



CTA Top 20 Innovation Abstracts

21) Improved pearl millet for Eritrea

Negusse Abraha¹, F.R. Bidinger, A.G.Bhasker Raj² and C.T.Hash²

¹ Department of Agricultural Research and Human Resource Development, Ministry of Agriculture, Eritrea

² ICRISAT, India

In Eritrea, harvests of pearl millet - an important crop for subsistence farmers – are badly affected by downy mildew (*Sclerospora graminicola*). In 2000, the Eritrean pearl millet breeding programme began screening local landraces and exotic cultivars to develop productive varieties resistant to drought and downy mildew disease. From the screened varieties, potential parents of local and exotic materials were used for cross-breeding. The improved varieties were tested on-station and in farmers' fields. The best performing variety, Tokroray x ICMV 221, showed more than 30% yield increase and 98% resistance to downy mildew disease. Farmers readily adopted the improved varieties and recommended the production and distribution of seeds. The new varieties are now the most widely grown and farmers are also selling to other farmers interested in growing the improved seed.

22) Cactus as fodder

Awet Estifanos Gebre and Tesfay Hagos¹

¹ Tigray Agricultural Research Institute, Ethiopia

In the Tigray region of Ethiopia, where rainfall is erratic and scarce, crop residues (straw) are an important livestock feed, particularly during the dry season. However, these are generally of poor quality. Researchers from the Tigray Agricultural Research Institute initially introduced a urea-molasses block, but production was limited as competition for molasses grew. This was then replaced with the fruit from a cactus – *Opuntia ficus indica* – to produce a urea-cactus block (UCB). The cactus is widely available in Tigray but much of the fruit is wasted. Since the introduction of the lower cost UCB, daily milk production has increased by 50%

(0.5-1 l/day) and the survival rate and appearance of cattle have improved. Local NGOs and youth groups are now manufacturing the blocks, which are easy to make at village level.

23) Cashing in on cage fish farming

Ronald Kirabo¹

¹ Think Youth development Initiative-Uganda and Fisheries Training Institute Entebbe

Overfishing and harvesting of immature fish in Ugandan water bodies, particularly Lake Victoria, is leading to a dramatic decline in fish stocks. The National Fisheries Resource Research Institute (NaFRRI), with the support of Chinese aquaculture experts, has introduced cage fish farming using bamboo or metal framed mesh cages suspended on plastic drums which keep them afloat in the water. Each cage holds up to 10,000 fingerlings, typically of Nile tilapia (*Oreochromis niloticus*). The fingerlings are fed natural and artificial feeds of high nutrient value until maturity at six months, when they are harvested. A single cage can produce up to 5 tons of fish, with each fish weighing 2-5 kg. The technology is particularly appropriate and has been adopted by women and young farmers. Fish farming currently supports 4.2 million smallholder farmers in Uganda and reduces over-exploitation of fishery resources.

24) Improved churner for butter extraction

Mawahib ElTayeb Ahmed¹, Emad M. Mahjoob¹, Fatima Mohammed & Community², J.M. Diop³, Faisal Elhag⁴, Mahmoud Mekki⁴, Tag Elsir Khidir⁵, Ehlam Hassam⁵

¹ National Center for Research, Sudan

² Elkiryab Village, Sudan

³ PROLINNOVA, Sudan

⁴ Agricultural Research Corporation, Sudan

⁵ Food Research Center, Sudan

In Sudan, traditional methods of milk processing generally practised by women are labour intensive and yields are low. The final products, butter milk and ghee (clarified butter) are of low quality and stability. Producers are unable to meet the high consumer demand. Participatory development of a simple butter churner based on traditional practices and technologies (AlBukhsa and Elsein) was undertaken with the women in the ElKiryab community. The improved churner is portable, easy to clean and

requires less effort. The extraction rate is faster, converting 90-95% of the milk into butter in 15 minutes, compared with two hours for producing the same amount using the traditional churns. The resulting product is of higher quality and more stable than traditional ghee. Further field testing is planned with women from different areas.

