

International Engagement to Enhance Global Food Security: An Example in the Republic of Kosova

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Summary and Implications

Since 2011, personnel at Iowa State University (ISU) have been engaged with the southeastern European country of the Republic of Kosova (more commonly known as Kosovo). The purpose of this engagement has been to empower Kosovars to transform their agricultural sector so that this newly independent country can reduce its reliance on food imports and develop into a food secure nation.

Activities conducted under terms of the international memorandum of cooperation and understanding between ISU and the University of Prishtina (UP) are described in this report. Accomplishments resulting from this partnership include: 1) guest lectures by ISU faculty to UP veterinary students, 2) teaching of workshops and courses by ISU faculty to a global population of students enrolled in UP's International Summer University 2-week educational program, 3) on-farm consultations with Kosovo dairy farmers, 4) establishment of relationships with livestock-oriented associations in Kosovo, and 5) birth of the first-ever bovine embryo transfer calf in Kosovo. These and other on-going activities are heightening awareness of the need to improve agricultural productivity in Kosovo, particularly in the dairy sector, to stop the flow of euros out of the country for purchase of food that could and should be produced within Kosovo.

Introduction

By the year 2050 it is estimated that 9.7 billion people will inhabit planet earth. Food availability must nearly double between now and then to meet the nutritional needs of this rapidly growing human population. At the current rate of improvement in global agricultural productivity, an insufficient quantity of food will be available in the years ahead. The difference between the supply and demand of food is known as the "food gap". If the food gap is not closed, there will be widespread hunger and famine.

The mission of Iowa State University (as stated in the 2017-2022 strategic plan) is to "create, share, and apply knowledge to make Iowa and the world a better place". The vision of Iowa State University (ISU) - stated in the same strategic plan - is that "Iowa State University will lead the world in advancing the land-grant ideals of putting science, technology, and human creativity to work."

The land-grant university system in the United States is based on three prongs – teaching, research (discovery), and

extension (outreach). To lead the world in advancing these three land grant ideals, it is vitally important that expertise and technology existing at ISU be shared with others across the globe to equip them with the knowledge, skills, and abilities they need to help make the world a better place. Reducing hunger will clearly make the world a better place.

In summer of 2011, efforts were launched to establish a relationship between ISU and the Republic of Kosova – a country that had been identified by the United States Department of Agriculture (USDA) Foreign Agriculture Service (FAS) as a developing country with significant opportunity to increase agricultural productivity.

The Republic of Kosova and Its Agriculture

Located in southeastern Europe (in the Balkans), Kosovo is a relatively new country; in 2008 it declared independence from Serbia. It is not presently a part of the European Union. Kosovo is classified as a lower-middle income country with a gross national income (GNI) per capita of \$3,850 as of 2016 (World Bank Open Data, <https://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=XK>). (By comparison, the GNI per capita in the US is \$56,180). Kosovo's GNI per capita is lower than its neighboring countries of Montenegro, Serbia and Macedonia but is slightly higher than that of its other neighbor Albania. Annual growth rate of Kosovo's gross domestic product (GDP) has been steady over the past 8 years (average 3.21%), peaking at 4.62% in 2011 (World Bank Open Data, <https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=XK>).

Kosovo has a population of 1.8 million people, and 60% of its residents live in rural areas (Kosovo Ministry of Agriculture, Forestry, and Rural Development [MAFRD], 2016). Agriculture dominates as the primary source of income/economic activity in rural areas, and there is great potential for increased agricultural output to lift people out of poverty (MAFRD, 2016). The 2015 Agricultural Census revealed that 130,775 agricultural households in Kosovo generate 86,620 jobs (MAFRD, 2016). Given that Kosovo's economy is heavily reliant on agriculture, development of the agriculture sector is considered a top national priority. In 2016, the value added from agriculture was 13.4% of Kosovo's GDP (MAFRD, 2016).

Investing in agriculture will undoubtedly enhance Kosovo's economy, which is why government support of agriculture increased from 11 million EUR in 2010 to more than 59 million EUR in 2015 (Kerolli-Mustafa and Gjokaj, 2016). The revenue generated from current assets by the food industry/agribusinesses has increased gradually each year; peaking at 323 million EUR in 2015 (MAFRD, 2016). However, idle land is a major impediment to increased

agricultural productivity and income. From the 410,427 hectares (1.014 M acres) of land utilized for agriculture in Kosovo in 2015, 52.7% was in meadows or pastures. Although some grazing land is needed to support the cattle, sheep and goat industries, a major portion of these lands needs to be converted to more efficient and productive use. Less than ideal land use, combined with antiquated policies and practices due to large gaps in technical knowledge, leads to market deficiencies that severely impede Kosovo's economic development, as well as directly and negatively influence agricultural sustainability. Switching a large portion of these grazing lands to different agricultural use should lead to increased agricultural output, increased farm income and increased purchasing power for the rural communities, thereby enhancing economic growth.

