

# EGSP Highlights

August 2013

## Effective Grain Storage for Sustainable Livelihoods of African Farmers Project (EGSP II)

### Grain storage technologies to reduce post-harvest losses

A Launch and Inception Planning Workshop for the Effective Grain Storage for Sustainable Livelihoods of African Farmers (EGSP) Phase-II Project was held in Lusaka, Zambia, during 28-29 June 2012. Building on the successes of the previous phase (2008-2011), EGSP-II (2012-2016) aims to improve food security and reduce vulnerability of resource-poor farmers, particularly women farmers, in eastern and southern Africa, through the dissemination of effective grain storage technologies, especially metal silos and super grain bags.

Current regional post-harvest grain losses are estimated at USD 4 billion annually, according to project coordinator, Tadele Tefera. This is equivalent to a decade of food aid for the region, or enough annual calories for about 48 million people. With the support of the Swiss Agency for Development and Cooperation (SDC), phase I implemented the project in Kenya and Malawi, and its activities will now be extended to Zambia and Zimbabwe in phase II. Use of similar technologies in Latin America has significantly reduced post-harvest losses in the region. For this reason, EGSP-II "should go a long way in reducing post-harvest losses," said Elizabeth Diethelm-Schneller, SDC deputy director for Southern Africa. B.M. Prasanna, director of the CIMMYT Global Maize Program, noted that the metal silo is one of the most effective technologies against some of the most destructive postharvest pests, such as the large grain borer and the maize weevil.

The meeting allowed CIMMYT scientists, partners, and collaborators in the Southern African Development Community (SADC) to exchange ideas, information, and research outputs on the effective grain storage project; raise awareness on promotion and dissemination of effective grain storage technologies in SADC; and consult stakeholders on effective post-harvest technology, policy environment, and market issues, for the purpose of refining, updating, and implementing EGSP-II. Bekele Shiferaw, director of the CIMMYT Socioeconomics Program, called for a holistic approach in the project implementation. "Enabling policy environment and market linkages have a strong bearing on investments in post-harvest handling," said Shiferaw. "Reliable markets that allow capturing of benefits from quality and seasonal price gains enable storage investments," he added.

Presiding over the launch on behalf of Emmanuel Chenda, Honorable Minister of Agriculture and Livestock, Republic of Zambia, Deputy Minister Rodgers Mwewa noted that the project could not have come at a better time for the region. The benefit of bumper harvests has been negated by insufficient storage capacity and resulting post-harvest losses. "Due to a lack of awareness and access to appropriate technologies, farmers end up selling their maize soon after harvest, when prices are at their lowest,



(From left): B.M. Prasanna, director of the CIMMYT Global Maize Program, Samuel Kareithi SDC regional programme manager: Food Security, Elizabeth Diethelm-Schneller, SDC deputy director for southern Africa and Tadele Tefera, project coordinator.

#### About EGSP II

Building on the successes and lessons learnt from the Effective Grain Storage for Better Livelihood of African Farmers Project (EGSP) Phase I (June 2008-Feb 2011), the goal of Phase II is to enhance food security and improve the incomes of resource-poor farmers in eastern and southern Africa by preventing postharvest losses in maize through the metal silo and complementary policy and institutional innovations that enhance its adoption by resource poor farmers. The project focuses on the interfaces between maize postharvest losses and food insecurity and the technological and institutional innovations required to reduce losses, increase incomes and increase incentives for farmers to adopt the metal silos. EGSP is managed by CIMMYT, in close partnership with public and private institutions, and NGOs in Zambia, Zimbabwe, Malawi and Kenya

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Swiss Agency for Development  
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International Maize and Wheat  
Improvement Center



KENYA



MALAWI



ZAMBIA



ZIMBABWE



partly to curb the loss to post-harvest pests and partly to meet other financial needs. The same farmers are forced to buy the grains back at more than twice the price later in the season, resulting in a continual poverty trap," added Chenda, in a speech read on his behalf by his deputy.

Maize provides food and income to over 300 million resource poor smallholders in eastern and southern

Africa. Therefore, postharvest losses fuel food insecurity and impoverishment. "We have to find lasting solutions to postharvest losses," said Chenda. "The potential impact of increased maize productivity on poverty reduction and greater livelihood security will not be realized unless technological and institutional innovations are identified and deployed to overcome the chronic syndrome of 'sell low and buy high,'" he concluded.

## Metal silos and super grain bags improve grain storage in Zimbabwe and Zambia

Farmers in Zimbabwe and Zambia, who have been losing their maize harvests due to poor storage facilities, can now effectively store their grain in metal silos and super bags, courtesy of Effective Grain Storage for Sustainable Livelihoods of African Farmers (EGSP) Phase-II Project.

The four-year project funded by the Swiss Agency for Development and Cooperation (SDC) was launched in Zimbabwe and Zambia on 17 and 20 September 2012, respectively.

