AGRICULTURE TECHNOLOGY PROGRAM (AGTECH)

FINAL REPORT (SEPTEMBER 2010- FEBRUARY 2015)

APRIL 2015

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DISCLAIMER

The authors' views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

ACRONYMS

AI	Artificial Insemination
B2B	Business-to-Business
GOT	Government of Turkmenistan
HH	Household
IPM	Integrated Pest Management
LN	Liquid Nitrogen
LNG	Liquid Nitrogen Generator
LOI	Letter of Invitation
MFA	Ministry of Foreign Affairs of Turkmenistan
MoA	Ministry of Agriculture of Turkmenistan
PMEP	Project Monitoring & Evaluation Plan
PPE	Personal Protective Equipment
SLU	State Livestock Union
TOT	Training of Trainers
USG	United States Government
WTO	World Trade Organization

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EXECUTIVE SUMMARY

The Agriculture Technology Program for Turkmenistan (AgTech) was a 4.5 year (9/2010-2/2015), $4 million economic growth project, funded by the United States Agency for International Development (USAID) and implemented by Weidemann Associates, Inc., a Crown Agents USA company. In the USAID directive for AgTech, the goals were to increase and develop private enterprises, and improve productivity of private, small and household farms. The project provided support to farmers, veterinarians, agribusiness processors and input suppliers in Mary, Ahal, Lebap and Dashoguz velayats (regions) by increasing access to needed training and equipment and strengthening market linkages in the horticulture and dairy value chains. The project has two key components:

Component 1: The improvement of genetics, education and organization as a means of increasing the incomes of private agribusiness involved in livestock, and

Component 2: Skills building for private producers, processors and marketers of fruits and vegetables.

To accomplish these activities AgTech focused on three objectives:

1. Increase household incomes of producers who are direct beneficiaries by up to 50% by the end of the project.
2. Increase yields for crops and livestock produced by private farms by three times.
3. A 50% increase in area under cultivation for crops other than wheat and cotton.

Private agriculture production exists in Turkmenistan in three forms. First, a few farmers have received special long-term leases on newly cultivated desert lands. These lands require leveling and irrigation canals, making them very expensive to bring into production. The second form of private production is through the lease of former state livestock farms. These leases are generally on ten-year terms from the state. The third form is production on backyard plots. Leased lands can range in size from a few hectares to one thousand or more. In total, private production accounts for only a fraction of the land under agricultural production in the country.

Throughout Turkmenistan, villagers rely upon their backyards to produce food for consumption and barter. This situation arose as a result of the dominant role of the state in all aspects of the agricultural sector. Backyard production includes livestock as well as fruits and vegetables. To promote better practices and greater productivity in these backyard farms, the project concentrated on greenhouse construction and plant care and management with supplemental training. This training addressed soil testing, fertilizers and pesticide safe usage and application. These activities were then shared in new areas outside the original project focus, reaching a diverse group of farmers and geographic regions.

After meeting targets and realizing results for Component 1, AgTech shifted focus to address Component 2, which included introduction of new technology and practices, with an emphasis on supporting lead trainers and farmers in their respective velayats (regions). This component's results are generally strong. During the first 12 months of the project, the Ministry of Foreign Affairs of Turkmenistan (MFA) requested AgTech deliver seminars and trainings for staff in state institutions. Therefore, the project organized seminars and trainings on drip irrigation technologies, and forage crop development for government officials and university members in response to this request. The project also concentrated on disseminating knowledge and training on soil management, greenhouse management, pesticide application and Personal Protective Equipment (PPE) use to the greenhouse owners and household (HH) farmers. AgTech project partners and extension service agents were provided with booklets, developed by the project, for distribution that illustrated proper greenhouse construction, production and management techniques both in Russian and Turkmen languages.

As with fruit and vegetable production, most livestock is raised in backyard areas and on small plots leased from the government on former state livestock farms. Those households that raised livestock on backyard plots faced serious constraints. The number of livestock kept on private backyard plots generally ranges from two to ten animals. Because of the small size of these plots, there is limited land available to grow feed. The animals subsist on grazing grasses in the spring, summer, and fall and are primarily fed wheat straw during the winter. There are few opportunities for production increase, which in turn is a limiting factor in the development of a value chain for meat processing and dairy products.

To improve genetics, increase knowledge, and organization of private livestock producers, the project supported the creation of an artificial insemination (AI) supply chain through cooperation with the Turkmen State Livestock Association "Turkmenmallary" and veterinarians. Private livestock producers received training on how to raise improved breeds including topics such as diet, veterinary needs, animal farm management and marketing. Based on pilot activities in 2011 and 2012, AgTech demonstrated the positive impact of feed and herd management techniques on milk production. AI practices and training were successful and government support increased for project activities related to improving the genetics of local cattle breeds. By the end of 2013, the project opened three AI centers in Mary, Ahal, and Dashoguz for livestock breeding and training purposes.

In addition to increasing production and yields for private producers and farmers, the project conducted capacity development and supplemental activities to improve livestock sector. During 2013 and 2014, in an effort to improve the state livestock sector and increase the domestic production of livestock products, the Government of Turkmenistan (GOT) reorganized the former Turkmenmallary into a State Livestock Union (SLU). Building from the AgTech project activities in livestock genetics improvement and the opening of several bovine pilot AI Centers, similar centers were then created in each region of the country by the newly formed SLU. The creation of the State Breeding Service in 2013 - as a separate entity under the umbrella of the SLU and as part of the government - is now intended for improving animal genetics and livestock breeding activities in the country. To further support the GOT's efforts, AgTech completed forage crop management seminars, cattle management trainings, pesticide use trainings, international standards seminars, a Livestock Conference and continue to create, produce and disseminate booklets and multimedia of various subject matters. The project consistently advocated for increased accessibility to training and advertising tools with GOT to promote best practices and to encourage spreading of the project activities.

PERFORMANCE MONITORING AND EVALUATION PLAN (PMEP) TARGETS AND DEVIATIONS:

Performance Indicator	Performance Indicator Definition	Project Total Proposed	Project Total
50% increase in Households (HH) income	*Horticulture HHs and farms increasing income by 50%*	*2000*	*1242**
	Livestock HHs and farms increasing their income by 50%	*N/A*	*N/A***
Person hours of training completed in private sector productive capacity supported by USG assistance	*Number of hours of training completed by beneficiaries and training participant.,)*	*4600*	*6147*
Farmers, processors and others who have adopted new technologies or management practices	*Number of beneficiaries and training participants using new technologies or practices as introduced by the project.*	*1550*	*4215*
Quantity of produce grown and/or sold	*Farmers, buyers or labs are using AI, improved feed, vet services, greenhouses, drip irrigation, grading, post-harvest packaging practices training*	*Baseline + 300 %*	*Baseline +164% **
Value of produce sold to local and international markets	*USD value of goods in livestock and horticulture sector.*	*Baseline + 50%*	*Baseline +197%**
Number of agriculture-related firms benefiting directly from USG supported interventions.	*Number of input providers and buyers strengthened to provide farmers with necessary inputs.*	*520*	*95*
Number of greenhouses constructed or improved	*Number of total greenhouses constructed and/or renovated*	*300*	*355**
Land under improved technologies or management practices	*Indicates the number of hectares under greenhouse or livestock project activities (existing and new land).*	*1300*	*3.2**

* Due to limitation set by the MFA gathering information and travelling to the fields was impossible after May 2014. Therefore indicators given on the tables are taken from April and May months for Mary and Lebap regions, and April, May and June for Ahal region.