Kosovo's dairy cattle sector is one characterized by significant opportunity for growth while at the same time hindered by policies. Milk production in Kosovo in 2015 was 282,534 tons. When compared with imports and consumption (MAFRD, 2016), this level of milk production equates to a self-sufficiency rate of 80.9%. Thus, abundant opportunity exists to increase milk production in Kosovo by nearly 20% simply to meet local consumer demand. Increasing milk production by 20% is not problematic with respect to milk processing because there are 40 milk processing companies in Kosovo (Kosovo Food and Veterinary Agency, 2016). Many of these processing plants are operating at only 30% of total processing capacity (Kosovo Milk Processors Association, 2017).

If Kosovars were to increase milk production by more than 20%, this would generate surplus milk that could not only eliminate the existing negative trade balance for milk and dairy products (-25.5 million EUR; Kosovo Agency of Statistics) but also create a positive trade balance with profits available for reinvestment in the dairy industry. It would also move Kosovo one step closer to becoming a food secure nation.

One of the challenges faced by Kosovo dairy farmers is higher production costs per unit of milk produced compared with their counterparts in the European Union (EU). One reason for the higher milk production costs in Kosovo is the comparatively low genetic merit of cattle being used for milk production. Average milk production per cow in Kosovo is 4,702 pounds (Bajrami, 2016) compared with 22,774 pounds per cow in the US in 2016. Historically, the basis of the Kosovo dairy cattle industry was the Simmental breed. The Simmental was favored because it is a dual purpose (meat and milk) breed. However, a significant increase in the genetic capacity of Kosovo dairy cattle for milk production could be realized by changing the genetic base of the dairy cattle industry from dual purpose breeds to breeds that are genetically superior for milk production (e.g., Holstein).

Another reason for the higher production costs per unit of milk produced in Kosovo compared with their EU counterparts is that the EU subsidizes milk production

which in turn lowers the cost of production for EU farmers. A third reason for the higher production costs per unit of milk produced in Kosovo is that Kosovo participates in the Central European Free Trade Agreement (CEFTA), which limits the ability of the Kosovo government to protect Kosovo dairy farmers through imposition of preferential tariffs. Kosovo dairy farmers are unable to compete price-wise with the imported milk; therefore, they are disadvantaged in the market.

Despite the lack of market competitiveness, it is interesting to note that Kosovo exported 800 tons of milk in 2015 – equivalent to 1.1% of the value of milk imports (MAFRD, 2016).

While the EU milk subsidies and free trade agreements seemingly hurt the Kosovo dairy industry at present, they do so in large part because Kosovo dairy farmers are not highly efficient milk producers. Among all livestock in Kosovo approximately 52% are dairy cattle, but average herd size is only 4 cows (Bajrami, 2016). Small herd size, coupled with low genetic capacity for milk production, makes it difficult for Kosovo dairy farmers to capitalize on economy of scale and to maintain economically viable dairy farms.

In an effort to enhance the economic competitiveness of Kosovo dairy farmers (until the dairy industry is able to transform itself), the government of Kosovo developed a national subsidy program in 2009. The subsidy per head scheme (SPHS) supports dairy farmers who own 5 to 50 dairy cows with direct payments of 70 EUR per head being made (Bajrami, 2016). In 2015, these SPHS payments totaled 3.8 million EUR - 71% more than in 2014 (MAFRD, 2016).

The dairy cattle industry in Kosovo is poised for growth; however, in order for this growth to occur a variety of changes is needed. These changes include (but are not limited to): 1) importation of dairy cattle genetics (semen, embryos, and/or live animals) with genetic capacity for high milk production, 2) improved feeding programs for dairy cattle with genetic capacity for high milk production, 3) enhanced health care for dairy cows with genetic capacity for high milk production, 4) farmer access to high quality educational materials pertaining to dairy cattle management, 5) establishment of a national standardized performance-based record keeping system for dairy cattle, and 6) development of an agricultural extension service that provides well-trained specialists to work side-by-side with dairy farmers on their own farms.

Embryo Transfer to Improve Milk Production

Embryo transfer is a reproductive technology designed to accelerate the rate of genetic improvement in traits such as milk production. Cows with outstanding performance for milk production can serve as "donors" of embryos that possess high genetic merit for milk production. Embryos collected from high genetic merit donor cows are transferred into the uterus of cows ("recipients") that do not have the genetic ability to produce large volumes of milk. By

allowing recipients to carry embryos with high genetic capacity for milk production (instead of their own embryos that possess average to below average genetic capacity for milk production), the ensuing generation of calves will have higher breeding values for milk production.

Embryo transfer technology for cattle was generally lacking in the Balkans until shortly after a faculty member from the University of Prishtina (UP) was awarded a United States Department of Agriculture (USDA) Foreign Agriculture Service (FAS) Borlaug Fellowship. This fellowship, named in honor of Iowa native and Nobel Peace Prize recipient Norman E. Borlaug (who is considered the father of the green revolution), promotes food security and economic growth by providing training and collaborative research opportunities to early- and mid-career scientists from developing countries. Through this fellowship program (<https://www.fas.usda.gov/programs/borlaug-fellowship-program>), faculty members at ISU provided a 10-week training program in bovine embryo transfer for a UP faculty member.

