains. For their domestic consumption, they avail custom-milling services of

nearby cooperative farm's mill, losing about 1 % burnt losses and also suffering admixture with other grains. In DPRK, normally the whole grain is milled and the flour recovery with bran is about 99 %.

The wheat grain consists of four major parts. Their weight is expressed as a percentage of the total seed as follows: Seed Coat (Bran): 10 %; Aleuron layer (Bran): 2 %; Endosperm: 83 %; Germ: 5 %; Total 100 %.

Above Post-harvest Loss Assessment Report had paid due attention to the question of equipment in general and more specifically to small-scale mechanization. Report also took account of some of the financial, technical and economic effects these may have. However, less attention was paid to socio-economic factors (competition between a harvest that is already mature and a new crop to be grown, means of access to fields, availability of workers, etc.) or socio-cultural aspects (dietary habits, cooking methods, etc.). This brief outline of the non-technical aspects of post-harvest losses reminds us that the post-harvest sector itself is part of a much broader and more complex system, in which various types of interrelationship and interdependence concern not only the successive operations in the food chain, but also the whole range of human activities and hence the very workings of society, thereby contributing to existence and the advance of civilization.

Intrinsically the nature and causes of post-harvest losses are complex and there are some specific factors that complicate efforts to define and measure losses and these are as follows:

i. A loss in weight can result in a gain in both the market/barter value and market/barter unit value of a consignment.
ii. On-farm loss in value at any point during storage depends on whether the grain is to be sold/bartered or used for home consumption, since the notional unit value of grain consumed on farm differs from the producer price of grain sold.
iii. Loss in value during storage depends on the length of storage. The relationship between time stored and quantity lost is not linear.
iv. The stock of grain used for home consumption is progressively depleted with the result that the percentage of the original stock lost depends on the degree to which a household is self-sufficient.
v. Grain which has deteriorated and is no longer usable for human consumption may still have a value as animal feed or for the distilling of spirits for human consumption.

C.14. Threshing:

C.14.1. Namnong threshers: Eight Namnong threshers were introduced. Namnong No.1, a paddy-rice integrated thresher is composed of a feeding device, an ear threshing apparatus, a straw threshing apparatus, with dust and straw. In addition to them, there are a feeding beam for paddy-rice packet and a straw processing frame. A feeding device is one to supply the paddy-rice to be threshed into an ear threshing apparatus. An ear threshing apparatus is a main attachment to thresh grains from an ear. A beater cylinder of an ear threshing apparatus is one, in which various heights of threshing pins made with steel plates are assembled. A straw threshing apparatus carries out a mission separating grains in cylinders in which the straw threshing pins are fixed. A grain charging transporter is composed of a screw conveyer installed horizontally and a bucket one. A cleaning device is composed of a revolving separator and an air sucking type one. Here a revolving separator drops grains downward through a mesh shield by separating them from grain mixture from a bucket conveyer while an air sucking type cleaning device cleans grains dropping from the revolving separator. A treating apparatus with dust and straw is composed of a blaster, a sucking pipe and a transporting one for straw. By means of this device, dust and straw brought out in the threshing course are treated 15~20m outside.

Various methods of threshing grains have evolved through the years, ranging from simple manual threshers to the more sophisticated engine-driven ones. Whether threshers are manually or mechanically operated, the threshing principle involved could either be any or a combination of the following actions: rubbing, impact, and stripping. The rubbing action occurs when the paddy is threshed by trampling or treading by men, animal, or tractors. In this case, grain separation takes place more as a result of twisting rather than pulling the grains. In grain separation by impact and by stripping, on the other hand, the grains are directly pulled from the panicle.

General Recommendations based on Field Visits:

i. The grains should be threshed immediately in the field after harvesting to minimize, if not to prevent, grain losses due to shattering during transportation, bundling, and stacking.
ii. Threshing dripping wet paddy using a mechanical thresher should be avoided whenever possible. Grains, impurities and straws, sticking to the thresher, and other surface make separation and cleaning very difficult. This increases the losses incurred.
iii. The length of cut of the straw during harvesting is based on the method of threshing to be used. If throw-in type threshers are to be used, the crops should be cut as close to the panicles as possible. This is because threshing materials with large amount of straws requires more power. On the other hand, if hampasan or a hold-on type thresher is to be used, the crop should be cut close to the ground in order to have longer straw that will provide enough space for holding.

C.14.2. Maize Shellers: The project has introduced 4 maize shellers to increase efficiency in maize shelling. The maize sheller has a capacity of 1 ton per hour and has been found to be of great help in overcoming the problem of inadequate capacity in the threshing centres. The machine operates with an 18 kW diesel engine. Hence the amount of fuel required to shell 1 ton of corn is approximately 8 litres.


Corn threshing/shelling machine

General Recommendations based on Field Visits:

i. Practice shelling when the moisture content is from 21% down to 18%. Within this range, the corn kernels are already hard and tough to resist mechanical damage or injury during shelling.
ii. To obtain good kernels, separate the immature, discoloured, or poor quality corn ears since these would lower the quality of the rest of the crop.
iii. When using mechanical shellers, if possible, shift or change the operator every 1-2 hours to avoid hearing loss. Otherwise use ear plugs or protective ear caps. According to AMTEC's test results, the corn sheller is the noisiest among most of the agricultural machines. It produces noise as high as 104.4 db (A) which is above the tolerable level.

C.15. Rice Milling Plant: Value can be added by processing paddy into rice. One of the major causes of post-harvest losses in rice milling is due to use of poorly maintained or outdated rice mills. The project has introduced 2 Rice Milling Plants, each with the capacity of 1.3 – 1.5 ton/hr/set.

The relevant text of the 'Evaluation Mission Report, May 2014' is quoted. ***Quote:*** At Soho demonstration farm, where the through the project introduced technology changes included among others also more efficient milling equipment, the management provided data indicating the following significant loss reductions in both quantitative and qualitative terms: increase in the rice milling rate from 65 % to new 73 % (2013); percentage of broken grain reduced from 40 % (previous equipment) to 6 % (new mill). ***Unquote***

C.16. Knapsack Hand Sprayer: Our agriculture faces two major challenges, the production of sufficient food to feed the growing population and the prevention of environmental degradation. Damage by storage pests is one of the major constraints to increase the quantity and improve the quality of available grains. The reduction of losses caused by storage pests is the obvious strategy for increased food supply. In addition, quality aspects such as pest-free and residue-free agricultural products are becoming increasingly important. Considering available budget and actual need at field level, the project procured and distributed 100 knap-sack sprayers.

Technical Specifications:
Knapsack Hand Sprayer: 20 litres capacity to be used for agricultural purpose.
Material: PE, Brass metal
Pump & lance: Brass
Maximum pressure: 1.0 Mpa
Working pressure: 0.2 – 0.4 Mpa
Use: For agricultural purpose only.