Presiding over the launch in Harare, Danisile Hikwa (principal director of the Department of Research and Specialist Services, Ministry of Agriculture, Zimbabwe) warned of the negative impact of post-harvest losses on food security: "The potential impact of increased maize productivity on poverty reduction and greater livelihood security will not be realized unless technological and institutional innovations are identified and deployed to overcome the chronic syndrome of 'sell low' and 'buy high'. The existing best-bet post-harvest technologies need to be rapidly scaled-up and disseminated in the region."

Wilfred Mwangi, CIMMYT regional liaison officer, noted that the traditional granaries have failed to protect farmers' maize harvests against the two most destructive post-harvest insect pests in the region, maize weevils and larger grain borers. "As a result of lack of adequate awareness and access to appropriate technologies, farmers end up selling their maize soon after harvest, when prices are at their lowest, partly to

curb the losses and partly to meet other financial needs. The same farmers are forced to buy the grains back at more than twice the price later in the season to meet their subsistence needs, resulting in a continual poverty trap," said Mwangi.

In her opening address in Harare, Nadia Otigger, SDC quality assurance advisor for South Africa, reiterated her government's commitment to reduce poverty in southern Africa, as Switzerland just approved a new strategy with focus on agriculture and food security, aiming to contribute to poverty reduction through the promotion of economically, ecologically, and socially sustainable agricultural production, especially for smallholder farmers.

Launching the project in Lusaka, Honorable Rodgers Mwewa, Deputy Minister for Agriculture and Livestock, Zambia, noted that self-sufficiency in food grains in the country does not depend only on increased production but also on minimizing post-harvest losses. "It is economical and environmentally appropriate to protect the harvested maize rather than to continue opening up new land and increase application of chemical fertilizers in the name of increasing production," he added.

Juliane Ineichen, SDC deputy director for Southern Africa, spoke during the launch in Lilongwe and noted that Switzerland expects to see changes in the lives of smallholder farmers with specific needs and requirements who are facing all kinds of challenges while producing crops and providing food; as well as in institutions and policies providing enabling conditions for smallholder farmers to improve their situations.



## Project aiming to reduce post-harvest losses launched in Malawi



“Storage technologies provided by the Effective Grain Storage for Sustainable Livelihoods of African Farmers Project offer effective grain protection against pest and moisture,” said Honorable Jermoth Ulemu Chilapondwa, the Deputy Minister for Agriculture and Food Security, Malawi, during the launch of the project on 26 September 2012 in Lilongwe, Malawi. “It will go a long way in complimenting the government’s efforts in fighting post-harvest grain losses,” he added.

As a major crop in Malawi, maize provides food and income to over 300 million resource-poor smallholder farmers in Eastern and Southern Africa. However, safe grain storage has presented a big challenge to the farmers. High post-harvest losses (up to 30 %) have made food security difficult to achieve at the household level despite increased production following government initiatives such as the Farm Input Subsidy Program. Jones Govereh, CIMMYT policy economist, noted that the traditional granaries have failed to protect farmers’ maize harvests against the two most destructive post-harvest insect pests in the region, maize weevils and larger grain borers. The Effective Grain Storage for Sustainable Livelihoods of African Farmers Project (EGSP-II), building on the successes of the previous phase (2008-2012), aims to change the situation. The objective of EGSP-II (2012-2016) is to improve food security and reduce

vulnerability through the fabrication, dissemination, and distribution of 4,000 metal silos and 24,000 super grain bags among smallholder farmers in Malawi.

The project is funded by the Swiss Agency for Development and Cooperation (SDC) and has three components: research, promotion, and policy advocacy for metal silos and super grain bag technologies. They are geared towards successful development of a well-functioning and sustainable input chain to provide small-scale storage technologies in areas affected by high post-harvest losses. The project is fully supported by the government of Malawi. According to Honorable Chilapondwa, “The Ministry of Agriculture and Food Security will endeavor to continuously assess the metal silos through the Department of Agricultural Research Services which has been tasked to do the research component, while the Department of Crop Development will be disseminating and promoting the technologies. I realize that policy consideration is key in successful implementation of the project. Bunda College has been mandated to address the issues and therefore take a leading role.”

The meeting allowed CIMMYT scientists, partners, and collaborators in Malawi to exchange ideas, information, and research outputs; raise awareness on promotion and dissemination of effective grain storage technologies; and consult stakeholders on policy environment and market issues for effective implementation of EGSP-II.