Approximately 6 months after completion of the training program at ISU, one of the ISU trainers conducted a follow-up visit in Kosovo to further aid in the transfer of the bovine embryo transfer technology to Kosovo. Based on observations of the dairy cattle industry at the time, it became clear that a change in the genetic make-up of the dairy cattle in Kosovo was needed to capitalize upon the rich but underutilized agricultural resources available there.

Following discussions with officials from UP, the Kosovo Food and Veterinary Agency (KFVA) and a private dairy farmer, the decision was made to seek approval to export to Kosovo frozen dairy cattle embryos from Holstein heifers at the ISU dairy farm. All necessary procedures were followed and all necessary paperwork completed to obtain an import permit from KFVA and an export permit (international health papers) from the USDA Animal Plant Health Inspection Service (APHIS).

The first-ever bovine embryo transfer calf produced in Kosovo (and likely in the Balkans) was born on July 6, 2015 (<http://www.news.iastate.edu/news/2015/09/03/kosovo>). Eight additional embryo transfer calves were born, although some did not live to reach sexual maturity. A presentation regarding this achievement was made at the 2017 International Embryo Transfer Society annual conference held in Austin, Texas, USA, and a peer-reviewed abstract of this work was published in the scientific journal *Reproduction, Fertility and Development* (29(1):157, <https://doi.org/10.1071/RDv29n1Ab99>). The embryo transfer calves have now reached sexual maturity and are being used for breeding purposes on a variety of dairy farms in Kosovo. This is an important first step in helping to transform the Kosovo dairy industry as well as in making progress toward attainment of food security in Kosovo.

Collaborative Research

The relationship formed between ISU and UP faculty members led to a collaborative research project focused on risk factors for the occurrence of displaced abomasum in Holstein dairy cattle in Kosovo. Displaced abomasum (DA) is a disorder where gas accumulates in the abomasum, and the dilated abomasum is displaced to the left or right side of the abdominal cavity. Risk factors that elevated the occurrence of DA included increased intake of concentrate feed after parturition, increased body condition score at calving, increased daily consumption of corn silage in the pre-partum transition period, and larger herd size. An increase in daily consumption of grass hay in the pre-partum transition period decreased the incidence of DA. Findings from this study have been utilized in the development of nutritional management protocols for Kosovo dairy farmers. Study results were published in the peer-reviewed scientific journal *Veterinarski Arhiv* (doi:10.24099/vet.arhiv.160216).

Educational Activities

For nearly two decades the University of Prishtina has hosted an International Summer University program (PISU). This 2-week educational program offers for-credit courses to students from across the globe. Faculty members from UP partner with professors from abroad to co-develop and co-teach courses at the baccalaureate and master's levels. In this competitive process, professors must vie for the opportunity to teach at PISU.

A course titled "Reproductive Technologies for Livestock Genetic Improvement" was taught at PISU in July of 2013. The focus of this course was on utilization of artificial insemination and embryo transfer technologies to facilitate genetic improvement of food-producing animals. In July of 2015, a workshop titled "Feeding the World in the Year 2050: The Potential Role of Kosovo and Other Balkan Nations" was taught at PISU. This workshop was attended by 63 PISU students and professors – the largest attendance at a PISU workshop to date.

A course titled "Global Food Security: Now and in the Year 2050" was one of only 11 courses taught at PISU in the summer of 2016. The focus of this course was to describe factors that affect global food security, to increase awareness of global hunger, and to stimulate students to consider changes in their habits that could reduce food waste.

In addition to these formal courses and workshops, ISU faculty also have given guest lectures to UP veterinary students, spoken to the Kosovo Veterinary Chamber, provided on-farm consultations pertaining to dairy cattle production and management, and forged relationships with the Kosovo Association of Milk Producers. These activities have been geared toward building of trusting relationships to facilitate change in the Kosovo agriculture sector.

In December 2016, ISU submitted an application to serve as a host institution for Kosovar students who were chosen (through an intensive, nation-wide competition) as a

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KAEF Graduate Fellow (KAEF denotes the Kosovo American Education Fund). Approximately 6 students from Kosovo are designated as KAEF Fellows each year, and KAEF Fellows study at a US higher education institute that will prepare them for helping to further develop Kosovo upon their return to their homeland. ISU is presently hosting its first-ever KAEF Fellow who was also designated as a David Gotaas Scholar (for the top KAEF Fellow from this year's cohort).

Iowa-Kosovo Relationship

Independent of any ISU activities, an important relationship between Kosovo and the State of Iowa has been formed. The Iowa National Guard played a significant role in post-war Kosovo not only as part of peace-keeping forces but also as trainers of Kosovars in military matters. This military-based relationship was expanded to the civilian world with hopes of aiding in development of this newly independent nation. Because of the deep and long-lasting relationship between Iowa and Kosovo, Kosovo was designated as one of Iowa's Sister States on July 7, 2013.

Public Television of Kosovo (RTK) prepared a news story about Iowa, Iowa State University and their involvement in Kosovo. The program aired October 3, 2016 in Kosovo. More recently, a documentary film about the Iowa-Kosovo relationship titled "With a Cup of Sugar" (<http://www.withacupofsugar.com/>) premiered October 21, 2017 in Des Moines.

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