



# NO MORE FOOD TO WASTE

GLOBAL ACTION TO STOP FOOD LOSSES AND FOOD WASTE





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# Foreword



Food loss and waste is a moral issue of global scale.

If only one-fourth of the food lost or wasted globally was consumed it would be sufficient to feed 870 million people – feeding nearly all who go to bed hungry every night -12% of the world's

current population.<sup>1</sup> Food loss and waste drives up the price of food.<sup>2</sup> Reducing food loss and waste is a key strategy towards ensuring food security for a projected 9 billion people in 2050.

Food loss and waste has a negative impact on already scarce natural resources. Around 30% of available agricultural land is used to produce food that goes uneaten; three times the volume of Lake Geneva in terms of water use is lost.<sup>3</sup> And food loss and waste is contributing to climate change more than most of the world's countries.

So it is clear tackling food loss and waste presents an enormous challenge to society. What needs to be done?

First, we need to measure. Then we need to successfully introduce prevention and reduction programs and policies. We must capitalize on the strengths of all stakeholders across the supply chain and forge partnerships among the private sector, research institutions, civil society and governments.

During the next four days, we will learn from best practices, to build on them for research and development, technological and social innovation, and to foster innovative ways of financing.

This is a year of opportunity – to incorporate food loss and waste into agreements on climate change and sustainable development; COP21 and the Post-2015 Development Agenda and beyond. We know the outcome we want: a world in which everyone is able to sustainably feed themselves. The challenge is to keep looking for new ways to form an ambitious action oriented agenda that integrates food loss and waste. We must establish cross-sectoral alliances and concrete commitments to reduce food loss and waste by 2030.

We have No More Food to Waste.

## **Sharon Dijksma – Conference Chair**

Minister for Agriculture,  
Government of The Netherlands

16 June 2015  
The Hague

Food loss is mainly caused by the poor functioning of the production and distribution of the supply chain and/or the institutional and legal framework.

Food waste refers to the removal of food from the overall supply that is fit for consumption, or which has been spoiled or expired, mainly due to economic behavior, poor stock management or neglect.<sup>4</sup>

## Food loss and waste

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**ALMOST A BILLION PEOPLE**

are going hungry, while we lose or waste

**1/3 OF THE FOOD WE PRODUCE.**



Source: FAO, 2013

Credit: Figure courtesy CCAFS-CGIAR ([ccafs.cgiar.org/bigfacts](http://ccafs.cgiar.org/bigfacts))



# The Scope of the Challenge

Worldwide, food loss and waste impede food security and fuel climate change and must be addressed to advance a sustainable development agenda. To meet the global food demand of a projected 9 billion people in 2050, it is estimated that 60 percent more food is needed.<sup>5</sup> When approximately one-third of all food produced for human consumption is either lost or wasted, reducing food loss and waste can efficiently and economically help close the hunger gap.<sup>6</sup> Less food loss and waste leads to more efficiency, more economic productivity and reductions in emissions of greenhouse gases that contribute to climate change. Both post-harvest loss of agricultural commodities and food waste leads to wastage of land, water, and energy resources used up in the production process.

To achieve global food security while protecting our natural resources, we must improve the sustainability of the food system.

We have an idea of the magnitude of food loss and waste – we know that the land area used to produce food that is not eaten is approximately equivalent to the size of China.<sup>7</sup> Reducing losses alleviates demands on the production system while helping to maintain food stocks in uncertain harvest conditions.<sup>8</sup> By one estimate, postharvest grain losses in sub-Saharan Africa alone could feed 48 million people and are valued at around US\$4 billion a year.<sup>9</sup> In industrialized nations, retailers and consumers dispose of around 300 million tonnes of food.<sup>10</sup>





Photo credit: CCAFS

The conference No More Food to Waste will lay bare the link between food loss and waste, food security, climate change, and sustainable development. An ambitious agenda will identify points of leverage across the Zero Hunger Challenge, the road through Paris and the Sustainable Development Goals, integrating food loss and waste into the international initiatives that will shape our future.

The challenge is clear. It is time for action.

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The total amount of food wasted by consumers in industrialized countries is nearly as high as the total net food production in sub-Saharan Africa.<sup>11</sup>

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People in Europe and North America waste 95–115kg of food each year, compared with only 6–11kg a year for people in Sub-Saharan Africa and South Asia.<sup>12</sup>

.....

If food loss and waste were a country, it would rank as the third emitter of CO<sub>2</sub> in the world, even without accounting for greenhouse gas emissions from land use change.<sup>13</sup>

.....

Food loss and waste claims 20% of freshwater consumption and uses 30% of the world's agricultural land area.<sup>14</sup>

.....

# Solutions and Opportunities

## Innovative Investment

Food loss and waste are a consequence of the way the food supply chain functions: culturally, economically, and technically. In low-income countries, where loss occurs in storage, transport and processing, investments are required to develop the value chain. Efficiently reducing loss leads to greater income for farmers and economic gains that allow for future investment. In high-income countries, loss is at the retailer and consumer levels and requires distinct strategies to mitigate waste. There are a number of ongoing public, and private-public partnerships tackling food waste at the country level demonstrating a willingness to address the issue.

Country level commitments on food loss and waste create an excellent opportunity to embed timed and clearly identified targets, strategies and programs into National Investment plans which guide both domestic and external investors, paving the way for any private/public initiatives in this domain. Self-financing can also play an important role in reducing food waste. The benefits from reduced waste can be sufficiently significant to cover the costs of investments in reduction without much need for additional financing. There is a clear opportunity for public-private partnerships.