## More Kenyans to benefit from improved grain storage technologies

“Maize research in the country has contributed to increased productivity by developing high yielding hybrid varieties that give quick returns to the farmers. However, 30% of post-harvest losses incurred during storage due to insect pests such as the larger grain borer and maize weevil; and lack of effective grain storage facilities negates the achievements,” noted Ephraim Mukisira, Kenya Agricultural Research Institute (KARI) director, in a speech read on his behalf by Joseph Ochieng, KARI Food Crops assistant director, during the launch of the second phase of the Effective Grain Storage for Better Livelihoods of African Farmers Project (EGSP-II) in Nairobi, Kenya, on 2 November 2012. “In monetary terms, this loss translates to over 10 billion Kenya shillings (US\$ 120 million). Therefore more effort is required in post-harvest management practices and marketing to fulfil millenium development goals and realize Vision 2030 [Kenya’s Blue Print to Industrialization],” added Mukisira.

Mukisira lauded the efforts by national institutions, CIMMYT, and other stakeholders in promoting use of storage technologies, calling for strengthening these efforts even further to achieve economically acceptable post-harvest losses of less than 5%. According to B.M. Prasanna, CIMMYT Global Maize Program director, heavy post-harvest losses prevent Kenya and other countries in the region from achieving food security.

The project’s three components – research, promotion, and policy advocacy for metal silos and super grain bag technologies – are geared towards successful development of a well-functioning and sustainable input chain to provide small-scale maize producers with effective storage technologies, clarified project coordinator Tadele Tefera. EGSP-II



**Metal silos at Kamuthatha Boarding Primary School in Embu County, Kenya. The school acquired six 2.7-tonne capacity metal silos and got more benefits than anticipated: reduced postharvest losses (previously amounting to 60% of stored grain); and no need for storage pesticides. The technology helps the school save about US\$ 3,600 per year.**

will address policy concerns to upscale metal silo technology and test new small-scale technologies based on hermetically sealed bags. Adoption of metal silos is quite expensive for the resource-poor farmers, and thus has remained low; the new small-scale technology can provide a solution to this problem, as it is a cheap alternative targeting smallholder farmers.

Jones Govereh, CIMMYT policy economist, added: “As a result of lack of adequate awareness and access to appropriate technologies, farmers end up selling their maize soon after harvest, when prices are at their lowest, partly to curb the losses and partly to meet other financial needs. The same farmers are forced to buy the grains back at more than twice the price later in the season to meet their subsistence needs, resulting in a continual poverty trap.” EGSP-II, a major initiative in sub-Saharan Africa, aims to change the situation.



## Sharing experiences with effective grain storage in Africa



A delegation from Kenya, Malawi, Zimbabwe, and Zambia – the target countries of the Effective Grain Storage for Sustainable Livelihoods of African Farmers (EGSP) Phase-II Project – visited Malawi during 22-23 October and Kenya during 25-26 October 2012 to share experiences with project implementation and to learn about the project's impact on the livelihoods of smallholder farmers. The delegation comprised of officials from ministries of agriculture and national agricultural research systems from the four EGSP countries, and implementing partners (Kenya Agricultural Research Institute and the Catholic Dioceses of Embu and Homa Bay in Kenya, World Vision in Malawi, Zambia Agricultural Research Institute, and University of Zimbabwe and the Department of Agricultural Mechanization in Zimbabwe).

The tour kicked off in Malawi with visits to Mchinji and Dowa districts. The delegates held discussions with the implementing partners and local artisans trained on metal silo fabrication, school representatives, farmer groups, and farmers who had benefitted from the first phase of the project. Everyone present praised the metal silo for its great results in protecting the grains against the larger grain borers and weevils. "This allows farmers to store maize more effectively and sell it when prices are as high as 47 kwacha (US\$ 0.16) per kilogram and not when prices are at 18 kwacha (US\$ 0.06) per kilogram," says Andrew Kasalika, chairman of the Tayamba Group in Mlonyeni Extension Planning Area (EPA). "With metal silos, women do not have to climb into granaries, which is quite cumbersome,"

added Christine Victory, Tayamba Group's secretary, noting that the technology is also environmentally friendly, "Men do not have to cut trees to construct the granaries."

In Kenya, the delegation visited Kamuthatha Boarding Primary School in Embu County, which has acquired six 2,700-kilogram metal silos. Nethy Kathungu, the deputy principal, shared the enormous benefits of metal silos: increased quality of grain, and thus increased quality of food for the pupils; reduced postharvest losses (previously amounting to 60 % of stored grain); price hikes no longer affecting the school during times of scarcity, as they can now store enough to feed all 450 pupils; no need for pesticides; and less storage space required to store the same amount of grain. As a result, the school saves about Ksh 300,000 (US\$ 3,600) per year.

The delegates also visited Gikinyukia Agro-Enterprise Self-Help Group in Mbeere South District, Embu County. The Group participates in collective maize, sorghum, and green grams marketing, and owns three 1,800-kilogram metal silos. According to Gibson Wachira Muchiri, the Group chairman, the plan is to assist every member in acquiring a metal silo through the Group's fund.

The delegates found the visit very educative and informative, especially officials from Zimbabwe and Zambia who will be implementing the project for the first time. The visit allowed them to witness the implementation of EGSP in Kenya and Malawi as well as the role of different partners in the process.