25) Voice-activated information delivery

Alloysius Attah and Emmanuel Owusu Addai¹

¹ Farmerline Ltd, Ghana

In 2012, Farmerline emerged as the winner of a World Web Foundation competition with an SMS app to provide farmers and investors with information to improve productivity and maximise incomes. However, field trials demonstrated that farmers were more comfortable using a voice-response system. Consequently, Farmerline developed a new, award-winning, voice-activated system. Farmers receive crop and aquaculture advice including best practices, record keeping services, access to inputs, market and finance information and weather forecasts. Two thousand crop and fish farmers have used the service and have reported improvements in productivity (10%) and profits (20%). Farmer-based organisations and NGOs are also using the service to reach farmers in their local languages.

26) Ventilated storage preserves yam quality

Kpemoua Kossi¹

¹ ITRA-CRAS (Togolese Institute of Agronomical Research - Centre for Agronomical Research in Dry Savannah), Togo

In Togo, post-harvest deterioration of yam is a key constraint. Variations in heat and humidity result in significant loss of quality during harvest and transport. In collaboration with local farmers and traders, researchers at ITRA-CRAS developed a well ventilated granary for storing yam tubers. Made of 95% local materials, the granary has clay walls, a straw roof, internal wooden shelves and netted windows to prevent theft and insect and rodent damage. Three yam varieties were stored for a period of five months (Feb-June) with no treatment other than disinfecting the granary. Storage losses were lower (8-15%) in the new granary, particularly for the Laboko variety, with 80.6% remaining in good condition after four months' storage. Farmers appreciate that the structure is simple to construct, storage is improved and market

value of yams has increased. Traders have also adopted the innovation.

27) Artificial insemination boosts Ugandan pig farming

Robert Natumanya, David Mutetikka, Donald R. Kugonza¹

¹ Makerere University, Uganda

Artificial insemination (AI) is not widespread in Africa as many farmers still use natural mating. In 2009, Makerere University established a community AI centre and boar stud to provide year-round quality semen and promote adoption of AI amongst small to medium-scale pig farmers. When the sows are “on heat”, farmers contact the centre. By optimising procedures for semen collection, storage and insemination, 80-90% conception rates and litter sizes of 8-14 piglets have been achieved. Since 2011, 50 farmers have been using the technology and demand is spreading within Uganda and neighbouring countries. By not having to keep a boar, farmers have reduced their costs; the increased litter sizes have also helped to improve incomes. The technology has also contributed to reduced disease incidence.

28) ‘Climate-smart’ hydroponics: growing more with less

Stuart LaPlace¹

¹ Clarence Fitzroy Bryant College, St Kitts

Horticultural productivity in the Caribbean could be boosted by a new, ‘climate smart’ hydroponic system. Designed and developed in 2011 at the Clarence Fitzroy Bryant College in St Kitts, farmers using the system sow seeds directly into the media rather than transplanting seedlings, reducing both the time and space needed for cultivation. In addition, the new system involves growing plants on vertical trellises, thereby increasing the harvest from vine plants by up to three times. Establishing the system – now used for food production and training at Clarence Fitzroy Bryant College – cost US\$5,000. The growing media can be recycled, more than one plant can be grown in a 3” cup at a time and the system is easy to maintain. The 300 plant hydroponic system is constructed within a shade house that allows air to circulate and increase pollination opportunities. It can be modified by farmers according to the size they need, and can be collapsed and relocated in the event of extreme weather. Meshach Alford, a St Kitts farmer who is using the system to grow lettuces for local restaurants and shops,

reports that time invested in growing the crop is minimal compared to traditional field-based production.