Strategies to reduce food loss and waste should be aligned with climate-smart agriculture practices, which seeks to increase sustainable productivity, strengthen farmers' resilience, reduce agriculture's greenhouse gas emissions and increase carbon sequestration.<sup>15</sup> Given food loss and waste's problematic contribution to climate change, initiatives to reduce food loss and

waste may be eligible for complementary funding from multilateral funds designed for combatting climate change, including the Green Climate Fund and the Global Environment Facility. Partners in the Global Forum on Agricultural Research for Development (GFAR) are currently promoting the building of an Agricultural Innovation and Enterprise Facility, that could be managed by IFAD, as requested by the Meeting of the G20 Chief Scientists.<sup>16</sup> The need for country commitment, leadership and substantial national investment in these domains is crucial because all these multilateral Investment schemes are (or will be) country driven and responsive to national demands.

At present, food waste costs over US\$400 billion per year; that figure is projected to rise up to US\$600 billion within 15 years. In 2030, reducing consumer food waste by 20-25% could save around US\$120-300 billion annually.<sup>17</sup> For food and agribusiness companies, improving efficiency in harvesting and post-harvest handling, packaging and monitoring freshness could save over US\$10 billion a year.<sup>18</sup>

The business case for reducing food loss and waste is clear and will require strong leadership by the private sector to achieve both innovation and diffusion at scale. At the United Nations Climate Summit 2014 many of the largest global food companies made a commitment to partner with farmers to reduce emissions and build resilience to climate change.<sup>19</sup> Reducing food loss and waste must be part of the strategy.

Food loss and waste costs food producers some US\$750 billion annually.<sup>20</sup>

“If a food retailer wants to monitor freshness, the wholesaler, packager and perhaps even grower need to invest in the relevant technology. The question is whether or not they are willing to invest, since a reduction in food waste may result in the retailer buying less. In addition, the wholesaler may have an ad hoc relationship with the retailer and will depend on a different retailer the following year. Overcoming this ‘split incentive’, where costs and benefits fall to different parties, requires an innovative approach to supply chain partnerships and business models.”<sup>21</sup>

**Rabobank**

## Closing the Data Gap

While the enormity of food loss and waste is generally accepted, more research is needed at every stage of the supply chain – to understand the drivers of food loss and waste, the intersection of the two and their impacts. If effective action is to be taken, understanding where, how much and why food is being lost and wasted is the first place to start. Measuring food loss and waste is essential in order to understand what works and track progress towards reduction goals. Lack of reliable primary data is a major hurdle for quantification of food loss, especially in developing countries. There are a number of recent initiatives to broadcast measurement standards; collaboration across the supply chain is critical to

establishing agreed metrics, minimizing confusion and duplicative efforts, and generating support for monitoring and evaluation.

The Food Supply Chain Case Studies Methodology, led by the Food and Agriculture Organization of the United Nations (FAO) SAVE FOOD initiative aims, to collect primary and empirical data on the causes of food losses in developing countries.<sup>22</sup> Global Food Loss Index (GFLI), developed by the Statistics Division of FAO, models country and regional food loss using food balance sheets to produce a map of caloric loss in percentage of supply. The availability of country level statistics on food losses varies greatly among regions, and in general such data are far from sufficient.<sup>23</sup> The development of a *Food Loss and Waste Protocol Accounting and Reporting Standard (FLW standard)* was initiated by the World Resources Institute (WRI) together with United Nations Environment Programme (UNEP), FAO and partners in 2013, in order to provide a global reference in reporting food loss and waste data.<sup>24</sup> It does not impose a definition of food loss or waste, and can be used by both countries and companies to measure any fraction of waste within the food supply chain.

“If we reduce food loss and waste to zero it would give us additional food to feed 2 billion people... We already know a lot about how to cut food losses. But we need to invest more in a number of areas, especially in infrastructure such as roads and cold chains, but also improving market information. We also need to close the gap between the knowledge we have and what farmers and other actors in the food chain are actually doing. When we do that, we see good results.”

**FAO Director-General José Graziano da Silva<sup>25</sup>**



“Improved connectivity of agricultural producers to each other and to markets and consumers can facilitate a reduction in food loss by optimizing production and distribution.”<sup>26</sup>

**Sir John Beddington, UK Government Chief Scientific Adviser 2008-2013**

## Creating an Enabling Environment

The transition to sustainable food systems must be backed by the right set of policies at multiple levels – international, regional, and national. Policy-making should account for the diversity of regions and contributions from international organizations, civil society organizations, and the private sector. It must enable investments in infrastructure, transportation, food industries and packaging industries. Both the public and private sector have a role to play in achieving this by creating an enabling environment. All efforts to reduce food loss and waste must pay special attention to the central role of small-scale farmers, women farmers and youth in growing the food we rely on. Select examples evidence the breadth of policies and programs in place around the world:

### Private sector initiatives

The International Food Waste Coalition is a multi-stakeholder initiative in the food-service industry to tackle food waste in the value chain. Sodexo, a member of the coalition, leads the Stop Wasting Food Campaign among colleges and universities.<sup>27</sup> The Food Waste Reduction Alliance, a project by the Food Marketing Institute, the Grocery Manufacturers Association and the National Restaurant Association, represents over 30 major companies working to divert waste for redistribution.<sup>28</sup> The Consumer Goods Forum, together with the World Resources Institute,

UNEP, FAO, World Business Council for Sustainable Development, European Commission, and Waste & Resources Action Programme, have joined together to support a global protocol to coherently measure food loss and waste throughout the food chain.<sup>29</sup> Nestlé has helped steer the development of the protocol and set a goal to achieve zero waste for disposal by 2020.<sup>30</sup>