Sprayers have been mainly used for insect pest control. In DPRK context, measures to protect grain stocks or prevent pest infestation in concrete or wooden storage and wooden corn-cob crib include the following:

i. Disinfection: The storage structures and containers are disinfected or sterilized before storing the grain. This is mainly done by spraying.
ii. Chemical control: The most common and still most effective method of preventing or eliminating storage pests is by using grain insecticides.
iii. In general, the conditions of the existing storages are in very poor conditions. Established insect infestation can be eliminated using safe contact insecticides and fumigants.

Basic Guidelines for Maintenance: Project trained concerned Team Leaders of Work Teams on maintenance. In fact, modern knapsack sprayers are designed for ease of service and maintenance. Only a few simple rules are needed to keep the equipment in top condition. These include:

i. reading the service manual to check for any specific service requirement of equipment,
ii. at the end of each spraying job, thoroughly clean the inside and outside of the sprayer, disassemble it, and clean each part meticulously,
iii. check for wear and correct fitting of "O" rings (it may even be advisable to have a few spare "O" rings on hand), and
iv. complete the service by reassembling the unit and returning it to storage. Sprayers should not be left out in the sun, as the ultra-violet radiation harms the plastic and shortens its useful life.

C.17. Capacity Building: A major role of the project was to establish the linkages between scientific know-how and field level (cooperative farms) do-how. For this purpose, project's activities were linked with Academy of Agricultural Science (AAS), Pyongyang Agricultural Campus (PAC), Mechanization Department, MoA, and so on. However, capacity building is a challenging and interesting task since

the content of the capacity building has to be dynamic, demand driven, locally relevant, specific and in Korean language.

Main objectives of the capacity building:

i. The dissemination of useful and practical information related to post-harvest management,
ii. The practical application of useful knowledge and skill to farm and home, and
iii. To get feedback from the concerned people about the technology transferred to them.

It is very difficult for multi-purpose cooperative farm staffs to keep themselves abreast with all the latest findings of research in all sectors of agriculture. They have to deal with day-to-day multifarious activities. Master trainers who keep themselves in touch with their respective research institutes on the one hand, extend the knowledge and skill and the latest scientific development that have scope for adoption in particular areas to the cooperative farm staffs in meaningful terms on the other.

Major activities carried out: The following activities were carried out by CTA, International Consultants (ICs), National Consultant (NC), senior staffs of Mechanization Department, PAC, Master Trainers and participants returned from abroad study tours depending on nature of the training.

a. Training: One of the main activities under the PHL project was training, with the ultimate aim of improving the post-harvest activities of cooperative farmers and other service providers. Overall, implementation was impressive, with courses and refresher courses being carried on need basis. The training materials were prepared by the senior staff members of the MoA and Pyongyang Agricultural Campus mainly based on reports of the CTA, International Consultants, Lead Technical Officer, and Post-harvest Loss Assessment Report. The training materials, in most respects were set out in an easily comprehensible form and to provide information that is accurate and is pertinent to the issues, problems and technologies being addressed. Attention was paid to making the content and presentation suitable to the ability levels of the target groups of staff and cooperative farmers (Team Leaders). However, the lack of photocopier, computer, printer, light generators and so on created some constraints in training implementation.

b. Learning and Teaching: Extension is an educational process for bringing about the desirable changes among the people, involving both learning and teaching and need some tools or methods commonly known as ‘extension teaching method’. ‘Learning’ is the process by which an individual, through his own activity, attains a change in his behaviour. It is an active process on the part of the learner. The essential role of an extension worker is to create effective ‘learning situations’. Considering the important role of moisture content in post-harvest management, Moisture Content Determination was used as one of the ‘extension teaching methods’ as described below.

The following essential elements were arranged for an effective learning situation:

i. An instructor – one of the Master Trainers,
ii. Learners: Cooperative farm staffs and selected Leaders of Work Teams of cooperative farms,
iii. Subject-matter: Moisture content determination,
iv. Teaching equipment and supplies: Moisture meters and a portable white board, and
v. Physical facilities: Sitting accommodation, well lighted lecture hall.

Moisture Content Determination: Moisture content is one of the essential factors affecting grain quality and its storability. Thus, the knowledge of moisture content determination of any product is indispensable since moisture content influences the price and storability of the produce. Therefore, it is important to study the different methods of determining the moisture content of agricultural crops. In grain industry, rapid moisture determination is an important activity.

The term ‘grain moisture content’ normally denotes the quantity of water present in a sample per unit mass of dry matter and moisture combined. It is expressed on a wet weight basis. The alternative and rarely used dry weight basis compares the moisture present with the weight of dry matter in the grain. For example, if 100 kg of moist grain contains 25 kg water and 75 kg dry matter:

Percentage moisture content on wet weight basis:

Weight of water x 100 *25 g x 100*
---------- = ---------- = 25 % moisture content
Weight of undried grain *100 g*

Percentage moisture content on dry weight basis:

Weight of water x 100 25 g x 100
---------- = ---------- = 33 % moisture content
Weight of dry matter 75 g

Percentage moisture content on wet basis is universally used by farmers, traders and agriculturists while on dry basis is more popular among researchers. Determination of grain moisture content accurately is important before making decision of harvesting, storage and milling.

Importance of measuring moisture content (courtesy: IRRI):

Operation	Desired Moisture Content (MC)	Primary Losses
Harvesting	20 - 25 %	Shattering if grain is too dry
Threshing	20 – 25 % for mechanical threshing <20 % for hand threshing	Incomplete threshing Grain damage and cracking/breakage
Drying	Final moisture content is 14 % or lower	Spoilage, fungal damage Discolouration
Storage	<14 % for grain storage <13 % for seed storage <9 % for long term seed preservation	Fungal, insect & rat damage Loss of vigour Loss of vigour
Milling	14 %	Grain cracking and breakage over milling

c. Farmers’ Field Days (FFDs): FFDs were conducted to convince invited farmers and to provide them with an opportunity of seeing the results of new practices, demonstration of skills, proper use of farm practices, equipments, machineries, etc., and to give them an idea regarding the suitability and application of these practices in their own fields. FFDs were carried out at cooperative farm level. Accordingly, farmers and staffs from the neighbouring cooperative farms visited the cooperative farms supported by the project.

d. Study Tours:

a. A Study tour designed to provide participants with some perspective on post-harvest operations for rice, maize and wheat was fielded to Thailand.
Organizer: Post-harvest Technology Center and Engineering Faculty in Kamphaengsaen Campus of Kasetsart University in Nakhonpathom Province, Thailand.
Duration: Jun. 25 – Jul. 13, 2012.
No. of participants: 5

b. Study tour on Agricultural Engineering

Organizer: Sub-Institute of Agricultural Engineering and Post-Harvest Technology (SIAEP), Ho Chi Min City, Vietnam.
Duration: Oct. 08 – 26, 2012.
No. of participants: 5

c. Study tour on post harvest handling - Rice
Organizer: Sub-Institute of Agricultural Engineering and Post-Harvest Technology (SIAEP), Ho Chi Min City, Vietnam.
Duration: 06-24 May 2013
No. of participants: 5

e. Major Reports/Publications:

i. Consultancy Report and training materials prepared by Dr. Saipin Maneepun, IC – Post Harvest, Nov. 04 – Dec. 03, 2011 (1 month),
ii. Consultancy Report and training materials prepared by Mr. Wenfu Wu, IC – Agri. Engineering, Mar. 26 – Apr. 30, 2012 (36 days),
iii. Consultancy Report and training materials prepared by Dr. K. B. Palipane, IC – Post Harvest, Oct. 08 – Nov. 17, 2012 (41 days),
iv. Consultancy Report and training materials prepared by Dr. Raul Alamban, IC – Agri. Engineering, Oct. 08 – Nov. 10, 2012 (34 days), and
v. Status of Post Harvest Loss in DPR Korea, FAO and Pyongyang Agricultural Campus, 372 pages.