The visits also helped the delegates to identify issues that need to be addressed for the second phase to be successful. These include cost-sharing for sustainability of the project, creating a sense of ownership, and producing a sufficient amount of maize for the metal silos to be fully utilized.

Speaking to the delegates, B.M. Prasanna, CIMMYT's Global Maize Program director, reiterated the importance of the project in enhancing nutrition and food security of smallholder farmers and consumers.

He called on the delegates to be the champions of the project and asked them to take it to the next level: "We can only be a catalyst, but we would like you to be the drivers of this movement. You should stimulate demand for the technology. CIMMYT derives its strength from people like you." Noting that awareness was critical to the success of the project, Prasanna also encouraged the officials to raise awareness among the target beneficiaries, women, women self-help groups, schools, and women-dominated organizations in particular.



The delegation at a farmer in Mchinji, Malawi who had acquired for metal silos.

## Improving postharvest grain storage and loss assessment methods

In November, 12 researchers and development practitioners implementing phase two of the Effective Grain Storage for Sustainable Livelihoods of African Farmers Project (EGSP II) travelled from Malawi, Zambia, Zimbabwe, and Kenya, for training on improved postharvest grain storage and loss assessment methods in Nairobi, Kenya.

The course was facilitated by Prof. Rick Hodges, University of Greenwich, UK, and CIMMYT Socioeconomist Hugo De Groot, Policy Economist Jones Govereh, and Project Leader Tadele Tefera. Practical and theory sessions covered topics such as hermetic storage, postharvest technologies, estimating storage losses, assessing ear and grain damage, economic data requirements and collection, and economic analysis of on-station and on-farm storage trials.

Participants were also introduced to the Africa Postharvest Loss Information Service (APHLIS); a system with an innovative framework for analyzing and computing quantitative postharvest losses under different farming and environmental conditions in eastern and southern Africa. It was discussed how using the APHLIS downloadable calculator can support loss reduction projects. According to Hodges, the advantages of this system are that its measure of percentage weight loss of grain is based on an actual reduction in the dry weight of grain; it does not account for changes in quality unless the

grain is no longer fit for human consumption; and losses are cumulatively calculated from production and including each step in the postharvest chain.

Despite the importance of economically analyzing crop and storage pest losses, Govereh lamented that such analyses are not well established in the research community. "Economic analysis is rarely available, especially for on-farm losses. In most cases, crop losses are commonly overestimated with benefits often overstated and costs underestimated."

Govereh outlined the economic analysis of crop and storage pests: estimating the extent of the problem (the area infested); estimating the intensity of the problem (infestation levels, damage, and crop loss); testing efficacy of control methods on-station and on-farm; basic economic analysis of new methods; farmer evaluation of new control methods; modeling and econometric analysis; and impact assessment. According to Hodges, estimating postharvest losses helps in influencing policy makers, improving the efficiency of value chains, and identifying opportunities for increasing food security.

Reiterating the economic benefits of storage, Govereh stated: "Most maize is produced by small-scale farmers in one major season and is meant for home consumption. However, consumption is continuous therefore storage is needed to buffer stocks and protect against price fluctuations."

## Curbing maize postharvest losses in Zambia

“Reducing postharvest losses is key to increasing availability of food as it is not only important to increase domestic food production but also to protect what is produced by minimizing losses,” stated Zechariah Luhanga, Permanent Secretary, Provincial Administration at the Office of the President, Eastern Province, at the Provincial Stakeholders Workshop on Effective Grain Storage for Sustainable Livelihoods of African Farmers Project (EGSP-II) held in Chipata, Zambia, on 29 May 2013. “We as the key stakeholders and participants in the agricultural sector can enhance food security and improve incomes of resource poor farmers and artisans by promoting improved storage technologies such as metal silos and hermetic bags in Zambia.”

The workshop had five main objectives: (1) to provide a forum for exchange of ideas, information, and research outputs on EGSP-II among stakeholders in Chipata; (2) to raise awareness on post-harvest losses and dissemination of effective grain storage technologies among provincial stakeholders; (3) to consult provincial stakeholders on effective postharvest technologies, policy environment, and market issues for the purpose of refining, updating, and implementing EGSP-II; (4) to engage in policy dialogue on matters related to storage and find means of enhancing adoption of the technology; and (5) to acquaint key stakeholders in the province with the post-harvest technology and ways to enhance its adoption among farmers.

Maize suffers heavy post-harvest losses estimated at 20-30%. “The main underlying factor is that most of the small-scale farmers do not have access to improved storage facilities,” explains Tadele Tefera, CIMMYT entomologist and EGSP-II coordinator. Ivor Mukuka, EGSP national coordinator for Zambia, noted that since the larger grain borer was first found in Zambia in 1993, there have been sporadic outbreaks causing substantial losses in maize. “For instance, rapid loss assessments in Lundazi and Chama districts revealed losses ranging from 5-74%. Other studies indicate storage losses of between 45-90% based on farmers’ estimation,” he added.