### Civil Society

CARE International is working with small-holder farmers to increase food security by reducing post-harvest loss through more efficient harvesting, better storage and processing.<sup>31</sup> They are addressing post-harvest loss from insects, rodents, fungus and moisture through household technologies. The Caribbean Farmers Network (CaFAN) is working with farmers to identify critical data gaps on post-harvest loss and keep up-to-date with new technologies to reduce loss.<sup>32</sup>

The Clean your plate campaign, an initiative that began with members dropping leaflets in restaurants and took off on social media, is now endorsed by the Chinese government.<sup>33</sup> Disco Soup, a movement initiated in Germany to raise awareness around food waste, prepare meals, and bring people together to celebrate, is now active around the world. A recent Disco Sopa event in Chile recovered 200 kg of fruits and vegetables.<sup>34</sup> Feedback, an environmental organization working to reduce food loss and waste, hosts Feeding 5000 events – a 2015 earth day event fed 5,000 people – a gleaning network and a campaign to allow feeding catering wastes to pigs.<sup>35</sup>



Photo credit: CCAFS



Photo credit: Olive Thiong'o (CCAFS)

### National Initiatives

In May, 2015 the French Parliament passed a law mandating supermarkets above 400 square meters to donate unsold food products to non-profits or for animal feed; it includes an awareness program for schools and businesses. Belgium passed a similar law in 2013.<sup>36</sup> At present, there is a proposal before the Brazilian congress to establish a National Policy on Food Waste.<sup>37</sup> In Argentina, a national program to reduce food loss and waste is in development.<sup>38</sup>

### Regional Initiatives

The Malabo Declaration, signed in June 2014 by African Heads of State with The New Partnership for Africa's Development (NEPAD) on accelerated agricultural growth and transformation for shared prosperity and improved livelihoods, includes a concrete target to halve current levels of post-harvest loss by the year 2025.<sup>39</sup> The 2014 Asia-Pacific Economic Cooperation (APEC) Action Plan for Reducing Food Loss and Waste launched, in Beijing, aims to enhance food supply efficiency and provide more affordable food for lower income consumers.<sup>40</sup> The 2014 European Commission's Communication 'Towards a circular economy: a zero waste programme for Europe', and the related legislative proposal to review recycling and other waste targets put forward objectives for food waste reduction in the EU.<sup>41</sup> It included a proposal for Member States to develop national food waste prevention strategies with the goal of reducing food waste by at least 30% by 2025.<sup>42</sup> In January 2015, the Community of Latin American and Caribbean States (CELAC) approved the CELAC Action Plan for Food and Nutrition Security and the Eradication of Hunger



Photo credit: Dharmi Parthasarathy/CCAFS





Photo credit: CCAFS

2025.<sup>43</sup> Food loss and waste reduction is one of the lines of action and includes several proposals for implementation. A network of regional experts on food loss and waste was established in 2014 to support the implementation of cross-sector collaborative reduction strategies.

### Global Initiatives

The Committee on World Food Security (CFS 41), based on its High Level Panel of Experts on Food Security and Nutrition, recommended the “food use-not-waste” hierarchy: prevention, recovery and redistribution of safe and nutritious food to people.<sup>44</sup> The UN will target food loss and waste reduction as part of its post-2015 development agenda, aiming to halve per capita global food waste at retail and consumer levels and to reduce food loss and waste along production and supply chains, including post-harvest loss, by 2030.<sup>45</sup> The Sustainable Food Systems Programme (SFSP), initiated by FAO and UNEP, is currently in its final phase of development, and will focus on sustainable supply chain management and the prevention of food loss and waste and sustainable consumption.<sup>46</sup> The nascent Global Alliance on Climate Smart Agriculture (GACSA), launched at the UN Secretary General’s Climate Summit in September 2014, offers a plum opportunity to engage with decision makers and a broad coalition of actors at the nexus of climate change, agriculture, and food security.<sup>47</sup>

“There is a need to harmonize, across commodities and different stages of the supply chain, the measurement frameworks for food loss and waste, to allow for structural, reliable and comparable data... within countries but also at global level, to facilitate exchanges of information and experiences. The use of standardized criteria is key to measuring food loss and waste and to assess where to take action to reduce food loss and waste. These criteria must be scientifically supported and validated by stakeholders in order to reconcile the different situations regionally and over time... transparency can be encouraged by policy and be organized in collaboration with statistical offices (to harmonize the reporting of data), the private sector (along food chains, traders, etc.), organizations (to be able to collect detailed information about specific commodities and supply chains) and academics (to guarantee independent and transparent processes). Companies and private sector organizations need to be involved in this process.”<sup>48</sup>