29) Digital extension for Southern African livestock farmers

Abisha Damba and Thembinkosi Nyathi¹

¹ Practical Action Southern Africa, Zimbabwe

Podcasting in local voices and languages to deliver extension messages on livestock production has been developed and tested in Southern Africa. The knowledge needs of the community were identified. The relevant content was then generated, recorded, converted into digital formats and uploaded onto inexpensive mp3 devices. Trained community workers disseminated the material at meetings in their respective wards and villages (Mbire district, Mashonaland). Farmers were able to diagnose and administer treatment to their livestock (including vaccination) as well as perform a variety of other activities (castrating, de-horning, worming etc). 20,000 farmers benefited from the pilot project and a further 50,000 farmers are expected to benefit. The development of locally-recorded podcasts that meet local needs strengthens capacity and knowledge exchange within the community.

30) Finger millet nurseries: a head start

Geoffrey Kamau¹, Rachel Kisilu¹, and Simon Masila²

¹ Kenya Agriculture Research Institute, Kenya

² Farmer Innovator, Kenya

Moisture stress and low soil fertility limit crop establishment in semi arid areas of Kenya. Farmer innovator, Simon Masila, and his self help group experimented with using finger millet nurseries to take advantage of the rains. The practice involves growing a nursery bed of finger millet 1.5 months before the expected onset of rains, by which time the plants are about 15 cm. This gives the plants a head start and farmers are able to select strong plants for establishment. The approach reduces seed loss, improves yield and helps to ensure they achieve a harvest. The Kenya Agricultural Research Institute (KARI) has tested this innovation with farmers; optimising nursery size, type of seed used and transplanting methods, and popularised it through existing local structures. The practice has expanded from the initial village to several administrative zones in the country. Some farmers have used the practice to establish other types of crops and others have begun to establish commercial nurseries.

31) Natural protection for stored onion seed

Joseph Ayembilla¹

¹ Navrongo-Bolgatanga Catholic Diocesan Development Office (NABOCADO), Ghana

Farmer John Akugre has experimented with the Barakuk plant (an indigenous tree) for preserving onion seed and for the treatment of animal wounds. Suitability of the plant for reducing the loss of grain and seed in storage due to weevils and other insects was discovered by his father through trial and error: its strong scent repels insects, effectively protecting stored cereals for several months. When borers attacked onion seeds, resulting in poor or failed germination, Akugre altered his father's method, burning the Barakuk plant, grinding it, mixing the ash with the onion seed and storing it. Germination rates increased by over 90% and yields increased between 40-80%. After this success, Akugre experimented further, and used the ash to treat a wounded goat. The ground Barakuk powder was mixed with Shea butter and applied to the wound, which healed very quickly. Several farmers have adopted this innovation. Initial trials carried out with local stakeholders, including the Ministry of Food and Agriculture, have been impressive. Additional scientific investigations are required to standardize and commercialize the product.

32) Indigenous Nguni cattle for secure livelihoods

Mona Ben Matiwane¹

¹ Department of Agriculture and Rural Development, South Africa

In South Africa, Nguni cattle are an indigenous breed that is able to thrive under difficult conditions, withstand livestock diseases, and maintain a high level of fertility. Through a partnership between the North-West University (NWU), Department of Agriculture and Rural Development (DARD) and the Independent Development Trust (IDC), 1,128 Nguni cows were distributed to 47 'projects', comprising 145 subsistence farmers, either as individuals or in groups. Each project was given 24 cattle (23 heifers and a bull) to build up a nucleus herd and was expected to return 11 heifers and a bull. Training in cattle management and entrepreneurship was provided. Seven projects have so far paid back their livestock and in total, 144 animals have been returned for further distribution. Over 5 years, the initial 1,128 cattle have increased to 2,741 (excluding sales). A survey revealed that 71%

of beneficiaries felt their standard of living had improved, 93% stated that their social environment was better, 65% reported that their food security had improved, while 100% said that managing the cattle had given them permanent employment.