**Tadele Tefera, CIMMYT entomologist and EGSP-II coordinator, addresses the participants. (Inset): Tadele and Ivor Mukuka, EGSP national coordinator for Zambia keenly to Zechariah Luhanga, Permanent Secretary, Provincial Administration at the Office of the President, Eastern Province, during the official opening of the Provincial Stakeholders’ Workshop.**

Luhanga reminded participants that grain post-harvest management development requires active participation of all stakeholders, including government, research systems, non-governmental organizations, and the private sector in bringing the technologies to farmers’ doorsteps. “You need to make sure to set priority activities so that they address the challenges faced by smallholder farmers regarding maize grain post-harvest management, but also expand their opportunities in the maize sector,” Luhanga urged more than 50 stakeholders present in the meeting. Besides post-harvest loss reduction, the metal silo technology provides huge business opportunities to artisans. “Engaging in metal silo fabrication and marketing can create jobs and rural enterprise development,” said Egbet Munganama, principal agricultural engineer at the Department of Mechanization, Ministry of Agriculture and Livestock, Zambia.

According to Jones Govereh, EGSP policy analyst, artisans can earn over US\$ 3,000 per year if they fabricate just five silos a month on average. “This is an attractive income for micro-entrepreneurs but commercially oriented entrepreneurs can earn much more,” he explained. “Improved maize storage technologies have a great potential impact on food security as most households lose much of their maize due to poor storage facilities,” concluded CIMMYT principal economist Hugo De Groote, considering that maize is the major food crop in Zambia. Tadele thanked the Swiss Agency for Development and Cooperation (SDC) for funding EGSP-II, a project aiming to reduce post-harvest losses, enhance food security, and improve incomes of resource-poor farmers in Zambia.



## Extension personnel urged to lead by example in promoting metal silos



Agricultural extension service staff members in Zambia have been challenged to be the first adopters of metal silos to help promote the technology for effective grain storage. "I implore you, extension workers, to be the first adopters and users of the metal silo technology. As citizens that live side by side with farmers, go and be the first to practice what you will be preaching. You must lead by example," stated Bert Mushala, the Permanent Secretary, Provincial Administration, Office of the President, Eastern Province, in a speech read on his behalf by his assistant Beenzu Chichuka at the official opening of the Improved Postharvest Management Training Workshop for Extension and Media Personnel held during 27-28 May 2013 in Chipata, Zambia.

"Farmers learn by seeing. Therefore, before they start using the metal silos, they want to see the chief executives, the business executives, extension workers, journalists, and other opinion leaders in the forefront, zealously storing maize in the metal silos," he added. The purpose of the training was to build technical capacity on hermetic grain storage technologies, such as metal silos and super grain bags, among extension and media staff in the project implementation districts of Chipata and Katete. The workshop intended to create awareness on the importance of grain postharvest management, help gain insights into different factors affecting postharvest management, and provide a better understanding of traditional and improved postharvest technologies and their use in grain loss reduction, summarized Tadele Tefera, CIMMYT entomologist and the Effective Grain Storage for Sustainable Livelihoods of African Farmers Project (EGSP II) coordinator.

Ivor Mukuka, EGSP national coordinator for Zambia and ZARI chief agricultural research officer, noted that this was part of the process of sharing information on EGSP as a means of promoting effective grain storage and thus helping smallholder farmers safely keep their grains for longer and sell when the time and price are right. Reiterating the importance of the technology, Mushala noted that self-sufficiency

in food grains in the country does not depend only on increased production and productivity, but also on minimizing losses both in the field and during storage.

Over the years, supporting organizations and other partners, including the Ministry of Agriculture and Livestock, have poured colossal amounts of resources into the production component of the sector. "The resultant improved yield gains, especially in maize, have largely been wasted through postharvest losses," regretted Mushala, adding that "this

project is therefore unique and outstanding to us in Zambia as it focuses on the comparatively neglected storage aspects. It is the first one of its kind and could not have come at a better time."

Mushala then reminded the journalists that they had an enormous task of educating the masses on the new form of storage as many citizens, even in urban areas, are engaged in agriculture. "Go and empower the masses with this information so that together, we can reduce on-farm storage losses to zero," Mushala urged the participants.

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*Eastern Province Agriculture coordinator Obvious Kabinda called for commitment: "You must have confidence and belief in the technology if you are to successfully promote it to others."*

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The messages did not get lost on the participants. "I have gained good knowledge of the technology and, like other trainees, will be using it to ensure that farmers are aware of its existence, have access to it, and are able to adopt the metal silos," said Michelo Lubinda, a producer with the Zambia News and Information Services (ZANIS), confirming the usefulness of the workshop.