** Upon further evaluation in association with USAID, this is no longer a viable indicator. Due to the remote and sparse location of many livestock households, documenting all newborn calves remains one of the main challenges. Another major challenge is poor record keeping, if any, by farmers. Farmers scarcely record increases in milk yields and income as a result of increased use of AI services and improved breeds.

Throughout the life of the project, the tasks were adjusted to meet the GOT's and stakeholders' demands. However, due to the restrictions placed on the project, obtaining reliable monitoring data on activities became a challenge that could not be overcome. Despite this and other challenges, the project addressed all the tasks per contractual obligations and was able to perform supplemental activities outside of the original scope of work. A full description of the PMEP results by indicator is attached as an annex to this

report. In light of the GOT restrictions on travel and communicating with project partners, the project collected the information to the best of its abilities.

BACKGROUND AND PROJECT OVERVIEW

Background

The agricultural sector of Turkmenistan is composed of approximately 1,588,100 cultivated hectares, producing 18.9% of the GDP and providing employment opportunities for 48.6% of the labor force. Because of the dry climate, practically all agriculture is dependent on irrigation. The GOT remains heavily involved in the agricultural sector, owning almost all land and placing conditions on the issuance of land leases. Although the private sector share of agricultural production is small, both male and female farmers are able to run market-oriented farming, processing and trading operations. Livestock and milk production are among the few agricultural activities in Turkmenistan without direct government involvement. As a result, the subsector is growing and has potential to increase household income.

To improve milk and meat yields, increase farmer profitability and create opportunities for market-oriented behavior involving private processors, improved genetics are needed. Declining and poor genetics of cattle due to restrictive procedures for the provision of genetic material are inhibiting sufficient dairy and meat production. In January 2010, the Government passed regulations that enable the Turkmenmallary (currently SLU) to work on improving the genetics of livestock by importing pure breed parent animals, conducting artificial insemination and licensing artificial insemination activities.

In addition to milk and meat production, opportunities exist in fruit and vegetable production processing and marketing. Though exact numbers are unknown, it was found that many farmer-entrepreneurs export greenhouse-produced fruits and vegetables such as tomatoes, cucumbers and lemons to Russia and Kazakhstan, and also sell these crops to local markets throughout the country. The project found that small, private food processors are profitable. This private-sector, entrepreneurial behavior is increasingly possible, permitted and encouraged. The AgTech project was designed to support this sector's increasing demand for knowledge and market linkages.

Project Overview

The Agriculture Technology Program for Turkmenistan (AgTech) was a 4.5 year (9/2010-2/2015), $4 million economic growth project, funded by the United States Agency for International Development (USAID) and implemented by Weidemann Associates, Inc., a Crown Agents USA company. In the USAID directive for AgTech, the goals were to increase and develop private enterprises, and improve productivity of private, small and household farms. The project provided support to farmers, veterinarians, agribusiness processors and input suppliers in Mary, Ahal, Lebap and Dashoguz velayats (regions) by increasing access to needed training and equipment and strengthening market linkages in the horticulture and dairy value chains. The project has two key components:

Component 1: *The improvement of genetics, education and organization as a means of increasing the incomes of private agribusiness involved in livestock, and*

Component 2: *Skills building for private producers, processors and marketers of fruits and vegetables.*

To target USAID's overall objectives, AgTech responded to the needs in Turkmenistan by designing activities that could increase agricultural productivity and farmer incomes. The activities included

transferring technology and information to the local input providers, farmers, and households, all in support of strengthening the horticulture and livestock sectors, and focused on three primary objectives:

1. Household incomes of producers increase by 50 percent
2. Yields of crops and livestock produced by private farmers increase by 3 times
3. A 50 percent increase in areas for cultivation of crops other than wheat and cotton

The following summarizes the activities employed by the AgTech team to accomplish the component objectives.

Component 1: Improve Genetics, Education and Organization for Private Livestock Producers

To reach the project objectives under this component, AgTech focused on the following eight tasks:

Task 1: Establish pure breed parent herd
Task 2: Train veterinary service and regional private vets on AI, improved nutrition, veterinary care, and farm management
Task 3: Upgrade laboratory services
Task 4: Develop training curricula and Train-the-Trainers (TOT) for animal health workers
Task 5: Train farmers in AI techniques
Task 6: Train farmers in animal husbandry and agribusiness topics
Task 7: Establish feeding trials
Task 8: Facilitate the supply of improved feeds to private farmers

There are limited opportunities for increases in production for private livestock farmers in Turkmenistan, which is a limiting factor in the development of the value chain, specifically meat processing and dairy products. To improve genetics, knowledge, and organization for private livestock producers, the project supported the creation of an AI supply chain through cooperation with the Turkmenmallary and veterinarians. Private livestock producers received training in how to raise improved breeds addressing topics such as diet, veterinary needs, animal farm management and marketing. Drawing from results of pilot activities undertaken in 2011 and 2012, AgTech demonstrated the positive impact of feed and herd management techniques on milk production. AI practices and training received great success and increased government support, throughout the project, for AI activities related to improving the genetics of local cattle breeds.

During 2011 and 2012 AgTech opened three AI centers in Mary, Ahal, and Dashoguz velayats. The AI Center is considered a one-stop shop for livestock development needs, including formal training and education, equipment for conducting AI services, and laboratory equipment that can aid in the analysis of the success of attempted inseminations. Throughout the life of the project, AgTech has provided support to the AI Centers with marketing and promotional material, including AI booklets, leaflets regarding newly introduced breeds and contact numbers of all active AI specialists in their respective regions.

As well, AgTech procured supplies for the developing AI training centers, achieved progress with establishing a suitable feed mix and practical tools for the livestock component, and established working relationships with local entrepreneurs and international organizations working in the sector. AgTech staff worked closely with the Turkmenmallary to establish improved breeds of priority livestock of beef cattle and dairy cattle. The project worked with livestock experts to identify appropriate breeds for rural areas, developing criteria that included: productive capacity, feed conversion rate, climactic adaptability, cost, and availability. To ensure the sustainability, AgTech trained 65 local veterinarians and zoo technicians

on techniques to perform bovine AI and equipped them with AI toolkits to provide breeding services to a wide-ranging population of livestock owners across the country. These specialists are widely involved in providing AI services to farming households across the country.

Recognizing the high local demand for beef and dual purpose breeds and in 2013 and 2014, AgTech consulted with international breeding specialists to identify new breeds to introduce to the market. The project introduced new breeds that were based on high levels of adaptability and efficient milk production capabilities (i.e., less food intake for optimal dairy output). During Year 4, the AgTech procured 5,000 doses of bovine semen from World Wide Sires, including Jersey, Limousin and sexed female Brown Swiss and Holsteins, for AI extension training. By the end of the project, AgTech assisted local entrepreneurs to import a total of 17,000 doses of progeny tested high quality bovine semen directly from the leading U.S. suppliers.

In the final two years of the project, the livestock component activities focused on extension services at the farm and household level, to increase the number of beneficiary farmers. In 2014, AgTech completed forage crop management seminars, cattle management trainings, pesticide use trainings, international standards seminars, and a livestock conference including all state ministries and agencies related to the livestock sector. Throughout all these activities, AgTech pushed for increased accessibility to training and advertising tools to promote best practices and is now able to witness the project's widespread impact.