Impact: As observed during field visits, **t**he exposure of government extension staff to the training has had the important impact of putting post-harvest activities firmly on the extension agenda. The training methods also led to involved extension workers to become more aware of the importance of a participatory approach to extension. The interviews with Work Team Leaders at cooperative farms showed that many cooperative farmers are now aware that they can improve their livelihoods through the adoption of improved post-harvest practices. Consequently, one would expect them to see that these should be in the interest of farmers to actually adopt these practices. There are practices, such as changing the timing of the harvest, which are costless and these could be easily adopted.

It would be more sustainable if the provincial authority will manage to continue to train farmers in post-harvest practices by building this into their established extension programmes. This, of course, will be the most appropriate means of continuing with post-harvest extension following closure of the project.

C.18. Monitoring and Evaluation (M&E): The Project's Logical Framework Matrix and Operational Work Plan provided time-bound, performance and impact indicators for project implementation along with their corresponding means of verification. In line with the FAO and UNDP policy and procedures, monitoring was done at cooperative farm levels. Six monthly and annual reports were sent to the resource partner – UNDP, FAO Representation, FAO RAP Bangkok and FAO TCSR Rome. The evaluation brought the achievements against the set targets. It identified the bottlenecks and possible rectification mainly through brainstorming meetings with UNDP and MoA.

In order to maximize the benefits from the Project, the lessons learned and 'good practices' developed in post-harvest management were captured and made available to support related developmental programmes and activities in neighbour counties.

Team Leader, Monitoring and Evaluation, and Programme Analyst, UNDP; Coordinator, National Committee for FAO; and National Project Director (NPD) visited project's activities at cooperative farm levels. In addition, Chief Technical Advisor, Assistant FAOR, Operations Assistant and National

Project Coordinator (NPC) visited fields and met concerned staff members very frequently on need basis. Project staff never faced problem to visit field whenever need arose.

C.18.1. Evaluation of Seed and Post-harvest Projects: An evaluation of Seed and Post-harvest projects by an external independent International Consultant was carried out during 27th March to 30th April 2014. Work on this evaluation was carried out in two segments: i. a two week field mission to the Democratic People´s Republic of Korea between 27 March and 10 April 2014, which included meetings in Pyongyang and field visits to six project sites, and ii. desk work for document review and report writing during the second half of April 2014. The Consultant prepared very precise and informative Evaluation Report of 69 pages. The relevant text of the report is quoted below:

Quote:

Preliminary figures, recorded on one of the six demonstration farms, show that a 50% reduction of such losses to around 7.5% is clearly within reach. A total of 6,804 cooperative farmers are expected to directly benefit from the achieved results under the Post Harvest project.

The high rate of post-harvest losses has been identified to have serious dampening effect on the country's efforts for increased agricultural productivity and food security. The Post-Harvest project has been supporting inventions to enhance capability in post-harvest handling of grains through:

- introducing, testing, and optimizing improved, new and appropriate post-harvest technologies, and
- raising skills development in the management, maintenance and repair of equipment at the county and farm levels. Six cooperative farms have been supported by the project as demonstration farms to
- raise the awareness of famers on strategic actions and
- strengthen capacities in loss assessment and use of technologies to reduce post-harvest losses.

Unquote

C.19. Successful Post-harvest Technologies (PHTs) based on Field M&E: While analyzing the adoption of specific postharvest technologies, we found that the simpler the postharvest technology, the better its chance for being still in use over the long term. If farmers can reduce post-harvest losses by adopting a simple practice, then the use of a technology or technology package is sustainable. Small scale and simple postharvest practices such as the use of moisture meter to identify proper moisture level, small tractor with trailer to protect from damage during handling and transport harvested crops or grains, the use of shade (drying facility), threshing yard, thresher, and use of plastic tarpaulin have been generally more successful.

i. Improved practices were adopted if they fit well into an existing value chain (representing small steps of improvement rather than requiring huge changes).
ii. Encouraging cooperative farmers to learn more about PHTs and take more responsibility for their crops after harvest leading to reduced losses.
iii. Sustainability of the adoption of technological innovations depends most upon their profitability in the local setting, not at the end users.
iv. Empowering local cooperative farms and work team leaders through capacity building help to generate continue local action and improve chances of sustainability.
v. International study tours have served to build local capacity and enhance aspirations.

C.20. Relevant Cross-Cutting Issues: The project received all-out support from all concerned Departments of GoDPRK. This was due to most needed support provided by the project, but was also linked to the presence of respected, well mannered, diligent, cooperative and considerate project

staffs. The project provided a strong social support to work teams of cooperative farms (encouraging women to participate as much as possible in traininig and technical discussion) and to implement a non-discriminatory approach.

C.21. Environmental Sustainability: The project itself didn't involve practices or technologies that were likely to have a significantly damaging impact on the environment. A positive environmental impact deriving from improved post-harvest practices for grains was that they led to a greater domestic availability of foodstuffs and therefore reduced the amount of land that must be devoted to growing food crops.

D. Project Outline and Results

Overall Project Objective: Reduction of post harvest losses for food and nutrition security.

UN Strategic Framework (UNSF) Strategic Priority Area: Area 3: Nutrition

UNSF Outcome(s):
1: Improved Nutritional Status of targeted populations to enable them to lead healthy lives;
2: Sustained Household food Security.

Expected CP Outcome(s): Increased access of people to diversified range of foods as well as farmers' increasing agriculture diversification and productivity.

CP Outputs: Strengthening national food and nutritional security.

Expected Project Output(s):
i. Project farms harvest losses reduced by 50 percent,
ii. A validated set of recommendations and policies outlined for reducing national post harvest loss, and
iii. Improved post harvest technology and management interventions promoted to a wider agriculture community.