Tefera thanked the Zambia Agricultural Research Institute (ZARI) and the Ministry of Agriculture for their commitment in implementing the project in Zambia, and the Swiss Agency for Development and Cooperation (SDC) for funding the project.

The training was organized by CIMMYT, ZARI, and the Department of Mechanization, Ministry of Agriculture, and facilitated by Tefera, Mukuka, CIMMYT agricultural economist Hugo De Groote, EGSP policy economist Jones Govereh, and senior mechanization specialist Moffat Khosa and principal agricultural engineer Egbet Munganama from the Department of Mechanization Ministry of Agriculture, Zambia.

## Curbing maize postharvest losses key to attaining food security in Kenya

Kenya has experienced tremendous improvements in maize productivity, rising from 1,530,000 metric tons in 2002 to 3,420,000 in 2011. However, postharvest losses of up to 40% of the harvested grain pose great challenges to attaining food security, as about 80% of Kenyans live in rural areas and derive their livelihoods mostly from agricultural activities. With maize being the main staple crop and agriculture the cornerstone of Kenya's economy accounting for 27% of GDP and producing over 75% of industrial raw materials, postharvest losses also pose a challenge to the economic development of the country. To address these issues, CIMMYT and the Kenya Agricultural Research Institute (KARI) organized the Improved Postharvest Management Training Course for Extension & Media Personnel in Nakuru, Kenya, during 26-27 June 2013.

"It is pointless to heavily invest in good agricultural practices, attain high yields, and lose 40% of it. Feeding the nation does not only require increased production but also a safeguard of all that is produced," stated Leonard Ochieng', Nakuru County director of agriculture, Ministry of Agriculture, presiding over the official opening of the course. The training aimed to build technical capacity in hermetic grain storage technologies, such as metal silos and hermetic bags, among Kenyan extension and media staff. According to Tadele Tefera, CIMMYT entomologist and coordinator of the Effective Grain Storage for Sustainable Livelihoods of African Farmers Project, the course also intended to create awareness on the importance of grain postharvest management, help extension and media staff gain insights into different factors affecting postharvest management, and explain traditional and improved postharvest technologies and their use in grain loss reduction.

According to Nakuru County Crops Protection Officer Hannah Oduor, there is always a surplus of maize in Trans Nzoia, Uasin Gishu, and Nakuru (the Rift Valley counties referred to as the granaries of Kenya), but the country is forced to import more nonetheless. "We cannot afford to continue importing maize, for this is a very expensive and unsustainable affair. Money for development is used to import food that we could have easily safeguarded with appropriate technologies like metal silos," stated Ochieng'. The problem lies in high incidence of maize weevils and the larger grain borer storage technologies. "We need technologies like the metal silos for effective storage of this surplus to cater for periods of scarcity and for redistribution to other parts of the country where production is below consumption," said Oduor.

Grace Kirui, the Nakuru deputy county director of agriculture in charge of extension and training, lauded CIMMYT and KARI for organizing the course. "It was in line with the Ministry of Agriculture's renewed efforts in intensifying training and dissemination of appropriate pre- and post-harvest technologies to reduce both quantitative and qualitative losses," she noted and then called on the trainees to use their newly-acquired knowledge to educate and create awareness among the wider public. "The technologies that reduce postharvest losses, to which you have been exposed during the training, will go a long way in improving food security, creating employment, increasing farm incomes, saving on foreign exchange, and alleviating poverty," said Kirui. "I call upon you, agricultural extension officers, to work hand in hand with artisans to promote the technology during your normal extension activities, field days, exhibitions, and shows."

## Metal silos: a timely intervention in curbing postharvest losses

The metal silo technology promoted by CIMMYT for maize storage has been hailed in Kenya as the ultimate solution to high maize postharvest losses caused by the maize weevil (*Sitophilus zeamais*) and large grain borer (*Prostephanus truncatus*), two major destructive insects of stored maize causing 30% losses and more than 80% damage to stored maize in Kenya and other countries in sub-Saharan Africa. The real losses are even bigger: when considering their environmental impact, the subsequent losses in nutritional value, industrial input, market opportunities, and the possible adverse effects on health of populations consuming poor-quality products, the need for interventions becomes even more apparent and pressing. "Addressing waste across the entire food chain must therefore be a



critical pillar of future national food strategies,” said Ngari Nyaga, Crop Post Harvest Division head at the Kenyan Ministry of Agriculture, during the official opening of a national Stakeholders Workshop on Effective Grain Storage for Sustainable Livelihoods of African Farmers Project (EGSP-II) held in Nakuru, Kenya, on 28 June 2013.