**High Level Panel of Experts on food security and nutrition**



# Integrating Solutions— A Food System Approach

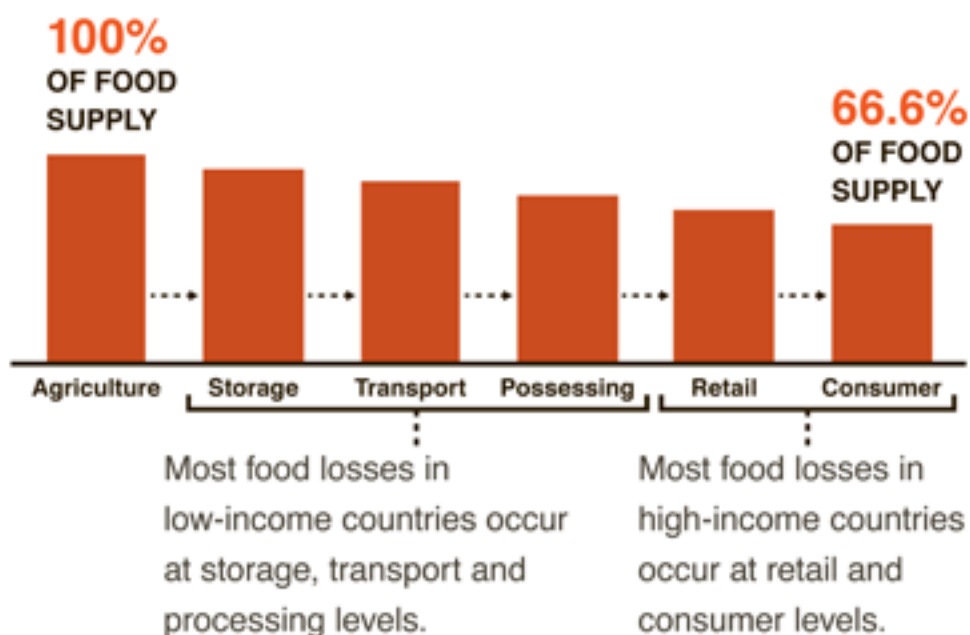
Mitigating food loss and waste demands systemic action.<sup>49</sup> We must shift to sustainable food systems – producing and consuming with less environmental impact. Comprehensive strategies to end hunger and mitigate climate change need also address food waste and loss. Doing so involves reimagining production, access, and sustainability at all levels in the food system; it requires partnerships and collaborative action throughout the supply chain.

The impacts of food loss and waste – and as such prospective solutions – cut across food security, climate change and sustainable development. Linking these disparate agendas will bolster investment in reducing food loss and waste and manifest their ascent among global priorities.

“We note with great concern the significant extent of food loss and waste throughout food value chains and their negative consequences for food security, nutrition, use of natural resources and the environment. We highlight this as a global problem of enormous economic, environmental and societal significance.”<sup>50</sup>

**G20 Agricultural Ministers**

## Supply chain emissions



Source: FAO, 2013

Credit: Figure courtesy CCAFS-CGIAR (ccafs.cgiar.org/bigfacts)

# Case Studies

## A Loss-reducing Rice Thresher In Six West African Countries<sup>51</sup>

Without the right machinery, rice harvests have to be threshed by hand, and the gruelling labour of beating, trampling, sifting and cleaning the rice usually falls to women and children. Rice is damaged or lost in the process – or rots in the field if there aren't enough workers. In Senegal, manual threshing causes post-harvest losses of up to 35%.

Until recently, most farmers had no good alternative. There was just one type of small-scale threshing machine available, and it wasn't much more efficient than the ancient manual techniques. Enter a low-cost, high-efficiency thresher from Asia. Shipped to the Senegal River Valley in the mid-1990s through an international partnership between AfricaRice and the International Rice Research Institute, it became the prototype. Researchers from the Senegal River Valley National Development Agency and the Senegalese Institute of Agricultural Research, as well as local artisans, farmers' organizations and an agricultural machinery factory, adapted the technology and put it on the market. This demand-driven project was inspired by a survey of farmers' needs and developed by a coalition of local partners to ensure relevance.

The African thresher, known as ASI, can process 6 tonnes of rice per day – compared with one tonne for six manual labourers – and cleanly separates 99% of the grains. Farmers welcomed the new thresher because it replaced arduous work and yielded more and better product. Within 90 days of use, the economic benefits are more than double the US\$5000 cost of the technology. The machinery saves as much as one third of the rice harvest from being lost. In effect, it can boost the yield of usable rice by half. This cuts net greenhouse gases by requiring less energy and fertilizer per kilogram of rice delivered to the consumer.

ASI machines thresh over half of Senegal's rice and are spreading across West and Central Africa, with each country testing and adapting its own thresher to the local context. By 2005, over 400 machines were operating in six West African countries and the project is ongoing. AfricaRice is using the same model to develop further technologies such as a combine harvester.



Photo credit: S. Kilungu (CAAFS)

## Drying Fish Fast For Under US\$30 In India<sup>52</sup>

When fisherfolk neither sell their daily catch nor have the option of refrigeration, they regularly spread the fish out to dry in the sun. Sun-dried fish or prawns can lose most of their moisture within a day, but in the meantime they are exposed to weather, dust, insects, birds and animals. A solar dryer – often just a bamboo or wood frame covered in plastic or glass, with a couple of holes for air circulation – collects the sun's rays to increase the temperature and speed the drying while protecting the product from damage.

Solar dryers have been introduced in a number of countries, including Bangladesh, India, Indonesia, Rwanda, the Philippines and Papua New Guinea. According to research in Maharashtra, India, using a solar dryer improves the colour and texture of dehydrated prawns compared with traditional sun-drying. Better quality and less loss should add up to a higher market price for each catch. Other perishable products like fruit, vegetables, spices and medicinal plants can also be dried this way, often with similar benefits.

A team from the local College of Agricultural Engineering and Technology built and tested solar driers in Maharashtra. The solar fish dryers solved a problem that fishers care about: losing their product to pests or the elements. Cheap and easy to build, solar dryers are a pro-poor solution. In Maharashtra, simply running an electric dryer for 2 months costs about as much as building a solar dryer from scratch.