Project Locations:
i. Jangsuwon Cooperative Farm, Samsok District, Pyongyang
ii. Up Cooperative Farm, Yonan County, South Hwanghae Province
iii. Soho Cooperative Farm, Mundok County, South Pyongan Province
iv. Pyongam Cooperative Farm, Koksan County, North Hwanghae Province
v. Daepyong Cooperative Farm, Singye County, North Hwanghae Province
vi. Osin Cooperative Farm, Daean District, Nampo City

D. Performance Assessment **D1. Achievement of results**						
	Progress towards targets					
Results Chain	Indicators	Baseline	End Target (expected value at project completion)	Achieved	If not achieved explain why	If applicable/follow up action to be taken
Impact: The priority # 1 of the CPF: Strengthenin						

g national food and nutritional security.						
Project Outcome						
Output (1) Project management system established and agreed to; national project counterparts trained in project scope and post harvest technologies management.	*Work plans, staff and counterparts in place, Master trainers trained and study tours successfully organised.*	No project Management in place or counterparts mobilized.	- All project staffs received background training in post – harvest handling and management. - Prepared detailed Annual Work Plans and assigned responsibilities. - Prepared training manual and reference guide available for master trainers, county trainers and all project personnel. - Master trainers fully trained in key projects areas by International and National Consultants, CTA and National Project Coordinator. - Master trainers and other personnel acquired knowledge and skills during study tours in Thailand and Vietnam and applied their knowledge and skills towards further development of project.	Achieved: 90 – 95 %.	Not applicable.	Capacity building is continuous process and it should continue.
Output (2) Technologies introduced, tested, demonstrated and optimized.	New technology introduced.	Antiquated and inefficient post-harvest equipment used.	- New equipments/machineries purchased, tested and techniques for use developed. - Work procedures drafted. - Techniques and conditions for sun drying paddy and corn optimized.	Achieved: 90 – 95 %.	Not applicable.	Servicing and maintenance of equipments and machineries should be continued with the support of MoA.
Output (3)	Existence	Limited	- Altogether 13	Achie	Not	Maintenance

Capacities developed in good post harvest practices and in the management, maintenance and repair of equipment, capacities developed in loss assessment.	of trained cooperative staff and technicians.	knowledge base on good post-harvest practices and on the management, maintenance and repair of equipments and machineries.	threshing cum drying yards, each having size of 333 square meters, constructed and are in use. - County level staff trained in the key project areas. - County staff familiarised with new management and major technology practices. -Farmers and work team supervisors increased awareness of post harvest problems and issues and were trained in key post harvest techniques. - A larger number of cooperative farmers within the demonstration cooperative farms, and neighbouring farms are aware of major strategies for reducing post harvest losses. - Sustainable postharvest technologies and management practices applied for rice, corn and wheat. - Project counterparts implemented good post-harvest practices.	ved: 90 – 95 %.	applicable	of farm infrastructure, equipments and machineries should be continued with the support of MoA.

Internal use

	1	2	3	N/A	
Extent to which a contribution to Impact has been made	X				

Provide a small narrative text to support the scoring: The relevant text of the 'Evaluation Report, April 2014' is quoted. **Quote:** The technology introduced through the projects, including better quality maize shellers and rice threshers, also resulted in a significant improvement of work conditions and a general reduction of the overall work load for the mainly female staff carrying out the various operations in the threshing barns during harvest time. Better drying and storage furthermore improved the overall quality and quantity of food available for the farm families.

With a view to accelerate progress towards universal and national development goals, the two evaluated projects focus on contributing to "Nutrition and Food Security", which is also one of four

United Nations Strategic Framework (2011-2015) MDG-based priority areas in DPRK. The UNSF (2011-2015) aims at achieving two outcomes for nutrition, namely: i. Improved nutritional status of targeted population to enable them to lead healthy lives, and ii. Sustained household level food security. **Unquote**					
Extent to which the expected outputs have been delivered	X				
Provide a small narrative text to support the scoring: The relevant text of the 'Evaluation Report, April 2014' is quoted. **Quote:** In supporting further post harvest related programming substantial additional benefits are for example possible through an even wider use of threshing- cum – drying floors, combined harvesters, mobile threshers, maize shellers and improved crop storage, whereby the sustainability of the adoption of technological innovations is primarily dependent upon their profitability in the local setting. **Unquote** The Ministry of Agriculture highly praised the works of both Seed and Post-harvest projects during 4th Project Board meeting held on 29th May 2014 and requested to FAO and UNDP to continue these two projects. In addition, Deputy Secretary General, NCC also highly praised the performance of particularly seed and PHL projects while meeting with ADG/Regional Representative, FAO RAP Bangkok on 25th March 2014 in Pyongyang. Ultimately, credit goes to all concerned staff members. These two projects are headed by the same Chief Technical Advisor and this proved to be additional strength of the projects					
Extent to which outcome has been achieved	X				
Provide a small narrative text to support the scoring: Major Constraints/Challenges: i. Serious money transaction problem occurred during April – August, 2013 and mid March – mid September 2014; ii. Meeting specific procurement rules and the export license requirements is time consuming; iii. Difficult logistics and very high costs of forwarding goods to DPRK; and iv. Linkage with International Organizations is very important to keep pace with the latest developments in post-harvest management. It is usually best options for taking advantages of research at home and abroad. Unfortunately, linkage with International Organizations is weak. v. Physical verifications of each and every equipments/machineries on quarterly basis at farm level were very much time consuming. Despite above constraints, the outcome so far achieved (considered progress towards indicator targets at outcome level, extent to which outputs are being delivered, assumptions, risks and the external environment) is very satisfactory.					
Overall results achievement rating	X				

Score	Meaning
1	Performance is good
2	Performance is problematic. Corrective action needed
3	Performance presents deficiencies. Major corrective action, reorientation or early termination required

D.2. Relevance

a. Quality of design and relevance to problem that was to be solved through the project: In DPRK context, project design was highly relevant to the problem that was to be solved through the project. However, the Results and Resources Framework in the Project Document included output baselines, indicators and targets that were to a large degree not measureable and not sufficiently specific, perhaps largely due to a lack of information.

The relevant text of the "Evaluation Report, April 2014" is quoted. **Quote:** Individually stated project objectives were furthermore generally believed to be realistic and achievable during a 3-year implementation period on the foreseen number of demonstration / pilot cooperative farms. However,

to make full use of realized benefits and up-scale project achievements from the current pilot level to a larger geographic area or even national scale, additional resources will be required. Optimal longer-term results will to a large degree depend on the right mix of capacity building, improved infrastructure and availability of better equipment. **Unquote**

b. Alignment and strategic fit (CPF outcome/UNDAF outcome/national priority/Organizational Result/synergy with other interventions): The relevant text of the "Evaluation Report, April 2014" is quoted.

Quote: "Improved Seed Production for Sustainable Agriculture" and "Reduction of Post-Harvest Losses for Food Security" are two key projects of the "Food security and Rural Development" component of the UNDP Country Programme (CPC). UNDP`s country programme document for the Democratic People's Republic of Korea (2011-2015), prepared in close consultation with all stakeholders including relevant ministries, research institutions, donors and United Nations agencies, reflects the agreement on the United Nations Strategic Framework (2011-2015) between the Government and the United Nations country team.

Through the two evaluated projects the CPC supports the Government in achieving its 2015

- National Development Goal One to "Improve the Living Standard of People" and
- Meeting underlying target of "Ensuring Food Security" in line with the Millennium Development Goals (MDGs).

With a view to accelerate progress towards universal and national development goals, the two evaluated projects focus on contributing to "Nutrition and Food Security", which is also one of four United Nations Strategic Framework (2011-2015) MDG-based priority areas in DPRK. The UNSF (2011-2015) aims at achieving two outcomes for nutrition, namely:

- Improved nutritional status of targeted population to enable them to lead healthy lives, and,
- Sustained household level food security.