Tadele Tefera, CIMMYT entomologist and EGSP-II coordinator, outlined the workshop objectives: provide a forum to exchange ideas, information, and research outputs on EGSP-II among stakeholders in Kenya; raise awareness on postharvest losses and dissemination of effective grain storage technologies among stakeholders; consult stakeholders on policy environment and market issues for the purpose of refining, updating, and implementing EGSP-II; engage in policy dialogue on matters related to storage; find means of enhancing the technology adoption; and acquaint key stakeholders in the country with the technology and how they could enhance its adoption among the farmers they are supporting through their activities.

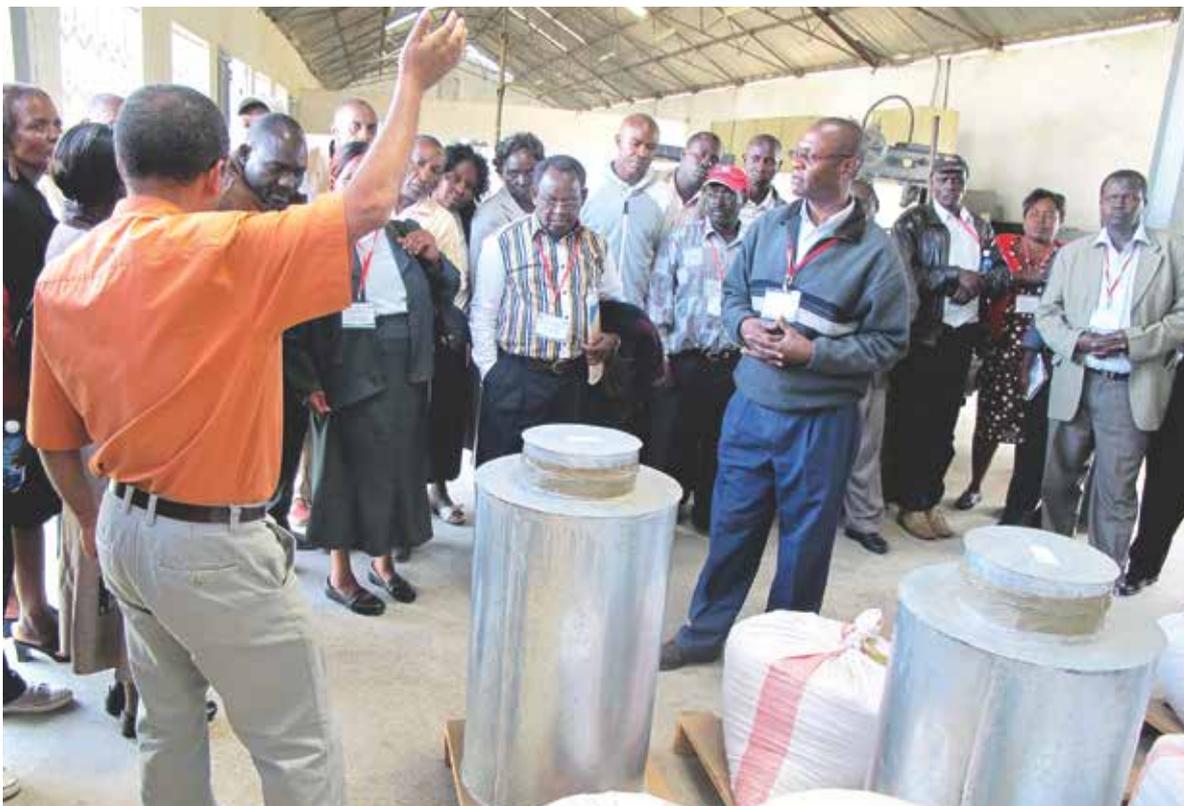
With the annual average production of about 33 million 90-kilogram bags, postharvest losses of about 20% translate into 540 million kilograms. “The metal silo technology being promoted by CIMMYT is a timely and critical element in the quest to promote food security,” stated Nyaga, pointing out that about two million Kenyans are considered food insecure. The technology will “lower postharvest losses, assist farmers to save on dusting labor, have healthy and

tradable grains, and allow the farmers to wait for better prices instead of selling immediately after harvest for fear of losing their grains to weevils, larger grain borer, and poor storage.” The technology will also help to address an issue recently reported in a Ministry of Agriculture survey: the incorrect use of pesticides. According to Nyaga, metal silos will “lead to zero usage of storage pesticides, hence result in better health and stoppage of illegal use of restricted pesticides by farmers.”

As other forms of storage – traditional granaries and sisal and gunny bags – have proven ineffective, and chemical control unsuccessful (only half of Kenyan maize farmers use storage pesticides), Nyaga welcomed the decision of Kenya, Uganda, Tanzania, Rwanda, and Burundi to work together to develop technologies and policies to reduce crop postharvest losses in the region.

The workshop gave stakeholders a chance to update themselves on the project, appreciate the magnitude of the postharvest losses and the effectiveness of alternative postharvest technologies being used, and better understand the economics of postharvest management. It also provided the latest news from on-station trials on metal silo technology and super grain bags.