33) Boosting yam production

Adanma Amaefula and GN Asumugha¹

¹ National Root Crops Research Institute, Nigeria

Yam production has been declining in Nigeria due to the high cost of seed yams, which often accounts for 50% of the total production costs. Yam miniset technology (YMT) was developed by the National Root Crops Research Institute (NRCRI) as a more efficient and affordable way to produce seed yam, but dissemination and adoption of the technology has been poor: 66% of yam farmers in major yam producing areas are unaware of it. To overcome this hurdle, NRCRI aims to develop and disseminate a guidebook (written in local languages) to complement training on YMT in order to enhance adoption and boost yam production. By producing yam at a lower cost, farmers will be able to improve their income and wellbeing.

34) M-fodder: SMS sourcing of hydroponic fodder

Elvis Ouma and Angela Atieno¹

¹ University of Nairobi, Kenya

Smallholder livestock keepers often struggle to access high quality fodder. M-fodder aims to solve this problem by linking livestock (cattle, poultry and pigs) keepers to hydroponic fodder producers, using a mobile phone based SMS system which costs €0.03 per SMS. It is also available as a mobile, web-based application which can be downloaded on a smartphone. The hydroponic system involves sprouting grass seeds in mineral solution rather than soil. It takes 7-10 days for the grass to reach around 45 cm high. Livestock keepers use the app to order fodder 8 days in advance and save between € 0.18-0.25 per day through this system. The adoption rate is estimated to be 60-80%. Mr Ochien, a dairy farmer, has testified that milk yields and profits have increased.

35) Improved beans outperform traditional varieties

Mbaka Njoka¹, Peter Kamau¹, Lena Kinyua¹, Mary Mwenda¹, and Bernard Towett²

¹ Kenya Methodist University, Kenya

² Egerton University, Kenya

In Eastern and Central Africa, beans are a dietary mainstay and boost soil nitrogen. The common bean is widely grown and consumed, but farmers have faced declining yields and lack of improved varieties. This led a team of breeders and agronomists to develop superior cultivars. The improved varieties are high yielding - around 1,800-2200 kg/ha, compared to 350-750 kg/ha for commercial varieties - and can earn the farmer about 3.2 times more. They also have high levels of zinc and iron and greater pest and disease resistance. The superior varieties also produce 3.2 times more biomass, which can be used as fodder. Through collaboration with commercial seed dealers, farmers began growing the superior varieties but after two to three seasons, differences in performance were noted under different environments. Researchers are aiming to disseminate the new varieties using a 'farmer initiated bean selection' programme to over 2 million farmers in 5 years.

36) Improved crop processing with adapted technology

Godfrey Mwinama and Wilson M Baitani¹

¹ Center for Agricultural Mechanisation and Rural Technology, Tanzania

In 2010, power tillers were imported to help Tanzanian farmers increase productivity. Many underperformed during land preparation operations in upland farms, but performed well in haulage and lowland land preparation, particularly rotavation in rice fields. To increase the usage of power tillers throughout the year, a group of researchers developed a dual purpose machine for multi-crop primary processing (HPO-MPPM), specifically for maize shelling, groundnut de-shelling, forage chopping, and wheat and sorghum threshing and for transportation. The machine reduces labour requirements, improves the quality of harvested grains and forage, and reduces post-harvest losses. The HPO-MPPM is manufactured with locally available materials and powered by a power tiller. In 2013, the HPO-MPPM shelled 2.5 t of maize per hour; over 2 months, more than 60 t of maize were shelled for various smallholder farmers who paid TZS 1,000-2,000 (€0.44-0.88) per bag.

