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Improving food security in Ukraine by replacing postharvest processes and upgrading local food storage to maintain produce quality and prevent food spoilage and loss

Known for ages as the “breadbasket of Europe,” Ukraine is ironically now on the roster of food insecure nations of the world. It is burdened by decisions and systems imposed under the former Soviet Union and impulsive choices made after independence. Collective farms liquidated with land shares disbursed to the workers and rural population. Social services tied to collective farms reduced or eliminated without adequate replacements. Rural poverty expanded in the midst of a demographic crisis. Subsistence farming on household plots became essential for survival. Private households succeeded in growing food to meet their needs, plus surpluses to sell. Most potatoes, vegetables and fruits grown in Ukraine come from private household plots. Despite the productivity, nearly half of this produce is never consumed because of food spoilage and loss. The quality and safety of food consumers buy is inconsistent and prices vary based on availability. The Ukrainian government wants stable prices for high quality food. Its solution is the adoption of international food safety standards and the construction of large regional cold storage warehouses. As principal growers of fresh produce, private households must adapt their agricultural activities to the new environment or be left behind growing food for themselves and whatever open market sales they can achieve. Improving food security in Ukraine requires private households to replace their postharvest processes and upgrade local food storage to ensure food quality and prevent food spoilage and loss.

Ukraine is blessed with fertile soil, temperate climate, abundant water, and a great geographic location. It is one of the largest countries in Europe with a total land area of 603,550 square kilometers with fifty-five percent being arable (Central Intelligence Agency). Representing one-third of the world total, nearly half of Ukraine’s agricultural land is *chernozem*; the richest, most fertile black soil (USAID 4). Its climate is temperate-continental, similar to Kansas, and subtropical, Mediterranean in the Crimea (USDA Foreign Agricultural Service). The country is well drained by hundreds of rivers, including the third longest in Europe, the Dnieper River. Located on the Black Sea, Ukraine has immediate access to world export markets. Ukraine has the natural elements for a successful agricultural economy.

Ukraine’s agricultural economy is in transition from government controlled agriculture to an open market. Agriculture and food processing account for twenty percent of GDP while employing about twenty-two percent of the population. Large independently controlled enterprises grow major crops for processing and export, such as wheat, barley, sunflowers, and sugar beets (USAID 13). Small scale farming includes private farmers and private households. Combined, their share of agricultural land grew to thirty-six percent by 2003 from only six percent in 1990. Collectively, they produce over two-thirds of total agricultural production in Ukraine (USAID 16). Their production stresses time consuming activities related to producing potatoes, vegetables, fruits, grapes, and livestock (Martylenko, Kobzev and Oginskiy 218). Private farmers manage farm operations with employees and/or family, and depend on the productivity of the land for income and subsistence. Private small farms operate on land owned or rented by the farmer and produce a diverse array of crops and livestock on typically less than one hundred hectares (ha) of land. By contrast, private households produce food on small plots primarily for their personal consumption and possible sale, while also being employed elsewhere, such as in factories, schools, and retail. They farm nearly one-third of all agricultural land (11 million ha) and contribute about two-thirds of total agricultural production (USAID 19). Ukrainian agriculture is moving toward an open market where farmers produce crops and livestock best suited to their farms’ size.

Rural Ukraine and private household farmers

For Ukraine's private households, subsistence farming means survival in an environment of declining rural areas and nominal help from local and national governments. Ukraine's rural areas' share of the population is now less than one-third of the total (Pantyley 36). Causes for the declining population are a low birth rate of about ten percent, a high mortality rate of nearly twenty percent, and out-migration of young and in-migration of elderly (Pantyley 37-47). In fact, one third of women in rural areas are over sixty years old (United Nations). A lack of income earning opportunities explains the persistent poverty. Since independence, rural areas lost seventy-five percent of industrial jobs, forty percent from collective farms, and a third of jobs in social services (Organization for Economic Co-operation and Development 127). Living standards in rural areas are low. Rural households own their home and the plot of land they farm. Yet, the quality of the physical home is likely to be low since more than half were built forty to sixty years ago, with about fifteen percent built before or during World War II (Organization for Economic Co-operation and Development). Rural dwellings are often poorly equipped with basic utilities. For instance, in 2004 about thirty-four percent had access to natural gas, twenty-one percent had a water connection, and 19.5 percent had a sewage system (Pantyley 49). The structure of income for rural households is about twenty twenty-five percent from wages as an employee in agriculture; forty to fifty percent from the household plot (subsistence farming and sales); and another fifteen to twenty-five percent from pensions (Organization for Economic Co-operation and Development 123).