These AI activities have ensured that a total of around 2,000 livestock farms increasing their income by 50% and as well as increase farmers' milk yields by 50%. Results have shown that cows born using project supplied semen have a much higher average milk yield of 15.7L than the base average milk yield of 8L. Another result of project supported AI activities, 6,000 local cows were inseminated in 4,215 livestock households and livestock farms across the country by project-trained AI specialists using progeny-tested imported bull semen. About 2,000 healthy calves have been born across the country and a 90% increase in milk production has been recorded in livestock households that now have second-generation project calves.

AGTECH COMPONENT 1

HIGHLIGHTS:

- *90% increase in milk production in livestock households that now have second-generation project calves.*
- *AgTech trained 65 local veterinarians and zoo technicians on techniques to perform bovine artificial insemination (AI) and equipped them with AI toolkits to provide breeding services to a wide-ranging population of livestock owners across the country.*
- *Construction and reconstruction of 355 greenhouses across the country by vegetable producers who attended AgTech training seminars.*
- *Over 2,500 greenhouse producers and growers attended AgTech's training seminars and 1,242 of them have since increased their income by more than 50%.*
- *Project direct beneficiaries, i.e. greenhouse farmers, growers, livestock farmers and owners who participated in project activities, training sessions and/or used project consultations have increased their yields and production on average by 164%.*

Component 2: Introduce Successful Agribusiness Practices

To reach the project objectives under the second component, AgTech identified on the following six tasks:

Task 9: Identify greenhouse demonstration partners and establish demonstration agreement.
Task 10: Construct and ready demonstration greenhouse.
Task 11: Organize greenhouse demonstrations.

Task 12: Establish training materials to share.

Task 13: Training plan for private fruit and vegetable producers, and related value chain actors.

Task 14: Train fruit and vegetable producers and related value chain actors in agribusiness topics.

To improve agribusiness practices, AgTech implemented seminars greenhouse construction, plant care and management, and were supplemented by trainings on soil testing, fertilizers and pesticide safe usage and application. These activities have spread to new areas of Turkmenistan, reaching a diverse group of farmers and geographic regions. Training-of-Trainers (TOT) sessions were also held to build local capacity to continue offering the training. The project also facilitated the reconstruction of greenhouses throughout the region, and worked with an international seed supplier and local farmers to initiate seed trials necessary for determining the best seed products for Turkmen soil conditions.

AgTech helped build or renovate a total of 355 greenhouses, including construction of 10 new greenhouses and the successful start of tomato and cucumber production in the Serdar district of the Balkan Province. These production successes stemmed directly from the training seminars conducted using AgTech's demonstration greenhouse in the area. Prior to AgTech intervention, there were only two primitive greenhouses in the entire Serdar district, which was used for lemon growing. AgTech also produced and disseminated various brochures and booklets on best practices for greenhouse production of vegetables, including greenhouse construction, soil management, pest and disease control and the use of drip irrigation systems in greenhouses.

In 2014, the MFA requested that AgTech focus on delivering seminars and trainings for state institutions. Therefore, the project organized seminars and trainings on drip irrigation technologies and forage crop development. AgTech also focused on sharing knowledge and training on soil management, greenhouse management, pesticide application and Personal Protective Equipment (PPE) use to the greenhouse owners and household farmers. Over 2,500 greenhouse producers and growers attended AgTech's training seminars and 1,242 of them have since increased their income by more than 50%.

Supplementary Activities

In addition to the original objectives, AgTech also pursued supplementary activities to further work on the project objectives after close-out; including study tours to Ukraine and Turkey, trainings on World Trade Organization (WTO) accession and working with the USDA Cochran Fellowship Program.

Overall, the foundation set during the first two years and focus on training extension services and business development fostered continued growth in both vegetable crop and livestock production. In the end, direct beneficiaries of the USAID AgTech Project, i.e. greenhouse farmers, growers, livestock farmers and owners who participated in project activities, training sessions and/or used project consultations were able to report an increased in their yields and production.

PROJECT ACTIVITIES

COMPONENT 1: LIVESTOCK

AgTech focused on providing user-friendly herd management and AI training, using incentives to encourage the improvement of animal hygiene and nutritional intake. The incentives were provided through a private entrepreneurial business model comprised of training veterinarians and having them work with local partners as extension agents, which helped expand the quality of dairy cows and their milk production. The following sections summarize and highlight the activities carried out to improve the country's livestock sector.

SPOTLIGHT: AI TRAINING IN THE VELAYATS

In 2013, with the financial support of Chevron, and utilizing the new AI Center in Ahal, the project hired the CEO of Veterinarians Without Border, Dr. Thomas Graham, to conduct a two-week training program with a group of 13 of the most promising Turkmen AI specialists. This training was designed to help farmers and veterinarians incorporate best practices in heat detection and increase the AI technicians' pregnancy detection skills. The scope for the training was expanded to include not only reproduction, but also nutrition, calving assistance, young stock growth, physical examination, disease diagnostic methods, medical treatment, vaccination protocols, hoof trimming, and building/housing design recommendations. The goal is to lower the days needed to detect pregnancies from 90 days to 45 days. By doing so, farmers will realize a significant increase in farm productivity and breeding efficiency, which can ultimately result in more milk and meat production. Simultaneously, AI specialists with advanced heat detection and palpation skills will improve their success rates for conducting AI, strengthening the ability for AI technicians to have prosperous careers.

Among the highlights of the training was the use of a hand-held ultrasound tool to support the palpation of cows to determine pregnancies in the herd. Dr. Graham has indicated that this will take a good deal of time and practice.

Breeding Improvement: Breeding Supplies and AI Training

To increase farmers' milk production in Turkmenistan, AgTech reintroduced bovine AI to improve the genetics of local cows. Since the project beginning, AgTech worked with farmers to increase milk production and calving in heifers. The milk production increase in heifers was designed to demonstrate to small-holder farmers the economic benefits of AI and its best practices, which was expected to increase demand for AI services among rural households.

The activities began early on with an AI training of trainers. This 45 day hands-on training focused on the physical techniques to accurately test for an existing pregnancy, use of AI tools for impregnating cows, and testing to verify successful conception. The TOT used 700 doses of semen acquired from progeny-tested Holstein and Brown Swiss sires (350 doses of each) from the United States, and the 12 AI Kits procured by the project through World Wide Sires. During the TOT, the need for an AI Center to continue training and conducting AI services was identified.

By the end of the project's first year, 10 AI trainers completed the AI TOT, who then trained a total of 44 new technicians across the country by the close year two. Included in the TOT workshop and following the procurement of 2250 doses of bull semen (70% Brown Swiss and 30% Holstein), each AI trainer was given his allocation of genetic material, a 10L Dewar flask, and an AI kit to equip them with the proper tools needed to widen the impact of this activity. As a part of the ongoing effort to build sustainable activities in livestock development, the project encouraged each farmer to charge a certain amount for each insemination, thus building equity from which they can invest in their operations. Following their trainings, the last of which concluded in August 2014, each new technician was awarded an AI kits and the trainers have co-shared $300 each for 100 doses of semen from the next procurement.