Sun-drying has always been an accessible method for processing fresh produce to stabilize its value. Solar dryers are an inexpensive upgrade: in Maharashtra, the materials to build a dryer cost less than US\$30 (INR 1700). The investment is affordable to local fisherfolk, with the payback period only 2.5 months. Unlike a mechanical dryer, solar dryers require no electricity or fuel and produce zero greenhouse gas emissions. More of the catch makes it to market, and fishers may obtain higher prices for a cleaner and more attractive product. Improved livelihoods increase resilience to all kinds of shocks. The enclosed drying frames might protect against unpredictable weather or climate-driven pest outbreaks while the zero-emissions solar dryers are a climate-friendly technology.



Photo credit: CCAFS



## Milking The Demand For Dairy In Kenya<sup>53</sup>

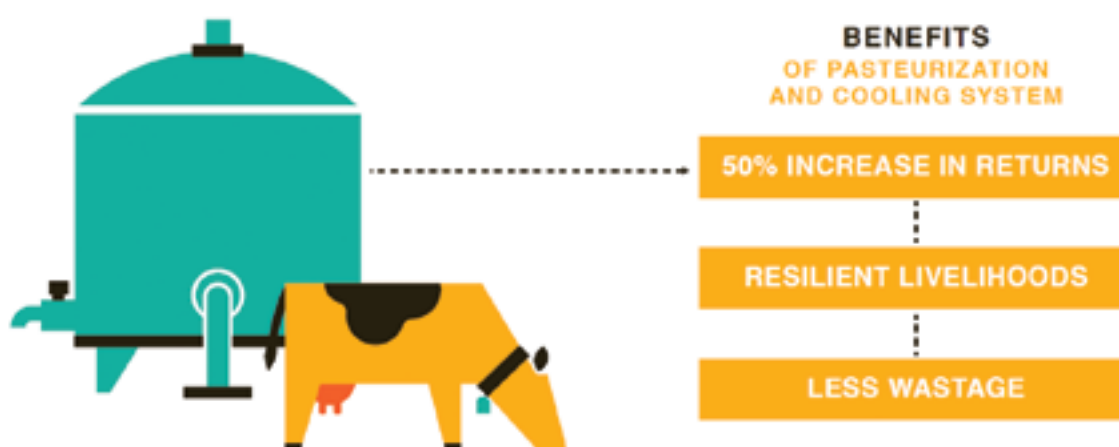
Fast-growing cities worldwide are thirsty for milk. Demand for milk and dairy products in developing countries is growing at 2.5% year on year, and small-scale farmers are already trying to increase production. One of their biggest challenges is processing and packaging. Milk bound for distant urban markets must be pasteurized, but an FAO study in Kenya found that heating and chilling equipment costs up to US\$50,000 – a dubious investment for dairy cooperatives dealing in small volumes. Instead, common practice is to boil milk in cans or other improvised boilers, which destroys nutrients and flavour. Worse, hand-packaging the boiled milk creates an opportunity for contamination and spoilage.

A better alternative is the low-cost technology known as Milk-Pro, originally developed in South Africa. FAO collaborated with the Kenyan government to test and assess Milk-Pro's benefits at the Naivasha Dairy Training Institute in Kenya, field testing it in 1998.

Milk-Pro is designed for rural conditions and low budgets. Whereas conventional pasteurizers require specialized electrical supplies, Milk-Pro runs on standard outlets or generators. Milk is sealed in plastic sachets for pasteurization and shipping, which prevents contamination and extends the refrigerated shelf life to 15 days. Cutting the number of steps for processing fresh milk also reduces the water used for cleaning equipment and containers. The system's price, just under US\$10,000, is within reach for a Kenyan dairy cooperative. The added value of higher-quality milk with less contamination and a longer shelf life can increase farmers' returns by up to 50%. When processing 750 litres of milk per day, the payback period is one year.

Proper processing moves dairy farmers up the value chain, boosting their profits. Milk-Pro improves general resilience through better livelihoods and cuts some of the water used by dairy farms. On the consumer side, it provides for an increasing supply of safe, affordable local dairy products. An FAO-UNDP project later introduced the system to Bangladesh and the project is ongoing.

### Low-cost pasteurization adds value for Kenya's dairy farmers



Credit: Figure courtesy CCAFS-CGIAF (ccafs.cgiar.org)

## An Innovative Fish Processing Technology In Senegal<sup>54</sup>

Men and women play distinct productive and social roles at different stages of the value chain – these roles are often underlying causes of food loss. The difficulties that women face in obtaining access to and benefits from resources, services, jobs and income-generation activities affect their productivity and efficiency in food production, and subsequently can lead to food loss. Meanwhile, food loss often results in economic loss and an increased work burden for women.

In 2013, women fish processors groups in Africa began working with the Thiaroye of Fish Processing (FTT) oven. Introduced through a collaborative framework between FAO and the National Training Center for Fisheries and Aquaculture Technicians (CNFTPA), a training institute in Senegal, FTT has a dual function – smoking and drying – as well as the storage of finished products.

Fish products smoked with the FTT are higher quality, with minimal risk of contamination. It allows for drying products irrespective of weather conditions, whereas in sun-drying operations high post-harvest loss occurs during rainy season and cloudy periods. Furthermore, FTT reduces the wood or coal/fish ratio for smoking and eases the use of agricultural by-products (corn or millet cobs, coconut shells or husks, etc.) and cooking gas. FTT provides a higher yield and marginal post-harvest loss, while increasing the return for the operator and confidence for the consumer. Fish processing activities, especially fish smoking, with this new oven has radically transformed the women’s working conditions, allowing a reduced work load, making them more competitive and consequently improving their livelihoods.

FAO is currently working towards the broad dissemination of the FTT, in line with the recently endorsed Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication, in particular its sections on value-chains, post-harvest and trade, and on gender equality.