Aggregate farm production in DPRK is estimated to have increased for the third consecutive year and exceed 5 million mt for the second year in a row in 2013, bringing the country closest to self sufficiency in almost two decades. Despite this improvement, major challenges remain to reaching the food production level of over 6 million mt achieved in the late 1980s through cooperation within the former Soviet Union trading arrangements.

In addition to geographical and climatic constraints[1], production is currently mainly limited by

- agricultural input shortages (improved seed varieties of adequate quality, lime, pesticides, plastic sheeting[2], adequate supply of plant nutrients through the application of different chemical fertilizers and organic matter, etc.),
- the degree of mechanization[3],
- a departure from sound agricultural techniques (adequate crop rotation[4], soil conservation[5], timeliness of harvesting and threshing processes[6], etc.) and

[1] The major portion of the country is rugged mountain terrain with little scope for increasing cereal production by expanding farming into new areas. Arable land is limited to about 19.5% of the total landmass (Source: FAO, 2012).

[2] The System of Rice Intensification (SRI) has the potential of increasing yields by over 20 percent but is coupled with the use of plastic trays for planting the rice seedlings.

[3] Using better seeding equipment has the potential to increase yields by around 10 percent because of better germination and appropriate spacing between each plant. Lack of tractor power makes land preparation slow and difficult, thus impeding the use of off-season manures or of double cropping.

[4] Rotating cereal crops (especially maize and wheat) with legumes such as soy or green manure could potentially increase yields by around 10 percent

[5] Conservation agriculture (low tillage farming) can reduce soil erosion, save fuel, and improve soil quality

- the level of incentives for stimulating increased production and productivity (including for example the comparatively low price level for soybean, uncertainties linked to labour investments into activities that will only produce benefits in subsequent years, such as longer term measures to improve soil quality, etc.).

Over the years, domestic production of fertilizer has declined to a level of about 10 percent of total requirement[7], increasing dependence on imported fertilizer, reducing its overall use and creating imbalances in the applied mix of plant nutrients (including a very low application rate of phosphate and potassium[8]). The foreign exchange situation combined with international restrictions on trade has, on the other hand, not allowed adequate commercial imports of much needed agricultural inputs such as fertilizer[9], pesticides, plastic sheeting, and spare- parts for machinery, tyres for tractors and trucks and fuel. Much needed lime application to improve fertility of acidic soils[10], although improved lately, is constrained by the lack of transport facilities and fuel availability. Leguminous crops (soybean, mung bean, etc.) have been identified for many years as an essential addition to the DPRK crop mix, but to date, have not been planted at an adequate level.

Considering its developmental needs and priorities the DPRK Government set the following sectoral policies:

- innovation in breeding and seed multiplication,
- double cropping,
- improvement in potato farming,
- improvement in soybean farming and
- active introduction of advanced farming systems (including organic farming),

and identified in 2012 the following five governmental strategic objectives in the food and agriculture sector:

- Priority A: Strengthening national food and nutritional security,
- Priority B: Improving natural resource management,
- Priority C: Improved rural livelihood,
- Priority D: Improved mitigation of the impact of climate change on agriculture and improved disaster management, and,
- Priority E: Improvement in institutional capacity for agricultural research, extension and administration.

Both, the “Improved Seed Production for Sustainable Agriculture” and the “Reduction of Post-Harvest Losses for Food Security” projects are fully in line with these priorities and specifically contribute to the intended goals.

- Outcome A1 (Increased food production) and
- Outcome A2 (reduced food loss in production and supply chains), as well as the defined

---

[6] Improved timing of harvesting and threshing processes importantly reduces post harvest losses

[7] Source: FAO/WFP, 2013 Crop and Food Security Assessment Mission (CFSAM) Report. More recent reports published between January and April 2014 underline significant capacity increases to produce fertilizers, herbicides, insecticides and plastic sheeting domestically at the Namhung Youth Chemical Complex.

[8] Source: “The State of North Korean Farming: New Information from the UN Crop Assessment Report”, background analysis by Randall Ireson, 18 December 2013

[9] In 2013 DPRK bought a total of 207,334 mt of fertilizers from China, down by 18 percent from the previous year, according to news reports (Source: Yonhap News Agency report of 4 March 2014). Significant import increases were recorded for January 2014 when the country imported 35,113 mt of fertilizer from China according to data by the Korea Rural Economic Institute (KREI).

[10] Applying lime to the fields to offset acid soils has the potential to increase yields by more than 20 percent

- ❖ Priority Output A1-1 (Enhanced capacity of seed farms to introduce superior varieties)" and
- ❖ Priority Output A2-1 (Best practices for reduced on-farm post-harvest-loss developed)

of the "Country Programming Framework (CPF) 2012-2015 for The Cooperation and Partnership Between FAO and the Government of the Democratic People´s Republic of Korea".

The Government of the Democratic People´s Republic of Korea has since the adoption of the above framework continued to highlight the key importance it gives to the agriculture sector in its strive to rapidly and sustainably improve national food security and eventually reach food self-sufficiency. In his New Year Address 2014, as well as his message delivered during DPRK´s first national conference of farm sub-work team leaders[11] Mr. Kim Jong Un, Supreme Leader of the DPR Korean people, in fact underlined, that agriculture needed to be identified as the priority area for improving the economy and people's lives in DPRK. At this occasion the Supreme Leader personally emphasized details of DPRK farming policies, including a specific call to implement a seed revolution, identifying short growing periods, efficient uptake of available fertilizer and pest resistance as key criteria for the development of improved crop seeds in DPRK.
Unquote

Considering above circumstances, the project was very much aligned with the outcomes of CPF, UNDAF and other interventions.

D.3. Sustainability

Dimensions of sustainability: Key steps taken to ensure the sustainability of the project interventions included: i. involvement of communities in the planning and design of interventions; ii. an assessment of community environment and capacity to ensure local ownership, motivation to maintain and operate facilities, resources and assets created with project support; iii. coordinated capacity building and participatory process to strengthen the involvement of cooperative farmers, and national government institutions; iv. ensuring community contributions and investments in project components costs, i.e., through community cost sharing arrangements and local resources mobilisation; v. effective training and capacity building to provide communities with on-going maintenance related technical and managerial skills; and vi. ensuring that interventions are inclusive, i.e., participation of the poor and marginalized groups, women.

The project's contributions in terms of asset creation, increased local capacities, access to new technologies, and established linkages and partnerships provided incentives to the stakeholders and created strong foundation for sustaining benefits of interventions in the long term and potential for replication.

D.3.1. Financial Sustainability: The project improved food security and nutrition for 6,804 cooperative farmers (Male: 3,140 = 46.14%; Female: 3,664 = 53.85%) in 6 demonstration farms by helping to increase the availability of food, through reducing post-harvest losses. The quantified economic benefits are cost savings consisting of reduction in out-of-pocket household expenses resulting from avoided health costs. These occur, based on the assumption that poor households are more vulnerable to illness because of their poor living conditions and inappropriate diets leading to malnutrition. The analysis does not attempt to quantify economic gains and only provides conservative estimates based on benefits streams that can be quantified. Commercially-viable activities are, by definition sustainable beyond the end of the Project. Financial data is not available. It is simply based on principle that reduction in post-harvest loss means saving of grains/money.