In 2011, AI efforts began to bear fruit when the first calf, a male Holstein which was preceded by 206 calves born by the end of project year 2. It was a challenge for the project's AI technicians to track farmers in distant areas who have no means of communication, but of those that are known, 70% of inseminations were reported as successful. This success rate is acceptable for their corresponding level of experience, but there are few people who can determine pregnancy in cows in the country. Even the best technicians in the country still struggle to identify pregnancies through palpation, and of those who can, they can only positively identify bovine pregnancies after 80-90 days.

Taking these educational needs into consideration, the project began training AI technicians. By 2013,

AgTech had trained at least 55 technicians who provided direct support to over 1,500 successful artificial inseminations throughout the country. By project close, AgTech had trained 65 AI specialists across the country and provided them with necessary tools and genetic material, and provided assistance in advertising their services to livestock farmers to increase awareness of AI breeding options. AgTech also assisted local entrepreneurs to import about 17,000 doses of progeny tested high quality bovine semen directly from the leading US suppliers.

Aside from the Brown Swiss and Holstein breeds genetic material imported at the beginning of the project, AgTech introduced two new breeds in 2014, Jersey and Limousin. The Jersey breed was chosen based on its high levels of adaptability and efficient milk production capabilities (i.e., less food intake for optimal dairy output). Recognizing the demand for beef in the country and also that profitability among farmers is greater for beef, AgTech imported Limousine genetics. Additionally, to accelerate local milk production from the new cattle, AgTech procured and distributed female sexed semen on a cost-sharing basis to project participants.

To create an initial demand for beef breeds and female sexed semen, AgTech regularly provided each of the active AI specialists with a small amount of Limousin and sexed semen doses (15-20 doses) as compensation for their efforts in tracking and recording AI activities and new born calves in their respective regions. This practice also captured the full potential of the local AI service market for project trained AI specialists and further contributed to the popularity of AI services as a cattle breeding method among livestock farmers.

Figure 1 Farmer from Ahal with calf born with Project supplied AI materials.

By fall of 2014, the number of cows inseminated by project AI specialists reached 5,534. Additionally, AgTech recorded an almost double increase in milk production in about 25 households, and up to an 80-90% increase in some households can be found where second generations of calves have been born through use of AI. More than 5,000 livestock households used AI services and estimates of about 2,000 healthy calves were born across the country. The new generation of calves born out of AgTech AI training activities was captured on media,

SUSTAINABLE CHANGES: SLU REFORMS

At the end of the project, the GOT adopted a new law affecting large farms and veterinary activities. On November 9, 2014, a decree was passed in the Cabinet of Ministers (CabMin) that states livestock farms established are allowed to import goods and supplies related to their production. This includes the import of pharmaceutical and medical products for non-contagious diseases, veterinary vaccines, antiseptics, etc. as well as products for AI (frozen bull semen and embryos) without a requiring a special license. Livestock farms established on CabMin decree are those farms that are newly built by the members of the Union of Industrialists and Entrepreneurs (UIET). UIET's development plan is part of the GOT policy in delegating a bigger role to the private sector to diversify the domestic economy and these plans are approved by the CabMin.

It is very likely that AgTech project partners and stakeholders had some influence on the GOT's decision. This was one of the most substantial obstacles identified by farmers and AgTech beneficiaries were some of the main supporters who advocated to the SLU and Turkmenmallory to create changes in the licensing process. As a result, the paper burden and licensing requirements for larger livestock farms are drastically reduced. All new farms built by the private entrepreneurs - members of the UIET, can now import genetic materials without license, or alternatively, if they wanted to obtain a license, then there is a fast track within the SLU for these newly established farms. The goal of the GOT is to rapidly increase meat and milk production in the country, so much emphasis and support is given to member entrepreneurs of the UIET, especially to those who want to work in the agriculture and in particular in the livestock sector. This is a major step towards greater sustainability of project objectives as well as all AI activities within the country.

and marketing efforts supported by the project helped increase the demand for world class genetic material among local farmers and larger commercial farms. This world class genetic material is now in high demand. Along with emerging interest and support of the AI activities triggered by project activities, AgTech believes that AI business and services will have a chance to continue, expand, and flourish in the long term throughout the country. Nonetheless, this will primarily depend on the GOT's ability to leverage its support for the livestock sector.

SUCCESSES:

- Every region in Turkmenistan now has trained AI service providers, equipped and available for fee-based services to inseminate dairy cattle with better genetic lineages.
- In bringing in semen from the U.S., AgTech broke through a trade barrier. While Turkmen farmers had previously bought semen from Turkey, Russia and Ukraine for AI services, few doses if any were certified from progeny tested sires. Using the U.S.-based AI services companies American Breeders Services (ABS) and World Wide Sires, the project was able to get semen tested for the conditions necessary to produce disease resistant, high quality milk-producing cows. By sending the doses in a vapor tank, the project was able to import the semen without the shipment having a dangerous goods label, thus reducing complications with customs upon entry. The project has made note of all processes and procedures for import so that others in the livestock industry may be able to replicate this process in the future.
- AgTech created a network between entrepreneurs, advisors and experts on AI. This network has become an invaluable resource for overcoming challenges encountered in AI. Without the network, farmers would not have readily available access to information that helps improve their business ventures and farms.
- AgTech provided AI services have also contributed to the demand for higher quality beef breeds. The feedback received from project AI specialists indicate that cattle farmers are more aware of the benefits of high quality cattle breeds and many of them are prepared to pay premium for top quality semen.
- The Project procured and introduced new breeds of cattle including Jersey, Limousin (beef breed) and female sexed semen for Holstein and Brown Swiss breeds. The sexed semen is intended to increase the number of female calves to accelerate impact on milk production and diversification of the genetic pool.
- The number of cows inseminated by project AI specialists had reached 5,534 by the end of the project.

CHALLENGES

- Due to the remote and sparse location of many livestock households and farmers' poor record keeping remains a challenge in documenting all newborn calves. The Project estimates that the number of cows born, as a result of Project AI activities, is 2-3 times greater. The Project also only recorded milk yields for 16 heifers due to difficulties in obtaining the necessary data.

Supporting Artificial Insemination (AI) centers

Livestock component activities expanded to regional TOT trainings and AI extension services at the farm and household level, increasing the number of beneficiary farmers. The results ignited greater demand for improved genetic material and AI services. To meet this demand AgTech assisted in the creation of AI Centers in different Velayats around the country.

At the end of Year 1, AgTech saw the Grand Opening of the first AI Center, located in Mary. The AI Center is a considered a one-stop shop for livestock development needs, including formal training and education, equipment for conducting AI services, and laboratory equipment that can aid in the analysis of the success of attempted inseminations. A computer is available for the area AI practitioners to build their own database of clients and keep livestock records to prevent health defects that could result from interbreeding blood lines. In late 2012, AgTech opened two additional AI Centers in Dashoguz and Ahal provinces. Along with trainings to support their activities, the project provided AI Centers with a small amount of newly introduced beef breed and sexed semen doses and supplied them Liquid Nitrogen (LN) from the Project Liquid Nitrogen Generator (LNG). In addition, AgTech notes important changes of all AI Centers to keep farmers and AI clients aware of developments in their region.