Photo credit: FAO

## Analyzing The Banana Supply Chain In Kenya Leads To Partnerships And Investment<sup>55</sup>

In Kenya, there are two main banana products – dessert or fruit bananas and cooking or plantain bananas. They are an important source of income for farmers and cooking/plantain bananas are a basic staple food crop for many communities. Dessert/fruit bananas are a major fresh fruit consumed by all population groups. Small-scale farming dominates the banana sub-sector with an estimated 390,000 farmers growing bananas, the majority of whom are women.

The banana supply chain is inefficient; it is estimated that 95% of the bananas sold are grade two bananas, handled by street vendors and retailers in residential areas with 5% sold to supermarkets and other institutions. Estimates on annual post-harvest loss range from 18% to more than 50%, due to poor storage and handling; however, there is a general lack of data on loss at specific points in the value chain. Around 25% of banana loss is attributed to diseases, harvesting and post-harvest handling. Post-harvest loss is mainly experienced by traders as they transport horticultural produce from the farm level to their sales points.

In 2012, FAO's SAVE Food initiative began a study on the main causes of food loss and the technical and economic feasibility, social acceptability and environmental impact of measures to reduce food loss. The methodology is based on four ('S') elements: screening, survey, sampling and synthesis. Consultants followed the bananas during 4 weeks, from production site to final retail outlet, making direct observations and measurements, and discussing the causes and solutions for food loss with actors across the supply chain.

The critical loss points for dessert bananas occur at wholesale and retail level; the critical loss points for the plantain occur principally at retail level. In a one-day workshop with stakeholders from public and private sector the study results and proposed food loss reduction strategy were discussed and endorsed.

As a result of the opportunities identified, We Effect, a Swedish development corporation, in partnership with the Saba Saba Agribusiness Cooperative in Central Kenya, invested in ripening technology and the creation of value added products including banana chips and banana flour.



Photo credit: FAO



## Mapping The Production System Of Black Gram In India<sup>56</sup>

India is the largest producer and consumer of the pulse black gram (urad); it produces 70% of the world's black gram and black gram accounts for 10% of total pulse production in India. India is also the largest consumer of black gram.

Total Indian production is not sufficient to fulfill its domestic demand. Because of this, India is also the largest importer of this pulse; accordingly, understanding this crop's postharvest loss is an economic priority and important strategy to improve food security.

In 2012, the ADM Institute for the Prevention of Postharvest Loss at the University of Illinois, in partnership with the Rockefeller Foundation's Food Waste and Spoilage Initiative and MART, conducted a two month study on black gram loss in 11 villages across two states. Participatory rural appraisals were conducted with farmer groups to assess harvest and postharvest practices and loss across the supply chain, as well as with focus groups of farmer organizations and women's groups. In-depth interviews with key stakeholders focused on postharvest activities and practices.

Results showed that loss was principally dependent on weather conditions, labor availability, and market conditions. Farmers were well aware of loss and could provide approximate quantification. Maximum loss was identified during the harvest and drying stages, whether produced for sale or consumption. Commercial farmers also reported significant loss during the storage, grading, and repacking stages.

Farmers cultivating black gram for both commercial and non-commercial production would benefit from enhancing skills and knowledge of farmers in post harvest management; efficiency and effectiveness of existing equipment and devices through targeted research; and developing and promoting low-cost devices and storage facilities for use at farmer level.

With greater access to inputs and through supportive public policy, there is considerable opportunity to decrease postharvest loss. Grading schemes would differentiate quality and incentivize investment in improved technology, while extending responsibility beyond the farm level to traders who traffic in pulses.



Photo credit: University of Illinois, ADM

## Promoting Andean Crops Through Markets And Agribusiness Development<sup>57</sup>

In Latin American Andean communities, food loss affects the efficiency of the supply chain, influences the low levels of nutrition and poverty and damages biodiversity. Arracacha (*Arracacia xanthorrhiza*) is an Andean root once highly produced but now is endangered. It has a high nutritional value, is highly productive, resistant to harsh conditions and requires less farm maintenance than other regional crops.

Seeing the potential of Arracacha to reduce food loss and increase food security in the Andean region, the project “Promotion of Andean crops: Markets and Agribusiness Development for Arracacha” was implemented. The project was funded by IDRC – Canada and executed by CIP, CONDESAN and a group of Institutions from Ecuador, Peru and Bolivia. The aim of the project was to strengthen small farmers’ capacity to manage the supply chain and in doing so, reduce loss by introducing value-added processes while adding a source of local revenue. The work was executed in three rural communities from Bolivia, Peru and Ecuador with significant levels of poverty.

Harvest loss was reduced by installing germplasm conservation systems in each community. Over 30 varieties of arracacha were collected and the vegetative period of development for the root was reduced from 12 to 9 months by implementing a new technique in the management of seed (changing the root stalk cut). Overall, the percentage of seedlings that take root increased from 70 to 97%. With these changes, production almost tripled and post harvest loss was reduced from 15% to 8%. The higher production and use of new technologies to add value to local products, generated a higher net income for these families.

Finally, 96% of farmers adopted these technologies. We had 3 microbusiness developed on each community. Various products were inserted into local and national markets; chips in Peru, bakery based on arracacha in Ecuador, and slow food restaurants in Bolivia. Overall, not only the loss of arracacha was reduced but also its production and competitiveness improved throughout the agroindustrial chain for all these communities.



Photo credit: Maron Königstein (CIAT)

## Implementing A National Food Waste Prevention In South Africa<sup>58</sup>

Very little is known about food waste in developing countries, with much extrapolation from small case studies. Think Eat Save intends to collaborate with the retail and hospitality sectors, encouraging and supporting businesses in initiating quantification and strategic reduction activities; the first pilot is underway in South Africa.