D.3.2. Institutional Sustainability: The project had the following built-in features to ensure institutional sustainability:

[11] First national conference of farm sub-work team leaders in Pyongyang on 6-7 February 2014

i. Support to the government priority aimed at promoting longer-term post-harvest management;
ii. Improved capacity in targeting and delivering interventions related to reduction of post-harvest losses;
iii. Strengthening cooperative farms in applying improved post-harvest practices;
iv. Building the capacities of technical institutions such as Pyongyang Agricultural Campus by involving them in research and capacity building activities under the project; and
v. Holding continuous policy dialogue with the relevant government on integrating innovative approaches for post-harvest management into national policies and programmes and priorities to ensure that capacities gained are embedded within the government's core approach and system and the lessons learned are replicated by the government with greater effectiveness and efficiency ensuring sustainability of impact.

The Government institutions, particularly MoA, PAC and AAS worked together from the formulation, and implementation of the action until achieving the expected results. Government institutions were better equipped with analytical tools and methodologies to develop and implement more focused and responsive programmes. The cooperative farms by participating from the formulation of the action until achieving the expected results developed a sense of ownership. The capacity building activities including abroad study tours helped them to develop their internal capacity and institutional strength and ensured sustainability. The above mentioned stakeholders are expected to scale up the outcome of this project to other areas in the country. Through working to strengthen the capacity of support service institutions and government counterparts, the project left behind not only viable community and household assets and more effective and responsive service provisions but also improved technical and managerial capability to sustain these improvements.

D.3.3. Policy Level Sustainability: The success of this project had a positive influence in the development of the Post-harvest Management Guidelines at the field level in the country since the key ministries responsible for agricultural development and improving nutrition were stakeholders of this project.

D.3.4. Environmental Sustainability: Project focused on 'environmentally friendly technology'. Project used technological systems that served agricultural producers, processors and consumers as well as the environment. Implementation of System of Rice Intensification (SRI) as demonstration though in small scale supported environmental sustainability. Cooperative farmers were convinced on the results of SRI, accordingly environmental sustainability will be ensured even after the completion of the project.

D.3.5. Social Sustainability: Involving cooperative farmers with equal scope of participation for individuals from planning to execution of the project activities fostered a sense of ownership and social harmony, an important precondition for social sustainability of the project.

Implementation Score			
	1	2	3
Work-plan and budget			
To what extent were activities implemented on time?		X	
Comments, if any: Serious money transaction problem occurred during April – August 2013 and mid March – mid September 2014. April to October is the main period for agricultural field activities. Procurements of expensive farm inputs, equipments, machineries and development of infrastructure in countryside were kept on hold. It had significant negative impacts on project's delivery on time. However, project managed somehow to procure less expensive but urgently required farm inputs and continued activities related to capacity building. During the period of money transaction problem, particularly MoA played a vital role to convince the suppliers/contractors to keep patience for the payment. In addition, FAO China supported a lot to procure required items from China.			
To what extent were activities implemented within planned budget?	X		
Comments, if any: In general, expenditures were made according to approved limits under different budget groupings expect very minor increase on construction of farm structures and machineries from the saving under training subheading as approved by Project Board, comprising of representative from FAO, MoA and resource partner – UNDP. All trainings were carried out as per project target, but the numbers of trainees per training were decreased.			
Risk Management			
To what extent has the risk management matrix been thoroughly assessed and updated? (self assessment)	X		
Comments, if any: The risk management matrix was thoroughly assessed and updated and it certainly helped to some extent, but didn't solve all the problems. All the required documents, namely technical specifications of the inputs, clearance of the technical specifications from the LTO, etc. were kept ready and once the money transaction problem was solved, the delivery of the project was very fast.			
Overall Implementation rating	X		
Comments, if any: Considering 2 times (altogether 11 months) serious money transaction problems and achievements during the project period against the targets, ground realities observed during field visits, database available at cooperative farms and findings of independent Evaluation Mission, it could be safely concluded that cooperative approach through various activities relating to seed though had very few shortfalls, was a right strategy to achieve the objective of cooperative-led development processes aimed at rebuilding capacities and meeting the needs of disadvantaged cooperative farmers.			

E. FOLLOW-UP ACTIONS

In developing countries including DPRK, significant post-harvest losses in the early part of the supply chain are a key problem, occurring as result of financial and structural limitations in harvesting techniques and storage and transport infrastructure, combined with climatic conditions favourable to food spoilage. Fortunately, the project has been supporting to reduce the post-harvest losses in the early part of the supply chain. However, the support provided by the project is not sufficient mainly due to budget constraint.

What concrete follow-up actions are foreseen/are taking place if any and by whom? Please indicate in order of priority		
Responsibility (name, Institution)	Additional resources required, if any	Status and contribution to sustainability of project results
FAO and MoA	FAO approved US$ 469,000 for a TCP project - "Farmer Participatory Seed Multiplication and Post Harvest Management"	TCP project may start soon. Seed and Post-harvest projects funded by UNDP were completed on 31st October 2014. Many positive things have been happening in seed and post-harvest sectors in the DPR Korea. However, these successes are not enough, there is still a long way to go particularly in the fields of seed quality, protected cultivation, post-harvest management mainly through proper threshing and drying, and capacity building. The GoDPRK and FAO DPR Korea would have not been in a position to carry out these most needed activities related to seed production and post-harvest management after 31st October 2014 had this TCP project not been approved on time. In order to carry forward the efforts of Seed and Post-harvest projects funded by UNDP to a logical conclusion and also to provide a basis for sustainability as well as a good exit strategy for both the donor and FAO, this TCP project was designed to address the remaining critical gaps. The TCP project will not repeat or duplicate what has already been achieved in the projects funded by others. Considering above circumstances, the Secretary General, DPRK National Committee (NC) for FAO, kindly requested FAO to approve this TCP project as soon as possible. In addition, NC kindly requested to give the first priority to this TCP project. The project will concentrate its support to the seed and post-harvest sectors in project areas via 6 cooperative farms. Project outputs will be a combination of capacity building efforts and the introduction of improved equipment, which are expected to result in quantitative as well as qualitative advances of the seed and grain production.