A declining social service infrastructure and reduced access to social services paints a bleak picture of life in rural areas. Ukrainians are entitled to universal health care. Yet, the country has a complex system of health care that provides disproportionately poor access to medical services to rural areas and "those who are poor or socially vulnerable." A quarter of all doctors are primary care physicians as compared to less than two percent being general practitioners (United Nations). Over forty-three percent of villages have no medical centers. Plus, obstetric-gynecological centers located at the collective farms during the Soviet years closed, increasing births in homes and potential complications (Pantyley 50). Education is universal with a low student/teacher ratio (United Nations). Students are expected to attend school for fifteen years. Ukraine's literacy level is extremely high at 99.7 percent and comparable to other European countries.

Since most rural households are subsistence farmers, there is no stereotypical description that adequately describes them. On average, the number of people in a rural household is 2.89 according to the 2001 Ukrainian census. Heads of rural households and their spouses may have off-farm employment, which contributes up to twenty-eight percent of household cash income. Heads of rural households work approximately 8.6 hours a day, 295 days a year on the family plot. Whereas those individuals employed by a corporate farm work 7.6 hours a day, 301 days a year on the family plot; which is in addition to the hours worked on the corporate farm (Lerman, Sedik and Pugachev 7). Women work outside their homes while also taking care of their family, in-laws, and household activities. Rural women, as a rule, work up to eleven to twelve hours a day, which "causes their premature ageing and disorder or loss of their reproductive function" (Pantyley 50). The most vulnerable rural households include: an unemployed head of household; three or more elderly people or children; a single elderly male or single parent with children; or a single person or a household with no income earners. Diet includes typical Ukrainian foods like potatoes, vegetables, pork, poultry, milk, eggs, and bread. Rural households consume more milk, potatoes, and bread each month, and less meat, eggs, fish, and vegetable oil than the average Ukrainian household. They also eat thirty percent less fruit (Organization for Economic Co-operation and Development). Generally, Ukrainian's eat three meals: a light breakfast of bread with butter served with coffee or tea, and a cereal of steamed buckwheat, barley, or millet with milk; a main meal about midday consisting of a soup and a meat or poultry dish; and a third meal in the evening (Food in Every Country). When surveyed in 2005, about half of rural respondents indicated they "would like to see their children leave the village" and less than ten percent viewed farming as a future occupation for their children (Lerman, Sedik and Pugachev 9). Although differing in their family composition, private households struggle with the same challenge, surviving as subsistence farmers.

Private households produce the food they need and sell their surplus. Their plots are split about evenly between growing crops and livestock. They may sell up to twenty percent of their output, which varies based on individual plot size. Typically, sales are direct to consumers, rather than to distributors and processors (Lerman, Sedik and Pugachev 5). Production from these plots is mainly fruits and vegetables, milk, meat, and wool. Household plots produce over ninety-five percent of all potatoes, eighty-five percent of all vegetables, and over seventy-five percent of all fruits grown in Ukraine. They also generate about eighty percent of the milk, and seventy percent of the meat and wool. Sales are typically made to generate cash, not profit (USAID 21-24). From small plots, private households produce a tremendous amount of food for themselves and Ukraine.

Barriers to food security in Ukraine

Even though they generate nearly two-thirds of Ukraine's agricultural production, private households face many barriers to improving their productivity and making food available. Major barriers include obsolete farm equipment, limited transportation options, substandard on-farm storage, crop spoilage, low prices, and limited options for crops (USAID 19). These barriers contribute to the loss of edible food in the early phases of the food supply chain cycle. Estimates indicate food losses are thirty to thirty-five percent due to poor post-harvest handling and another ten percent lost along the supply chain. In 2011, industry experts and government officials acknowledged that over half of "fruits and vegetables harvested in Ukraine don't make it to consumers" because of Ukraine's under-developed cold storage logistics network and poor transportation infrastructure (Rachkevych 2011). In response, the government wants sixteen large cold storage warehouses built by 2015 to "provide Ukrainians with fresh fruit and vegetables throughout the year and stabilize prices" (Ministry of Agrarian Policy and Food of Ukraine). Even with large new warehouses, the private farmers and households that grow fruits and vegetables must still get their harvests to the warehouses in excellent condition to derive any benefit.