Figure 2 AI Specialist from Dashoguz with a Project born calf

AgTech was planning on establishing a fourth AI Center to be built in 2014 with the support of the local Government in the Lebap region but this activity was put on hold. Even though a building for the center was identified and renovated by the Turkmenabat Veterinary Service, the efforts put forth for establishing the AI Centre in Lebap cancelled and redirected towards supporting local entrepreneurs interested in AI business as a result of changes in the GOT rules and regulations in relation to foreign assistance technical aid. AgTech identified four entrepreneurs that could be considered AI license candidates from Lebap, Ahal and Dashoguz velayats and assisted them with completing all necessary forms and paperwork. At the end of the project, the candidates were still going through the application process with the State Livestock Union (SLU).

AgTech provided continuous support to existing AI Centers in Ahal, Mary and Dashoguz. This support included marketing and promotional material, including AI booklets, leaflets regarding newly introduced breeds, and contact numbers of all active AI specialists in their respective regions.

Business to Business: Artificial Insemination

While AgTech project was in operation, it was relatively easy for project supported AI businessmen to have access to the U.S. market of AI goods supply and import frozen bovine semen and other AI related expendables such as AI sheathes, AI gloves, lubricants etc. at affordable costs. However, despite the price and quality advantage of U.S. suppliers, AgTech expected that after project close Turkmen entrepreneurs would face a number of challenges in continuing their import of genetic material directly from the U.S. suppliers, due to logistical, bank wire transfers and communication issues. As a result, AgTech believes local businessmen will look for their options in the regional countries.

Figure 3: Project Entrepreneurs and Businessmen after completion of Turkey B2B trip.

Throughout project activities it became increasingly clear that there was a need to connect the Turkmen input providers and livestock investors (e.g., importers of AI supplies, importers of animal pharmaceuticals, investors in animal feed and supplements, etc.) with the international suppliers and professionals that could support project activities. AgTech conducted research with interested entrepreneurs and project staff during 2013 and 2014, to identify other potential suppliers of AI goods. A number of European suppliers as well as suppliers from regional countries were contacted to explore the market and potential offers. Both local entrepreneurs and the project found that the average prices offered by the European companies, for example, for a dose of conventional Holstein or Brown Swiss breed at a 15 Euro is too high both for Turkmen AI specialists and livestock households. Additionally, business with European companies would entail the same challenges for local businessmen related to logistics, payment and communication issues. Turkmen entrepreneurs found Turkey and Iran as the most favorable markets for procurement of AI related goods. AgTech learned that Turkey is a relatively new and unexplored market for procurement of AI goods for local businessmen, while Iran had been used by local entrepreneurs for the last 5-6 years and there were a number of issues related to the quality of the genetic material procured from Iranian suppliers. Drawing from cultural ties of the two countries, the decision was made to send a group to Turkey.

Following the start of its close out phase, AgTech organized a three day Business-to-Business Trip to Turkey for a group of Turkmen entrepreneurs involved in AI and livestock business and representing four velayats to support emerging local market for AI related materials and goods for long-term sustainability of project started AI activities,. The purpose of the trip was to build long-term business relationships with key industry partners and suppliers of AI related goods in Turkey, which has favorable trade status with Turkmenistan. Turkey also has a reasonably developed livestock sector, from which Turkmen farmers and entrepreneurs can learn more about the next steps in becoming more productive, efficient livestock enterprises. As a result of the trip, Turkmen businessmen could start importing better genetic materials from Turkish suppliers as opposed to Iranian suppliers and maintain continuity and quality of the AI activities achieved by the AgTech over the last 4 years.

SUCCESSES:

- The project identified and assisted four entrepreneurs in the Lebap, Ahal, and Dashoguz regions in completing and submitting AI trade license applications to the State Livestock Union.
- Marketing materials with contact information for AI specialists and a grassroots effort of awareness of the health of the new calves is slowly increasing demand for more AI services.
- Along with the efforts of the Project in improve bovine health to improve productivity; the GOT recognized the necessity of re-organizing the former State Livestock Association "Turkmenmallary". In 2013 in an effort to improve the state livestock sector and increase the domestic production of livestock products to create the SLU as a more nimble organization. Building from AgTech activities with livestock genetics improvement and the opening of the AI Centers, the SLU created similar centers in each velayat of the country. The creation of the State Breeding Service in 2013, as a separate entity under the umbrella of the SLU and as part of the government, was intended to improve animal genetics and livestock breeding activities. In addition, in 2013 the GOT allocated additional arable farmland to the livestock sector in support of producing more forage crops to meet the sector's needs in animal feed production. The lack of adequate local cattle feed production, due to insufficient irrigated farmland for forage crops, was also noted by a number of AgTech's international livestock consultants and identified as one of the main reasons for the low levels of domestic livestock productivity in Turkmenistan.

CHALLENGES:

- The skills of the veterinarians are sufficient to support much livestock development, but the lack of a balanced ration for Turkmen herds remains a critical challenge to the development of a productive industry that is sustainable. As prices for feed and other inputs rise and as profitability decreases, the rate for sending cattle prematurely to slaughter will rise. This will over time eventually create a more food insecure environment for Turkmenistan if not carefully addressed by private sector farmers and government officials in the Ministry of Agriculture.

- Making the AI Centers self-sufficient was a priority to USAID and the AgTech program, but several issues challenged profitability in the sector. It was believed that changes in policy (e.g., liberalization of product registration, import licensing, and licensing for other veterinary activities) would ease the cost of doing business for farmers and veterinarians alike. These policy changes were requested by industry professionals. There has been greater levels of cooperation between the SLU and the Ministry of Agriculture, which has created new hope that these changes will be made in the near future.

Animal Health Improvement

During Year 1 AgTech conducted a feed assessment to evaluate the current state of livestock feed in Turkmenistan. Project staff met with a feed mill expert on feed input and investment options, recruited a short-term feed analyst Dr. Zahid Iqbal (who conducted a two-week feed assessment) and continuously consulted with universities and not-for-profit organizations in creating a suitable feed. Dr. Iqbal's cost effective recommendations for improving the local farms and their dairy production included increased water intake, open range feeding, untying cows for feeding, routine cleaning of manure and other simple tips for farm management and good animal hygiene. AgTech concluded that combining efforts of local and an international feed experts would be necessary to educate and produce an ideal feed mix that is cost effective to produce and affordable for local farmers to purchase.

In Year 2, AgTech worked with five farms in the Ahal and Mary velayats to conduct a feed demonstration over an 80-day period. In March 2012, the project spent several weeks to create a mixed feed ration. This activity required over 20 tons of feed to be produced and mixed. The feed consisted of 60/40 barley and cottonseed meal ratio, chalk, along with a 4% (1kg added per 25kg of feed) additive mix by Jivina, which is comprised of essential vitamins and trace minerals and locally procured in Ashgabat. By using locally available products and local partners, the goal was to demonstrate the widely held belief that an improved feed will increase dairy production among local cows and that such feed can be created in Turkmenistan locally with available resources.

The mixing process involved milling the barley, and then using the refined barley to be hand mixed with the cottonseed meal, the Jivina mineral mix and chalk. The feed is then gathered into 35kg sacks and has been distributed to the participating farmers to begin the demonstration by April 1. The activity was used as an opportunity to advertise to local farmers the effect good nutrition and animal care can have on their herd's milk productivity. A short 18 minute documentary was made from over 3.5 hours of video footage shot over a 3-month period. AgTech then identified key investors in the livestock sector interested in AI development and feed production. Currently all Turkmen feed mills produce animal feeds for chicken, sheep and animals other than cattle.