F. LESSONS LEARNED

F.1. Lessons Learned – Elements of Success:

i. Strategy: The project practiced 'Triangle Approach' which was very successful in many developing countries including DPRK. Triangle Approach means three angles were composed of International Organizations (FAO, EUPS Units and Donor), concerned Government Departments (Local Authority and Technical Departments) and Community (cooperative farmers).

ii. The major impact lessons learned were that i. The strategy should be one of individual empowerment for high impact livelihoods, e.g. construction of threshing cum drying floor, etc. (affecting many people and or large areas of land) through Work Teams of cooperative farms.

iii. In order to maximize the benefits from the Project, the lessons learned and 'good practices' developed in post-harvest sector in the project sites were captured and made available to support post-harvest sector in other counties. It occurred through periodic local level discussion forums namely technical working group, agriculture and food security thematic group, nutrition thematic group, and national level discussion forums namely training and workshops with other stakeholders involved in agricultural development.

iv. Technical Working Group meetings, composed of FAO and concerned technical staff from MoA, PAC and AAS were held on need basis. However, the minutes of the meetings were not prepared intentionally to have free and frank technical discussion.

v. Project used to give a copy of agendas for Project Board meeting to all concerned government officials in advance and also used to discuss informally before Project Board meeting to expedite its approval during the official meeting and it used to work very well. Project faced far less difficulties than other agencies probably due to transparency of work and working closely with technical line Departments.

vi. Bottom-up approach is good for field activities, while sometimes top-down approach is good to convince the Local Authority.

F.2. Lessons Learned – Impediments/Constraints:

i. Meeting specific procurement rules and the export license requirements was time consuming.

ii. Difficult logistics and very high costs of forwarding goods to DPRK.

iii. Quarterly physical verifications of the farm equipments/machineries by the resource partner were time consuming and it used to disturb field activities particularly during period of peak field activities. Sometimes cooperative farmers and cooperative staffs used to be very disappointed with this activity.

G. RECOMMENDATIONS

i. Focus on the Beneficiaries

a. Treat cooperative farmers as agri-business entrepreneurs rather than just farmers.

b. Request Farmers' Team Leader to consider issues beyond their farm plots – address the entire value chain, understand the needs of their end users.

c. Deliver practical oriented trainings or agricultural extension services that help to improve the quality of produce, post-harvest handling, and so on.

d. Provide training in local language or use qualified interpreter and incorporate audio-visual training aids.

ii. Work through Work Teams of cooperative farms whenever possible

Whether via informal groups, co-operatives or formal Work Teams of cooperative farms, it is vital to work with groups to impact policy and reach large numbers of beneficiaries. It is, indeed, very challenging work, but groups are the key to:

a. Assessing local needs, facilitating targeted training, introducing new crops and technologies.

b. Moving from project provided services to community provided services.

c. Development of creative schemes for the benefit of all members of work teams.

d. Designing appropriate, cost effective innovation delivery systems (providing people with the information and skills they need, when and where and in a way they can best understand and use it).

iii. Post-harvest best practices should be incorporated early on in project

Identifying appropriate interventions is the key, since barriers affecting adoption of postharvest interventions include complexity, availability and perceived costs versus benefits.

a. Best practices training should be supported by appropriate infrastructure development and technology improvements and interventions.

b. Past projects in agricultural development have tended to focus mainly on production, and when the evaluations are completed, admit had more attention been given to postharvest handling then losses would have been lower, and profits for farmers and other chain participants would have been higher.

iv. Invest more wisely in postharvest infrastructure

Training in postharvest management increases readiness and willingness to make changes, but if postharvest infrastructure is not there for participants, the results of training can be frustration. Similarly, providing infrastructure without training can be a disaster waiting to happen, since successful postharvest management requires complex knowledge and skills.

a. Make investments earlier in the project.

b. Match the facilities (cost, size, scope) to local needs and management capabilities.

c. Avoid over-building as large facilities are very difficult to manage and can be too costly to be profitable.

d. Deliver practical training to ensure that infrastructure is utilized, managed and maintained properly.

v. Build local capacity (strengthen institutions, human resources)

Training should leave behind a cadre of local trainers and support services to continue the work that is started by Project.

Capacity building includes:

a. Technical and educational programme development,

b. Training of master trainers,

c. Resource identification and strengthening of support services (local postharvest suppliers, repair services, engineers),

d. Building functional local capacity seems to have a strong relationship to sustainability, and

e. National and international study tours.

vi. Projects should have a longer term focus to increase the likelihood of sustainable results

a. Project cycles should not be too short (2-3 years does not provide enough time to build a solid base that will allow project to work successfully with low resource communities)

vii. Projects that follow on past projects (and follow up on any evaluation based recommendations) can achieve good results.

H. Possible Priorities Areas for a Project Extension or Complementary Project

In order to carry forward the efforts of Seed and Post-harvest projects funded by UNDP to a logical conclusions and also to provide a basis for sustainability as well as a good exit strategy for both the donor and FAO, a new project should be designed to bridge the remaining critical gaps in post-harvest management.

Annex – I. General Information on Demonstration Cooperative Farms under PHL Project:

No.	Farm	Jangsuwon, Samsok District, Pyongyang	Osin, Daean District, Nampo City	Pyongam, Koksan County, North Hwanghae province	Soho, Mundok County, South Pyongan province	Up, Yonan county, South Hwanghae province	Daepyong, Singye County, North Hwanghae province	Total
1.	No. of farmers	1211	1200	820	1250	1002	1321	6804
2.	No. of male farmers	598	530	380	560	482	590	3140 (46.14 %)
3.	No. of female farmers	613	670	440	690	520	731	3664 (53.85 %)
4.	No. of technicians	11	15	12	30	100	13	181
5.	Total crop area (ha)	650	822	550	520	720	731	3993
6.	Paddy area (ha)	352	318	110	502	570	201	2053
7.	Non-paddy area (ha)	298	504	440	18	150	530	1940
8.	Maize area (ha)	215	260	330	15	108	352	1280
9.	Other crops area (ha)	83	244	110	54	42	178	711
10.	Total production (tons)	2350	4112	1225	3160	4723	2250	17820
11.	No. of tractors	25	18	13	17	19	12	104
12.	No. of thresher	6	9	3	7	6	4	35
13.	No. of bullocks plough ox	50	92	65	99	77	131	514
14.	No. of work teams	6	10	9	7	6	8	46

Annex – II. Assets delivered under Post-harvest project							
UNDP TAG #	**Description**		**Quantity**	**Unit Price (USD)**	**Delivery Date**	**Total Price (USD)**	**Location**
PRK61788001 PRK61788002 PRK61788003 PRK61788004 PRK61788005 PRK61788006	Truck	10 ton capacity, FAW	6	27,780.50	7/9/2012	166,683	**Pyongam Cooperative Farm,** Koksan County, North Hwanghae Province - 1 unit, **Daepyong Cooperative Farm,** Singye County, North Hwanghae Province - 1 unit, **Soho Cooperative Farm,** Mundok County, South Pyongyang Province - 1 unit, **Jangsuwon Cooperative Farm,** Samsok District, Pyongyang - 1 unit, **Up Cooperative Farm,** Yonan County, South Hwanghae Province - 1 unit, and **Osin Cooperative Farm,** Daean District, Nampo City - 1 unit.
PRK61788007 PRK61788008 PRK61788009 PRK61788010 PRK61788011 PRK61788012	Tractor	4WD, 20 HP, YTO-200	6	5,758.50	7/9/2012	34,551	**Pyongam Cooperative Farm,** Koksan County, North Hwanghae Province - 1 unit, **Daepyong Cooperative Farm,** Singye County, North Hwanghae Province - 1 unit, **Soho Cooperative Farm,** Mundok County, South Pyongyang Province - 1 unit, **Jangsuwon Cooperative Farm,** Samsok District, Pyongyang - 1 unit, **Up Cooperative Farm,** Yonan County, South Hwanghae Province - 1 unit, and **Osin Cooperative Farm,** Daean District, Nampo City - 1 unit.