UNEP, together with partners WRAP and FAO, published the Think Eat Save Guidance Version 1.0 on food waste prevention in 2014. The guidance is being piloted with the Government of South Africa in the development of a National Food Waste Prevention Programme. The pilot follows the Guidance methodology, covering mapping and measurement, policy development, and specific activities in households and the supply chain.

In its first year, it is defining the Programme framework, mapping and engaging stakeholders in Programme development, quantifying baseline food waste volumes, and initiating city level projects. The cities of Johannesburg and Tshwane will collaborate to develop a school food waste prevention project, integrating edible education, hands-on activities, cafeteria prevention plans, and workshops for parents. A second project will be led by Tshwane Fresh Produce Market, identifying key products that are going to waste and working with suppliers, market staff and customers, to make lasting reductions. An optimized system for food redistribution is being explored and existing barriers to food donation are being identified. The foundation of a voluntary agreement engaging South African food supply chain businesses in food waste reduction commitments is being developed. A Steering Committee is being convened to lead and oversee progress. Central to the Programme and its Steering Committee is the high-level commitment of many diverse government departments, with the Department of Trade and Industry leading together with the Department of Environmental Affairs, with support from the Departments of Agriculture, Water, Health, Education, and Performance, Monitoring and Evaluation. It is hoped that this pilot will be a model for joined-up policymaking enabling a more sustainable food system.

UNEP seeks to initiate two further pilot programmes in other regions this year, and is currently building regional capacity on food waste prevention in Latin America and Asia Pacific through workshops and Country Action Plans.



Photo credit: Dharini Parthasarathy/CCAFS



## Working Towards A 30% Reduction Of Food Waste In Europe<sup>59</sup>

An estimated 89 million tonnes of food goes to waste in EU each year. A healthy, sustainable and resource efficient food system is a major priority for the European Commission in the coming years.<sup>60</sup> Two EU research projects led by Wageningen UR, in a unique collaboration with the leading organizations across Europe, demonstrate the EU commitment to reduce food waste.

The EU-funded “Food use for social innovation by optimizing waste prevention strategies” (FUSIONS) project aims to enable, encourage, engage and support Europe to reduce food waste at all levels of the food supply chain. Established in 2012, partners began by defining food waste and developed a technical framework to monitor flows in the food system. Researchers suggested methods for standardizing the ways in which food waste data are collected, analyzed and utilized across the EU. They identified the drivers and causes of food waste and mechanisms for reducing it. A European multi-stakeholder platform was set up comprising more than 185 members from leading European organizations. Through the delivery of seven feasibility studies, FUSIONS demonstrates the impact of social innovation in preventing food waste, their up-scaling potential, and connection to the policy and governmental measures that are enabling change.

The EU funded project “Resource Efficient Food and dRink for the Entire Supply cHain” (REFRESH) starts July 2015. The project’s goal is to contribute towards the EU objectives of reducing food waste across Europe, reducing waste management costs, and maximizing the value from unavoidable food waste and packaging materials. REFRESH will respond to this need by developing a better understanding of business and consumer behavior in relation to waste generation, handling, re-use and by-product valorization, stressing the importance of optimizing the performance of the whole food system. REFRESH will adopt a systemic approach, and uses cutting edge science to enable action by all actors in the food supply chain. Due to the inherent complexity of modern food supply chains and many interrelated reasons why food might be wasted, a public-private collaboration is needed with the commitment of businesses, governments, scientists, public authorities and community-based organizations.



## Improving Resource Efficiency In The Netherlands<sup>61</sup>

Future food chains need to operate in synergy with the environment and society, whilst sustaining profitability, in order to meet the global need for sufficient, affordable and high-quality food. In the Netherlands public-private collaborative approaches and research and innovation projects are set up to achieve a more resource efficient and circular economy, building on a coordinated framework for action.

Pre-competitive research carried out by TI Food and Nutrition (TIFN) aims to support business in the development of a sustainable and resilient food system that ensures the availability of top quality nutrition. The TIFN projects, *Valorisation of raw materials and process efficiency* and *Reduction of spoilage in fresh and chilled products* reveal that collaboration and innovation can provide insights to improve resource efficiency and cost reduction. The Dutch Food Retail Association (CBL) and the Federation of Dutch Food and Grocery Manufacturers (FNLI) co-financed the research and its business members collaborate on these projects.

Both projects provide decision-support models for business partners throughout the chain, for instance, by creating opportunities for re-use of waste side streams or reducing loss in fresh produce. Immediate gains are possible through improving ordering procedures and supply-chain communication for, for example, fresh-cut salads, and in the application of vacuum skin-packaging for different fresh meats. With projects conducted in a 'safe' research environment, the impact of several realistic scenarios for improving resource efficiency can be calculated, analyzed and evaluated.

The project CARVE has been initiated (Across supply Chain Action program *Reduction of food waste, improved Valorisation & Resource Efficiency*), in partnership with the 'Sustainable Food Alliance'<sup>xx</sup> to validate the TIFN research findings.<sup>62</sup> Solutions and interventions are tested in a series of chain-wide projects. Pilots are now being conducted in collaboration with parties including Royal A-Ware, Sonneveld, Iglo, Arla, the Dutch Dairy Association (NZO) and the Dutch Food Retail Association (CBL). CARVE develops practical reference points to help companies in the agrifood industry organize their chain as efficiently as possible and capitalize on opportunities to optimize the value of raw materials and residual waste.