SUCCESSES:

- For farms milking their cows by hand, the use of the improved feed increased the cows' appetites, and as they ate for longer time periods, the milk hands were able to collect more milk per session with the new feed.

- AgTech has carried out a presentation seminar on the World Organization for Animal Health (OIE) for veterinary and laboratory specialists from the Central Laboratory of the State Veterinary Service and the State Equine Association of Turkmenistan.\

- The Project sent a short-term international consultant on OIE, the regional director of OIE for Eastern Europe and Central Asia, to complete the seminar on OIE compliance for the State Veterinary Service. The activity was such a success, that the local government requested Dr. Lukauskas to meet with the Minister of Turkmen Equine Association and the head of the International Department of the Ministry of Agriculture of Turkmenistan.

- The Project retained a Senior Officer (former) of the FAO, to lead a seminar on international best practices in the areas of livestock management, effective breeding, feeding techniques, and veterinary care procedures. He was able to offer tailored recommendations that accounted for the local conditions in Turkmenistan and will be helpful in ensuring sustainability following the Project's closure.

Figure 4 Ultrasound Machine used during US Based AI Activity

US Based AI and Heat Detection Training

In April 2014 AgTech completed a month-long U.S.-based pilot training on advancing AI and heat detection skills. By working on US commercial farms alongside dairy experts on a daily basis, the participants were expected to become experts beyond the level achievable on smaller dairy farms in Turkmenistan.

The trainee selection focused on those who would benefit the most from exposure to new technology; i.e. AI practices and training on a large number of heads of cattle. These individuals were identified as the most advanced practitioners in bovine reproduction in their respective velayats. The objective of the training was centered on advanced technology and regular exposure to a significantly higher number of heads of cattle than available on farms in Turkmenistan. The training practice and instructions were designed to refine the participants' skills, allow them to master their craft and ultimately, help improve the human capital of the Turkmen livestock industry.

Two-thirds of the training was dedicated to manual palpation of animals to identify cows in estrus and the duration of pregnancy. In addition, a number of other activities were performed on a daily basis, including observation of or participation in 5 - 10 calving's per day and 25-35 inseminations. Each trainee was also equipped with an ultrasound that was brought to Turkmenistan at the end of the training, for veterinary use in the velayats.

The lead trainer, Dr. Thomas Graham, emphasized that the dual training allowed for an accelerated learning curve, even for experienced professionals. The training helped the trainees visualize the cow using the ultrasound machine, while using tactile senses to detect a cow's pregnancy status. The intensity of the training ensured retention and sustainability of the high-tech equipment use. These improved breeding practices were expected to continue in Turkmenistan with other AI specialists.

SUCCESSES:

- AgTech provided the opportunity for Turkmenistan's leading veterinary experts to train on US commercial farms and hone their expertise with the use of advanced technology and techniques practiced in a setting unavailable in Turkmenistan

- The participants confirmed that the pilot training helped to increase their ability to detect pregnancy via the palpation method. Instead of detecting within 90 days of gestation, the participants were able to detect within 35-40 days of gestation.
- Each participant reported a better understanding of how to operate the ultrasound equipment and understood the importance of its utility.
- These achievements indicate a significant step forward for project beneficiaries. The improved techniques help participants detect early pregnancy and more accurate insemination allows for a reduction in time between the gestation period and maximization of milk production.

CHALLENGES

- The US based training schedule was quite standard for U.S. farm activities. However, the training proved to be challenging for the participants who have never set foot on such vast dairy commercial farms.

Figure 5 Ms. Chikhnyaeva and Mr. Annayev on the Davis, California dairy farm.

COMPONENT II: HORTICULTURE

To promote better practices and greater productivity in backyard farms, AgTech concentrated on greenhouse construction and plant care and management with supplemental trainings also included on soil testing, fertilizers and pesticide safe usage and application. These activities spread to new areas of Turkmenistan, and reached a diverse group of farmers and geographic regions. After great success with these activities, AgTech shifted focus to trainings that introduced new technology and practices. The project also focused on supporting lead trainers and farmers in their respective velayats.

Export Market and Trade Capacity Study

To better understand the export potential of Turkmenistan, AgTech commissioned a study on the Export Market and Trade Capacity for Turkmen horticulture at project inception. The contracted company, MCT Agency, a local organization that specializes on market research, conducted the study and developed an independent analysis on the country's potential for exporting fresh tomatoes and cucumbers to neighboring markets. The study was designed to look inward at Turkmenistan's readiness to export. Also, internal transport of goods to local borders was studied to identify bottlenecks and opportunities to increase efficiency in getting goods from farmer to retail buyer.

The work for the study was completed in June of 2012. This assignment brought the MCT Agency's professionals to the farms where AgTech works throughout the country to get the most reliable information available. However, a major challenge that disrupted and delayed the progress on this study was the reluctance for farmers, customs officials, and other value chain actors to answer surveys honestly and completely. Unfortunately, issues in information gathering have led to further complications and questions regarding the analysis. AgTech and MCT Agency are worked closely to resolve remaining questions, but the validity of this and any other study conducted remains in question as long as farmers and traders are afraid to cooperate.

Despite challenges in collecting information, the MCT Agency determined that there is still significant domestic demand for tomatoes and cucumbers, leaving the export market as a niche for 5-10% of Turkmen farmers who are prepared to make the linkages necessary to cross internal and international borders to get produce from the farm to foreign countries. Exporting farmers are mostly using truck transport. The lack of knowledge of markets in neighboring countries, the underdeveloped distribution channels, and general corruption along the transit routes discourages many from pursuing an otherwise profitable endeavor.

Greenhouse Reconstruction

Through greenhouse improvements, AgTech has been assisting small household farmers in maximizing incomes with least cost investments. The affordability of greenhouses enabled farmers to reinvest in their business, build subsequent greenhouses and/or expand the size of their plots where possible. In the projects first year, instead of spending project money to build new greenhouses in areas that already have so many, the project's focus was on improving existing structures. The reasoning behind this method was that other family farmers can afford to replicate simple structures as opposed to spending thousands of dollars on world-class style greenhouses. Year 1 results exceeded expectations as 70 greenhouses have followed the project's lead in Mary and Lebap. The main goal was to affordably create a more productive environment given the same small plot of land. During Year 2, an additional 124 greenhouses were built or improved. Year 3 saw an additional 100 greenhouse constructions and renovations. During the final year AgTech worked with an additional 61 greenhouses, bringing the project's cumulative total to 355.

Figure 6 newly built greenhouse in Lebap

Despite the achievement, in 2014, the Ministry of Foreign Affairs (MFA) of Turkmenistan placed restrictions on training activities outside of the Ahal region and instead encouraged collaboration with government institutions. Therefore, in Year 4 AgTech worked with small household farmers via extension trainers and conducted several seminars for representatives of the MOA, lecturers and students of Turkmen State Agricultural University, representatives of the Water Resources Ministry of Turkmenistan, and the Food-processing Association of Turkmenistan. Two seminars were delivered on the *Forage Crop Development*, and on *Irrigation Development and Technology*.