PRK61788013 PRK61788014 PRK61788015 PRK61788016 PRK61788017 PRK61788018	Tripping Trailer	4 wheeled, 7CX-2T	6	2,436.33	7/9/2012	14,618	**Pyongam Cooperative Farm,** Koksan County, North Hwanghae Province - 1 unit, **Daepyong Cooperative Farm,** Singye County, North Hwanghae Province - 1 unit, **Soho Cooperative Farm,** Mundok County, South Pyongan Province - 1 unit, **Jangsuwon Cooperative Farm,** Samsok District, Pyongyang - 1 unit, **Up Cooperative Farm,** Yonan County, South Hwanghae Province - 1 unit, and **Osin Cooperative Farm,** Daean District, Nampo City - 1 unit.
PRK61788019 PRK61788020	Rice Milling Plant	Capacity: 1.3 – 1.5 ton/hr/set, total power capacity: 77kw including 5m belt conveyer	2	24,262.00	8/27/2012	48,524	**Soho Cooperative Farm,** Mundok County, South Pyongan Province - 1 unit, and **Up Cooperative Farm,** Yonan County, South Hwanghae Province - 1 unit.
PRK61788021 PRK61788022 PRK61788023 PRK61788024	Maize Sheller	Self-propelled, 24/25hp diesel engine, capacity: 1,200 kg/hour	4	4,105.00	7/1/2012	16,420	**Daepyong Cooperative Farm,** Singye County, North Hwanghae Province - 2 units, and **Jangsuwon Cooperative Farm,** Samsok District, Pyongyang - 2 units.
PRK61788025	Corn Combine Harvester	Mainly for harvesting of corn and wheat crops**,** 115HP diesel engine, self-propelled machine, hydraulic stepless speed adjustment, hydraulic control lifting, Model: 4lz-3A.	1	19,504	7/1/2012	19,504	**Pyongam Cooperative Farm,** Koksan County, North Hwanghae Province - 1 unit.

PRK61788026 PRK61788027 PRK61788028 PRK61788029	Combine Harvester	Combine (0.5ha/hour), 75 HP diesel engine, 2 meters cutting width, auto transmission, high efficiency, suitable for rice & wheat harvesting, Model: SDDF, 4LZ-2.0D	4	13,676	7/1/2012	54,704	**Soho Cooperative Farm,** Mundok County, South Pyongan Province - 1 unit, **Jangsuwon Cooperative Farm,** Samsok District, Pyongyang - 1 unit, **Up Cooperative Farm,** Yonan County, South Hwanghae Province - 1 unit, and **Osin Cooperative Farm,** Daean District, Nampo City - 1 unit.
PRK61788030 - PRK61788042	Threshing Yard	333 m^2	13	12,100.00	7/17/2012	84,700	**Pyongam Cooperative Farm,** Koksan County, N. Hwanghae Province - 2 units, **Daepyong Cooperative Farm,** Singye County, N. Hwanghae Province - 2 units, **Soho Cooperative Farm,** Mundok County, South Pyongan Province - 3 units, **Jangsuwon Cooperative Farm,** Samsok District, Pyongyang - 2 units, **Up Cooperative Farm,** Yonan County, South Hwanghae Province - 2 units, and **Osin Cooperative Farm,** Daean District, Nampo City - 2 units.
PRK61788043	Corn Cob Crib	50 ton capacity	1	16,662.00	6/10/2013	16,662	**Jangsuwon Cooperative Farm,** Samsok District, Pyongyang - 1 unit.

PRK61788044 - PRK61788051	Namnong Thresher	Namnong No.1, a paddy-rice integrated thresher is a machine to thresh and clean paddy rice, wheat, barley synthetically in the fixed place.	8	5,858.62	3/4/2013	46,869.00	**Pyongam Cooperative Farm,** Koksan County, N. Hwanghae Province - 1 unit, **Daepyong Cooperative Farm,** Singye County, N. Hwanghae Province - 1 unit, **Soho Cooperative Farm,** Mundok County, South Pyongan Province - 2 units, **Jangsuwon Cooperative Farm,** Samsok District, Pyongyang - 1 unit, **Up Cooperative Farm,** Yonan County, South Hwanghae Province - 2 units, and **Osin Cooperative Farm,** Daean District, Nampo City - 1 unit.
PRK61788052 - PRK61788053	Drying Facility	Roof surface: 127 sq. meter; surface of paved yard: 400 sq. m.	2	13,461.92	5/20/2013	26,923.83	**Soho Cooperative Farm,** Mundok County, South Pyongan Province - 1 unit, and **Jangsuwon Cooperative Farm,** Samsok District, Pyongyang - 1 unit.
PRK61788054 PRK61788055 PRK61788056 PRK61788057 PRK61788058 PRK61788059	Transfor mer	50KVA	6	2,810.00	February 2014	16,860.00	**Pyongam Cooperative Farm,** Koksan County, N. Hwanghae Province - 1 unit, **Taepyong** cooperative farm, Singye county - 1 unit, **Jangsuwon** cooperative farm, samsok district - 1 unit, **Maekjon** Foundation Seed Farm, Kangdong country, Pyongyang - 1 unit, **Daesong** Certified Seed Farm, Sukchon County, S. Pyongan - 1 unit, and **Soho** cooperative farm, Mundok county, S. Pyongan - 1 unit.
PRK61788060 PRK61788061	Transfor mer	100KVA	2	8,990.00	February 2014	17,980.00	**Soho Cooperative Farm,** Mundok County, South Pyongyang Province - 1 unit, and **Up Cooperative Farm,** Yonan County, South Hwanghae Province - 1 unit.

PRK61788062	Laptop	HP 8740w i7 4GB 17"; Tag ID: PRK785540001; Export License: D 486065	1	1,916.13	9/4/2012	1,916.13	**FAO DPRK**
PRK61788063	Vehicle-Great Wall,	HAVAL H5, 2.4 Litre Cylinder Engine, 4*4 WD, Chassis No. : LGWFF3A57CB921488 Engine No. : SKH5921;	1	13,350.00	2011	13,350.00	**FAO DPRK**
PRK61788064	Projector	SONY	1	1,725.77	2012	1,725.77	**FAO DPRK**
	Combine Harvester	Combine (0.5ha/hour), 75 HP diesel engine, 2 meters cutting width, auto transmission, high efficiency, suitable for rice & wheat harvesting, Model: SDDF, 4LZ-2.0D	3	17,714	Aug, 2014	53,143	Soho Cooperative Farm, Mundok County, South Pyongan Province - 1 unit, Jangsuwon Cooperative Farm, Samsok District, Pyongyang - 1 unit, and Osin Cooperative Farm, Daean District, Nampo City - 1 unit.
						635,133.73	
	Note: Above prices are converted from RMB and KPW into US$. Figures in US$ may not be 100 % correct due to round figures.						