Tefera thanked the Swiss Agency for Development and Cooperation for funding EGSP II, a project aiming to reduce postharvest losses, enhance food security, and improve incomes of resource-poor farmers in Kenya.



**Tadele explains to participants the research and validation (on-station testing of metal silos) component of the project when they visited the Nakuru Agricultural Technology Developments Center.**

## Kenyan farmers turn to new weapons against 'Osama'



The most important post-harvest pest in Kenya's dryland areas is the larger grain borer, locally known as 'Osama' in testament to its aggressive destructiveness.

Farmers say it flourishes in high temperatures – a particular problem as climate change brings warming conditions in many parts of the country.

But smallholder farmers in Eastern Kenya and other parts of the country have found a way to combat the pest: metal storage silos that help protect grain from both insects and fungal infections.

At Kiritiri market in Embu County, in semi-arid Eastern Kenya, Benjamin Njue Ngari, a local tinsmith, and his assistants are now busy moulding galvanized metal sheets into airtight cylinders to meet surging demand.

"It has two openings, one on top for filling, and the other one at the bottom for emptying," explains Ngari. "We make them in different sizes to store between one and 20, 90kg bags of grain."

A small silo that can accommodate one bag of grain costs about Sh3000 (\$35), while a huge one that can store 1.8 tonnes of grains costs Sh17,000 (\$200). The silos can be used for more than one year.

Once filled with grain, a small space is left at the top where a burning candle is placed just before it is finally closed. The candle helps eliminate all the oxygen in the container to suffocate any pests trapped inside, Ngari said.

The storage system eliminates use of chemicals, which have been the most popular method for pest control in many parts of the country.

"I remember a few years ago, when our school lost over two and a half tonnes of maize after Osama's infestation," said Edith Nyaga, the storekeeper at

Kamuthatha primary boarding school in Embu. But since the school bought six big metal silos for grain storage two years ago, "we've not had a problem even with the common weevils," she said.

According to Paddy Likhayo, a grain storage expert from the Kenya Agricultural Research Institute (KARI), post-harvest grain pests destroy up to 30 percent of all maize harvested in Kenya, or the equivalent of 162 million tonnes.

That is a problem that needs to be solved, with the United Nations predicting world population will hit 9.1 billion by 2050 and demand for grain surging.

It's also a particular concern for Kenya, where warmer temperatures are causing a spread of some types of pests.

"Osama is a real menace. With the changing climatic conditions we are worried that its infestation may spread to other parts of the country affected by the climate change, since it flourishes in high temperatures," said Likhayo. So far, the pest has already been spotted in Kitale, Kenya's grain basket in Western Kenya.

Heavy infestations of the grain borer can result in complete harvest losses, said Likhayo, who also heads the Effective Grain Storage for Better Livelihoods of African Farmers Project, implemented by the Maize and Wheat Improvement Centre (CIMMYT). The project introduced the metal silo technology in Kenya.

Until the year 2011, when the metal silos were introduced in Kenya, nearly all smallholder farmers stored their grain in sacks or in granaries, where they were susceptible to all kinds of pests including rats and rodents.

In Eastern Kenya, farmers who cannot afford to buy the metal silos have resorted to working in groups to purchase them.

“Through our self help group, we have purchased three metal silos, each with a capacity to store 1.8 tonnes of grain. We usually keep records of the amount of grain stored by each member of the group,” said Gibson Wachira, chairman of Gikinyukia Producer Marketing Group in Nyanduro village in Embu.

The group stores maize, sorghum and beans, and tests the moisture content of the grain before sealing it inside the silos, to avoid contamination with aflatoxins, naturally occurring toxins that can grow on grain that has not fully dried.

The aflatoxins contamination affects the liver once in human body, and in many cases the victim dies. In Kenya, such contaminations have been witnessed



mainly in the dryland eastern part of the country. The most notable one was in 2004, when 123 residents of Mutomo village in Kitui, Eastern Kenya died after consuming aflatoxins contaminated maize.

“To avoid aflatoxins contamination, we use simple techniques to test the moisture content before storing the grains in the metal silos,” said Nephy Kathongo, the head teacher at Kamuthatha primary boarding school.

“We collect samples of the grains to be stored, and put them in a dry transparent bottle containing some common salt. We then shake the mixture. If salt particles stick on the grains or on the bottle wall, then it means that the grains are not fully dry – hence, susceptible to aflatoxin contamination. Such grains must be dried up further before storing,” explained the head teacher.

So far, the metal silo grain storage technique has been introduced in Eastern and Western part of Kenya among small scale farmers. Likhayo said his organization now hopes to scale up the project, with experts from Malawi, Zambia and Zimbabwe visiting to learn from Kenya’s sites.

“Use of metal silos in Kenya has worked as a good pilot,” Likhayo said. Now, “we are targeting to introduce the technology in the three countries come the next harvesting season.”

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