SUCCESSES:

- AgTech delivered agriculture extension activities such as with drip irrigation and provided new field guides to farmers for pesticide application and fertilizer use.
- Following project recommendations and extension activities, a total of 355 new greenhouses were constructed or improved throughout the Ahal, Balkan, Lebap and Mary velayats. AgTech surpassed the original target of 300 greenhouses.

Horticulture Training

AgTech delivered knowledge and introduced new horticulture technology and practices by supporting lead trainers and farmers in their respective velayats. The training sessions focus on greenhouse management of soil preparation and plant protection. Many farmers were surprised by the preparations they need to take to make their soil most fertile for plant growth and the question and answer format of the project seminars allowed beneficiary farmers to receive tailored advice for their specific cases. During Year 4, AgTech adjusted its strategy to conduct more extension services for farmers who could then lead the dissemination of best practice information independently within their respective communities to generate a wider impact than farmer-to-farmer training alone, which increases probability of continuation among farmers. The main focus was shifted from regional trainings to direct extension services and preparing project partners on becoming greenhouse trainers and extension specialists, along with fostering linkages between local growers and foreign suppliers.

During Year 2 soil testing seminars were held, using a local consultant to train the lead farmers in each velayat. Following this initial training, the project-procured soil testing kits were left with each demonstration greenhouse for local farmers to access for analysis of their soil. By understanding the nutrient content in the soil of their greenhouses, the project's local consultants can accurately identify what type and how much fertilizer is needed for optimal greenhouse soil. This was particularly useful given the timing of the planting season (Jan-Feb) for the spring harvest.

In Year 3, AgTech specialists developed competition criteria in collaboration with project horticulture farmers. Criteria included such aspects of production as the yield per $100m^2$, use of best practices in production, percent of diseased crops, and minimum use of pesticides. Winners from each region were chosen by the project specialists and regional partners based on regular monitoring of production results and benchmarks set within the region. AgTech provided each winner with personal protection equipment (PPE), including backpack sprayer, rubber overalls, respirators, gloves and non-slip shoe covers to encourage and promote best environmental practices. This competition highlighted the importance of health and safety in effective management of greenhouse production for maximizing the value of best practices in pesticide utilization.

In Year 4, AgTech delivered a two-day training seminar on pesticide application and fertilizer utilization at the project office in Ashgabat. The seminar was led by the local pesticide consultant, assisted by the project's local Private Sector Agribusiness Specialist. The participants included project horticulture partners from all velayats. The event provided an opportunity for participants to discuss various topics including input supplies, import-export issues, the greenhouse vegetable market, government regulations on chemical and fertilizer supplies, as well as challenges in the input-supply market. Participants were

provided with an updated list of permitted pesticides and fertilizers issued by the Plant Protection Department of the Ministry of Agriculture and a pocket field guide on pesticide and fertilizer use and application developed by AgTech. This reoccurring meeting, along with informational support provided to project horticulture partners, contributed to their extension skills and expanded impact as the partners continue to provide their services to a larger pool of greenhouse producers in their respective regions.

AgTech procured PPEs for dissemination among greenhouse-growers, participants of project-held training sessions and long-term project collaborators. The intention was to create an incentive to attend these fertilizer safety trainings, while raising awareness about health and environmental impacts occurring as a result of such activities carried out by horticulture farmers and greenhouse producers. In collaboration with AgTech specialists and velayat horticulture partners, 20 greenhouse growers from each of Ahal, Mary, Lebap, Dashoguz velayats and 8 greenhouse farmers from Balkan velayat were selected as recipients of PPEs. The selection criteria for growers included: a) participation level of farmer in project-held seminars and trainings; b) year-by-year income increase as a result of adopting new technologies, following project recommendations and consultations, as well as; c) level of cooperation with AgTech on monitoring and recording project targeted indicators and achievements within the horticulture component. The 100 sets of PPE were distributed in time for the first growing season of 2014.

Business to Business: Rijk Zwaan

As part the Horticulture Training objective, AgTech sent a small group of four Turkmen horticulture project partners and seedling producers on a weeklong study tour with the Ukrainian branch of the Dutch seed producer, Rijk Zwaan in June of 2013. Rijk Zwaan covered all local expenses, including lodging, while the project covered airfare and daily per diem.

The visit included trips to seed trial sites in Kyiv, agricultural shops and laboratories, horticulture farms and agriculture firms in Crimea, trans-Carpathian and Kherson regions. The group was immersed in various informational meetings and discussions on horticultural production and best practices with greenhouse construction, management and use of effective techniques. An informational session on commercial and legal importation opportunities was also held.

Participants were exposed to best practices in greenhouse construction and management and effective production methods and growing techniques for different vegetables (e.g., cabbages, peppers, onions, tomatoes and cucumbers) as cash crops intended to maximize farmers' income levels. The trip established business linkages between local growers and foreign suppliers. AgTech envisions these relationships improving the underdeveloped input supply of the horticulture market in Turkmenistan.

SUCCESSES:

- As a result cooperation between AgTech horticulture partners, in 2014 a total of 454 greenhouse farmers and producers increased their yields from vegetable production by more than 50% compared to the previous season.
- 197% increase in value of production sold to local and international markets.
- The project saw great results of soil testing trainings. The result of specific soil preparations (i.e., nitrogen, phosphorus and potassium) and fertilizer applications for regional farmers that have led to reported greater yields.

CHALLENGES

- Licensing rules and regulations in relation to vegetable seeds, pesticides and fertilizers import remain to be the main challenge in domestic input supply market. This is also one of the limiting factors in local horticulture producers' ability to significantly increase vegetable production and meet the local market's demand for fresh vegetable products.

CHEVRON FUNDED ACTIVITIES

AgTech received gift funding from the Chevron corporation in the amount of $150,000, which was added to the ceiling price of the contract and obligated for project activities as previously designed and agreed upon by Chevron and USAID. AgTech completed the spending of Chevron's investment by December 2012.

LN Generator

The AgTech-procured NL280 400 VAC, 50 Hz 3-phase nitrogen generator and liquefier (LNG) was temporarily placed in Turkmen State Veterinary Services Laboratory in Ahal during project implementation in cooperation with the State Veterinary Laboratory. The project worked with the manufacturer, Kelvin International, provided technical support by remote communications. The LNG machine supplied project AI activities and beneficiaries through December 2014. Before procuring the LNG, the supply of LN product in the country was inconsistent and erratic, the main factor being that LN is not officially produced and sold in Ashgabat; it is produced as a byproduct by a certain facilities and sold illegally. It was very difficult for AgTech AI specialists to obtain LN to preserve their frozen bull semen. During the summer months, when the LN was not available for few months in a row, many AI specialists lost their bull semen stock, which impacted their business and clients. The procurement of LNG from Chevron funding, resolved this issue and enabled AgTech to significantly expand its AI activities throughout the country. Regular, accessible and affordable supply of LN product also led an increased number of active AI specialists in the regions, which helped to reach the reported figures of inseminated cows and newly born calves. The project AI centers and project participants received around 50 L of LN per month and a total of 3,288 liters were distributed (see Annex 2).

Heat & Pregnancy Detection Seminar for AI Specialists

The final $35,703.83 of the Chevron gift funds were spent on a consultancy by Dr. Thomas Graham, CEO and career veterinarian from Veterinarians Without Borders, who provided two weeks of training to address heat detection and other topics for breeding bovine livestock. This training was the next step for AI specialists to learn how to increase their ability to recognize heat intervals, plan for synchronized breeding for optimal farm efficiency, and lower the number of days in utero for the specialists to palpate pregnant cows. As a part of this training, USAID and Chevron co-funded the procurement of a bovine ultrasound machine, which Dr. Graham used during the training consultancy.