Although losing fifty percent of food destined for consumption appears extreme, it is not unique to Ukraine. Each year, an estimated one-third of food produced globally for human consumption is lost or wasted (Gustavsson, Cederberg and Sonesson v). Effective post-harvest processing and storage would immediately improve the quality and shelf life of food in Ukraine. Cutting in half the estimated loss of fruits and vegetables would increase available produce by twenty-five percent without changing annual production. Specifically, private households must prevent the causes of loss. During post-harvest, it means maintaining the quality and safety of the harvested fruit and vegetables while handling, storing, and transporting the produce to processors, distributors, and consumers (Gustavsson, Cederberg and Sonesson 2). Private households that adapt their production and post-harvest practices to meet food quality and safety standards will contribute produce to the new cold storage warehouses, gaining a better price, and improving the households' economic status.

Issues affecting private households' food security

Among the most important issues affecting private households and their ability to improve food security and economic wellbeing are property ownership, international food standards, and climate change. With respect to these areas of concern, private households will be reacting because they have minimal ability to influence them.

Land ownership must be secure, which is a prerequisite for obtaining credit. Despite the importance of land ownership, Ukrainian's are still working out the details twenty years after the demise of the Soviet Union. The Ukrainian government seems acutely aware of the problem and understands that food production is linked to solving land ownership issues (Interfax-Ukraine). Land sales have been banned since 2001. To resolve this issue, The World Bank is helping the Ukrainian government create a single land registry to record ownership of property through a national "land cadaster" (Organization for Economic Co-operation and Development).

Adoption of the EU food quality and safety standards poses a major challenge to private households who rely on sales into the food supply chain. Ukraine's standards, inherited from the Soviet Union, are clearly inadequate and must be upgraded if farm products are to be exported to European Union countries. Private households with existing relationships with food companies, such as dairies, may make the change to more stringent standards easier than others. Fruit and vegetable growers may find the change more difficult as the venue for selling their products moves from open markets to supermarkets. In 2009, eighty-five percent of Ukraine grown fruit and vegetables were sold in open markets by a wholesalers and individual middlemen while seventy percent of fruit and thirty percent of vegetables sold in Ukrainian supermarkets were imported. For this reason, the International Finance Corporation established the *Ukraine Fresh Fruit and Vegetable Supply Chain Development Project* to improve access to markets for Ukrainian fruit and vegetable growers. Investment in post-harvest handling and cold storage was one its objectives (International Finance Corporation).

Given its geographic size and location, Ukraine is susceptible to climate change. Its food security risk is moderate with some areas such as the Crimea facing a greater risk because of higher average temperatures and lower precipitation (Zoï Environment Network 14-18). In northern areas, climate change may prove beneficial to farmers by bringing longer growing seasons, more precipitation, and warmer winters. Such a change could even expand the range of crops that may grow. In southern areas, particularly the Crimea, droughts from rising temperatures and irregular rainfall during the growing season pose a significant challenge. Crimea already has limited water resources. Less rainfall will exacerbate the allocation of water among people, farming, and industry (Zoï Environment Network 42-45). As subsistence farmers, private households' food security is determined by availability of water, which may be in the form of rain or irrigation. Climate change will force many private households to adapt their farming to the new conditions.

Recommendations

Ukraine's private households are integral producers of food for domestic consumption. About two-thirds of Ukraine's food production is grown or raised on their small plots. They produce food for their households' own subsistence. Plus, many produce food for domestic consumption, selling directly to consumers or to wholesalers and distributors. Food security in Ukraine means preventing spoilage and improving the quality of food by improving postharvest processing and storage, particularly given the move to international food quality and safety standards. Failure of private households to adapt will relegate them to selling their fruit and vegetables in open air markets or to wholesalers and distributors at low harvest season prices. Fulfillment of the following recommendations would ensure edible food grown in Ukraine is available for local consumption longer at a lower, more stable cost and reward the growers with a better return on their investment.

Train and Educate. To improve the quality of food they produce, private household farmers should receive hands-on training and education on appropriate harvesting techniques, postharvest handling, and on-farm storage. Training information should support and reinforce requirements for supplying food to processors and distributors that meets international quality and safety standards.

Evaluate Onsite Storage. To determine whether current onsite storage is adequate, private household farmers should have their onsite storage facilities evaluated to determine whether they provide sufficient air circulation, ventilation, cooling, and cleanliness to prevent premature spoilage.

Rehabilitate, Replace, or Create Storage. To ensure the quality of food grown and provide a longer shelf-life, private household farmers should rehabilitate or replace deficient onsite storage facilities to provide at least the minimum air circulation, ventilation, cooling, and sanitary conditions required to optimally store the farm plot's production until either consumed or collected for offsite storage or sale. Subsistence farmers have a long history of onsite food storage and this recommendation's objective is to

leverage existing knowledge and improve farmers' storage facilities to prevent premature spoilage and extend the shelf-life of their harvests.