37) Innovation fund for agricultural transformation

Noah Ahmed¹

¹ Sierra Leone Chamber for Agribusiness Development, Sierra Leone

In Sierra Leone, where smallholder productivity is typically low, farmers generally rely on traditional-labour intensive methods and lack access to organized and assured markets. The country also spends \$200 million (€147 million) annually to import rice. The Innovation Funds for Agricultural Transformation (IFAT), a joint private-public initiative, is a competitive credit scheme providing financial support and technical backstopping. It uses a multi-stakeholder platform approach to bring together farmers and other value chain members to overcome challenges. IFAT targets smallholder rice, cassava, livestock, fruit and vegetable farmers, enabling them to establish small and medium sized enterprises and increase their income. Two agribusiness marketing companies won competitive bids of \$95,000 each to buy, process and package local rice. This increased the availability of well-packaged Sierra Leone rice at affordable prices which could compete with imported brands.

38) Health 'pack' for small ruminants

Lassane Percoma¹, Ange Irene Toe¹, and Issa Sidibe²

¹ Pan African Tse-tse and Trypanosomosis Eradication Campaign, Burkina Faso

² International Centre for Research and Development on Livestock, Burkina Faso

Poor access to veterinary care for livestock is a serious constraint to agro-pastoral development in Africa. The PATTEC initiative has developed a technical health pack for small ruminants in poor rural areas which also provides protection for the livestock against insect pests including the tsetse fly and malaria mosquito. The pack contains three treatments for internal parasites (one at the beginning of winter, one two months later and one at the end of the season), two monthly sprayings against ticks, antibiotic treatments for infections, treatment for lambs against heartwater, and vaccination against pasteurellosis. Up to 3,000 animals can be treated per phase. Farmers also receive training on maintaining the health of their livestock and assistance to treat external parasites. They are each given 3 kg of cowpea seed for forage crops. Both the incidence of internal and external parasites and animal mortality rates have been reduced. Farmers' veterinary expenses have also come down and farmers have expressed a

satisfaction rating of 95%. There are now plans to upscale this project.

39) Livestock-crops-fish: integrated in Benin

Hermann Abihona, Donald Akogou, Faki Chabi, Boris Dèdo, Thibaut Martins, Sosthène Sogbossi¹

¹ EMPREINTE VERTE, Benin

Small-scale family farmers with little land and limited financial resources can effectively maximise their productivity by adopting integrated production systems. In Benin, one such system combines catfish farming in tanks, rearing poultry (chickens or guinea fowl) and growing market vegetables. Supported by the NGO, Empreinte Verte, above ground fish tanks were established on farming plots between 100m² to 0.5 ha. The production cycle of fish is six months (50 fries per m²), and every 10 days, 5m³ of water (containing urea) from the tank is extracted to irrigate crops such as eggplant, amaranth, lettuce and carrots. Poultry farming (50 chicken flocks) can produce up to 20-25 kg of manure per week, which is used as organic manure for the vegetables. Diversified production limits risk exposure by 70% and productivity is increased by around 40% over conventional farming.

40) Beekeeper to beekeeper business model

Robert Kajobe¹, Professor Jacob Godfrey Agea², Cosmas Butele³, Dickson Biryomumaisho⁴

¹ Rwebitaba Zonal Agricultural Research and Development Institute, Uganda

² Makerere University, Uganda

³ Ministry of Agriculture Animal Industry and Fisheries, Uganda

⁴ The Uganda National Apiculture Development Organisation, Uganda

Whilst apiculture provides potential for income generation, and sustainable use of forest resources, beekeeping in Uganda faces constraints in production, packaging and marketing. Since 2005, Uganda has been able to export honey to the EU but this potential has not yet been fully realised. To expand marketing opportunities for producers, the Uganda Honey Trade Project created Beekeeper Learning and Collection Centre Managers. Managers were selected from within the community and trained to provide technical and marketing advice to beekeepers (10), who then

trained three more beekeepers each (30 in total) in improved apiary management and marketing. Contacts were made with buyers and honey was collected, bulked and sold to the centre. KABECOS, a beekeepers' cooperative used to buy 200 kg honey per year but within three years, this had increased to 14,000 kg. With the increased income, beekeepers are motivated to invest in more beehives. The bee colonies also provide vital pollination services for agricultural crops.