## Measuring Waste To Achieve Results In Food Service<sup>63</sup>

Food waste is standard in food service but industry leaders are taking steps to quantify and reduce loss, making the business case align with sustainable practices. Trim Trax is a simple initiative from the Compass Group UK & Ireland to target food waste which allows catering teams to measure how much waste is produced in their kitchens and take steps to reduce it. The initiative can minimize both the environmental and operational cost of food waste within a catering facility. It targets not only food waste, but also waste in the production process itself, through overproduction, or out-of-date stock.

Trim Trax works by giving each kitchen section their own Trim Trax food waste bin. Everything thrown away is recorded by volume, categorized and assigned a value each day. Results are then entered online. These are tracked and at the end of the week a report is generated, allowing them to easily monitor the waste reduction. The reports are accessible through an online portal; they help the catering team identify actions and set targets to reduce waste, to save money and to protect the environment. The best performers can be recognized and rewarded appropriately. Entering the information online enables the Corporate Responsibility team to measure waste across the whole company. It is a simple, high-impact tool to raise awareness of the issue of waste with our teams and embed the disciplines necessary to reduce it.

“As a leading foodservice and support services provider, Compass is continually looking at ways to further reduce its environmental impact and we fully support WRAP’s Hospitality and Foodservice Agreement. We have already made significant achievements across our business to increase recycling rates and reduce waste and we are committed to taking this further, working with our suppliers, clients and customers to meet the Agreement’s targets.”

**Ian Sarson, Group Managing Director, Compass Group UK & Ireland**



Photo credit: UNEP: Think Eat Save



## Reducing Banana Waste Through Partnership<sup>64</sup>

In an example of collaboration through the supply chain, the Midlands Co-operative and Fyffes, an importer and distributor of tropical produce, partnered to prevent banana waste between factory-in-gate and point of sale.

A trial process for bagging up loose bananas and put them up for sale as reduce-to-clear items, thereby reducing waste, was enacted in six stores. During the trials, stores completed data capture sheets to record banana waste. Employees were required to record data on different types of bananas (e.g. loose, small, value, and organic bananas) for three weeks, identifying the following criteria: amount wasted by weight/count; amount reduced by count; reason for banana waste; and total value of product.

The waste prevention work has accelerated plans to install banana hammock displays to reduce bruising from overfilling and optimize the banana display. To improve in-store practices, the team used posters and tested an intensive visit and coaching regime. This approach has since been modified and the Midlands Co-operative plan to use their new ‘Store Manager Buddy System,’ whereby the managers of the best banana waste prevention performing stores will ‘buddy up’ with the managers of the worst performing stores to share best practice. Fyffes will then coach the ‘Store Manager Buddy’ teams regarding in-store banana care. All stores will receive a banana care kit, developed by Fyffes.

The collaborative process revealed that 18kg boxes were too large for convenience stores. Introducing small 12kg banana boxes in 8 convenience stores reduced waste by 90% and CO<sub>2</sub> emissions by 56 tonnes every year. The smaller boxes minimized stock carry over at the end of the day’s trading and had the added benefit of maintaining product quality for the consumer. More frequent replenishment meant the fruit was fresher and less marked or bruised, which resulted in additional sales. Consumers benefited from a better quality product and less food was wasted in store.

All together, the various waste prevention solutions identified means for reducing banana waste by 83.7 tonnes per year –representing a reduction in the rate of waste as a proportion of sales of 50% – and saving 270 tonnes of CO<sub>2</sub>e per year (equivalent to the annual carbon footprint for two convenience stores). Both Midlands Co-operative and Fyffes benefited from breakthroughs achieved by working across functions, testing new strategies before making evidence based decisions, recording transferable lessons and expanding professional development opportunities.



# The Way Forward

This is a moment of opportunity, a year of opportunity.

We meet in the middle of Expo Milano 2015, where the theme is “feeding the planet, energy for life.”<sup>65</sup>

The United Nations theme for Expo Milano is the Zero Hunger Challenge – united for a sustainable world” – Zero loss and waste of food is one of the five elements of the Zero Hunger Challenge.<sup>66</sup>

In September, the post-2015 development agenda will be set at the UN Summit. Food loss and waste is relevant to all of the six themes for the interactive dialogues: ending poverty and hunger; tackling inequalities; empowering women and girls and leaving no one behind; fostering sustainable economic growth; transformation and promoting sustainable consumption and production; protecting our planet and combatting climate change; building effective, accountable and inclusive institutions to achieve sustainable development; delivering on a revitalized global partnership.<sup>67</sup> Goal 12.3 will read “By 2030 halve per capita global food waste at the retail and consumer level, and reduce food loss along production and supply chains, including post-harvest loss.”<sup>68</sup>

Also in September, UN Women and the People's Republic of China will host the Global Leaders' Meeting on Achieving Gender Equality and Women's Empowerment in honor of the 20th anniversary of the adoption of the Beijing Declaration and Platform for Action. Accounting for 60-80% of smallholder farmers in the developing world, women are essential to the campaign to reduce food loss and waste.<sup>69</sup>

In November, the 21st session of the Conference of the Parties to the UNFCCC will convene in Paris. For the first time, agriculture is included in the draft negotiating text under ADP – the Ad Hoc working group on the Durban Platform<sup>70</sup>. We need to build on this success. As national governments craft their Intended Nationally Determined Contributions, they can take the lead and make commitments to tackle food loss and waste. We must plan for the road through Paris and beyond.

2015 presents an opportunity to elevate the discourse around food loss and waste – an agenda that impacts the future will be set. We urge all stakeholders to team up for action. Working together we can ensure that food loss and waste initiatives are designed and implemented as part of the broad sustainable development strategy.

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