Foster Growth in Local Farmer Cooperatives. To leverage collective buying and selling power, private household farmers should become members in local farmer cooperatives focused on the production, harvesting, processing, storing, and marketing of fruits, vegetables, and other farm products. By joining together with other similarly situated subsistence farmers, private households can leverage their collective buying and production capacity to become attractive consumers of farm inputs and suppliers of food. Plus, they would more likely receive help to improve their harvesting, postharvest processing, and storage as members of farmer cooperatives than as individual households.

Grow Specialty Crops for Profit. Rather than growing only food for subsistence, private households should identify specialty crops to grow in collaboration with other farmers to improve earnings. By working closely with their fellow cooperative members, these farmers should have the ability to grow, harvest, process, and store high quality crops that provide an annual profit. Reliable providers of quality, safe food would also be in demand by food processors and distributors, creating additional opportunities.

There are many potential sources of assistance to implement these recommendations. Training, education, and onsite storage consultation could be provided by local member cooperatives, if they exist, food processors and distributors, and farm extension services sponsored by governmental agencies, nongovernmental organizations, and educational institutions. Fostering growth in local farmer cooperatives has been particularly successful as part of larger economic development projects.

Many projects have already demonstrated these recommendations can reduce food loss, improve food quality, and increase earnings. Examples include the current USAID funded project, AgroInvest, which is focused on strengthening cooperatives comprised of small and medium growers (AgroInvest Project); a Canadian sponsored project focused on increasing incomes of small produce growers in the Crimea (Mennonite Economic Development Associates (MEDA)); the Land O'Lakes USAID funded Agricultural Marketing Project focused on helping smallholder fruit and vegetable farmers develop cooperatives and meet international food quality standards (MacKillop 7-9); and the Heifer International projects focused on improving services cooperatives provide their members, including produce storage (Heifer Ukraine). The roadmap for helping private households improve production and their livelihoods has been developed over the past decade. It is now up to the Ukrainian government, international development agencies, and NGOs to step forward, invest the resources, and literally improve food security for both Ukraine's rural and urban populations by improving the quality of food grown, processed, stored and consumed.

Conclusion

An essential element of ending hunger in our lifetime is elimination of food loss and waste. Food has already been produced. No additional production effort is required. The challenge is protecting and preserving the food and its nutritional value as it moves from harvest to consumption. Nearly one-half of the fruits and vegetables grown in Ukraine are lost to spoilage and never get to consumers because of poor harvesting and postharvest handling techniques, and inadequate storage and transport services. Food security in Ukraine requires a stable supply of fruits and vegetables from local growers. Yet, these local growers are among the poorest segment in society, with limited resources to invest in their farming activities. To adequately supply their own subsistence needs as well as Ukrainian consumers' needs, private households must adapt to the new economic realities of food production. First, food processed and sold locally or exported will need to meet international quality and safety standards. Second, appropriate storage is critical for growers to receive the best price on their produce. Third, farmers need to grow fruits and vegetables demanded by consumers that bring the highest financial return. To improve food security by reducing food spoilage and waste, Ukraine's private household farmers must update and replace harvesting techniques, postharvest handling, and on-farm storage. Additionally, storage facilities

may need to be rehabilitated or replaced to provide adequate air circulation, ventilation, and cleanliness to prevent premature spoilage. Plus, in collaboration with other farmers, they should identify specialty crops to grow for the consumer market that will bring higher prices. Finally, private households need to formally join with other households in farmer cooperatives focused on the production, harvesting, processing, storing, and marketing of their fruits and vegetables. By emulating successful projects of the past decade, the government of Ukraine and international organizations can improve food security by providing financial and technical help to private households wanting to create or expand farm cooperatives focused on delivering quality, safe food meeting international food safety standards. Members of a cooperative will adopt better farming and postharvest handling practices, store their produce in appropriate facilities, and receive higher prices for the food they grow. Consumers benefit as well by receiving a better quality product. Improving food security in Ukraine starts with growers cutting food spoilage and loss by upgrading their farming and harvest practices, adopting effective postharvest handling processes, and storing their output in appropriate storage facilities. Ultimately, a secure food supply in Ukraine relies on farmers ensuring quality produce with extended shelf life by reducing spoilage in their postharvest handling processes and in their local storage facilities.

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