The ultrasound was shared use throughout the velayats. It was a tool that all 13 participating AI specialists used to train AI specialists at training events and seminars at the area AI Centers. The result was a reduction of accidental fetal aborts and an increase in heat detection efficiency, maximizing the productivity of cows and ideally speeding up the process of improving the genetic potential of Turkmenistan's dairy herd. This consultancy and procurement combined to fully exhaust the $150,000 in financial support from Chevron Corporation. AgTech continued monitoring the results of this investment until the project closed.

CAPACITY DEVELOPMENT AND SUPPLIMENTARY ACTIVITIES

Support to USDA Cochran Fellowship Program

AgTech assisted 11 of its partners and beneficiaries with correctly completing their application to the Cochran Fellowship program as well as professional references in Y3. The Fellowship Program provides superior training to participants to improve their local agricultural systems and boost market linkages with the United States. Participants are selected from a pool of public and private sector professionals concerned with agricultural trade and business development, as well as management, policy, and marketing.

The interview and selection process was carried out by the USDA and US Embassy representatives in Ashgabat. AgTech project did not take part in the interviews or the selection process. However, AgTech assisted the US Embassy in Ashgabat with scheduling the interviews.

Out of the 11 candidates only 2 passed the interview process and were selected to participate in the program. The selected candidates were Mr. Merdan Garayev from Lebap region and Mr. Gayrat Khudayshukurov from Dashoguz region. Mr. Garayev was a recipient of project AI services in Lebap, with a strong livestock and veterinarian educational background. Mr. Khudayshukurov represents the AgTech's second generation of AI specialists and directly involved in AgTech project activities.

WTO/OIE Accession Activities

In 2013, the GOT declared that Turkmenistan will consider joining the World Trade Organization (WTO), and that the benefits and disadvantages of the possible accession must be examined within the next few years. USAID was the first international donor organization to respond to the GOT's efforts in this regard and offered the necessary support and technical assistance. In March and September 2013 the USAID Macroeconomic Project, jointly with the MFA of Turkmenistan, conducted seminars on WTO accession for approximately 20 government entities. These seminars focused on the initial steps towards WTO accession and covered topics on the benefits and the main stages of WTO accession.

AgTech supplied a short-term international consultant and the regional director of the World Organization for Animal Health (OIE) in Eastern Europe and Central Asia, Professor Kazimieras Lukauskas, lead the OIE activity at the end of March 2014. During a three-day training seminar at the Central Laboratory in Ashgabat, the laboratory specialists were trained on the procedures and disease testing methodologies for a number of animal diseases in compliance with the OIE requirements. Participants were awarded certificates on completion of OIE training, which were signed and presented to participants by the USAID Turkmenistan Country Director Brandy Witthoft and Professor Lukauskas.

Figure 7 Participants of WTO Accession Training in 2014

As part of the AgTech activity and upon request from the local government, Professor Lukauskas held a number of high profile meetings with the Minister of Turkmen Equine Association and with the head of the International Department of the Ministry of Agriculture of Turkmenistan. Discussion topics included the development of

Turkmenistan's livestock sector, equine industry, improving veterinary services and capacity building for the local laboratory specialists.

Also in March 2014, AgTech added to the Accession Activities by conducting a seminar on the Sanitary and Phyto-Sanitary (SPS) measures that apply to the WTO. Seminar participants included specialists of the Plant Protection and Quarantine Services of the MoA, provincial representatives of these services, and representatives of the MoA. The seminar introduced participants to WTO regulations that guide food safety as well as animal and plant health. Participants were instructed on the key provisions of the WTO that related to agriculture and to the protection of fish, forests, wild flora and wild fauna. The discussion also focused on how countries develop their own sanitary and phyto-sanitary standards based on scientific recommendations and international best practices.

In late June 2014, AgTech completed the final seminar devoted to World Trade Organization (WTO) accession issues related to animal health, trade of animal products, and food safety for the MFA. This seminar complimented the earlier WTO SPS seminar, and was one of several learning events USAID organized with the GOT to examine benefits and challenges of joining the WTO. Participants of this event included specialists from the State Veterinary Service, MoA, the S.A. Niyazov Turkmen Agricultural University, and the Academy of Sciences of Turkmenistan.

SUCCESSES:

- AgTech delivered a presentation seminar on the OIE for veterinary and laboratory specialists from the Central Laboratory of the State Veterinary Service and the State Equine Association of Turkmenistan.

- AgTech sent a short-term international consultant on OIE, the regional director of OIE for Eastern Europe and Central Asia, Professor Kazimierias Lukauskas, to deliver the seminar on OIE compliance for the State Veterinary Service. The activity was such a success, that the local government requested Dr. Lukauskas to meet with the Minister of Turkmen Equine Association and the head of the International Department of the MoA.

- The Project retained Dr. David Ward, a Senior Officer (former) of the FAO, to lead a seminar on international best practices in the areas of livestock management, effective breeding, feeding techniques, and veterinary care procedures. Dr. Ward offered tailored recommendations that accounted for the local conditions in Turkmenistan and will be helpful in ensuring sustainability following the Project's closure. His recommendations included, increasing forage production and align livestock production priorities with Turkmen Governement goals and policies for to improve livestock development, and use on-farm demonstrations and "Cow Cards" to improve livestock management practices.

Seminars, Conferences, and PR Events

Seminar on Livestock Development for the Agriculture University and the SLU of Turkmenistan
In May of 2014, with support from the MFA and MoA, AgTech delivered a presentation and a seminar for the Agriculture University on the livestock sector development in Turkmenistan. The seminar provided an opportunity for industry representatives to discuss important issues related to the local livestock sector, and share knowledge on gaining state support, policies needed to increase domestic livestock production, and key sector recommendations. Participants in this event included specialists from the State Livestock Union of Turkmenistan and lecturers from the Livestock and Veterinary Departments of the State Agricultural University.

Seminar on the water saving irrigation technologies for the Agriculture University and the State Food Industry Union of Turkmenistan

Per MFA's recommendation, AgTech held a seminar for the Agriculture University and the State Food Industry Union of Turkmenistan in June 2014. The seminar focused on water saving irrigation methods. With support from the MFA and the MoA of Turkmenistan, this seminar provided an opportunity for participants to discuss water conservation matters, agricultural irrigation, water management policies, regional issues, sector challenges and the irrigation infrastructure. Participants included specialists from the State Food Industry Union and the Ministry of Water Resources of Turkmenistan as well as academics from the Water Conservation Department of the S.A. Niyazov Turkmen Agricultural University.

Seminar on growing and maximizing the yields of forage crops for the Agriculture University and the Academy of Science of Turkmenistan

AgTech prepared a seminar for the Agriculture University and the Academy of Science of Turkmenistan on growing and increasing yields of forage crops in Turkmenistan. Topics such as cultivating high-value forage crops in Turkmenistan's unique climatic and soil conditions were highlighted. This seminar was designed to expand on the USAID-organized AI and livestock sector development seminars held over the last year, as part of the comprehensive effort to better enable Turkmenistan's agricultural sector maximize its meat and dairy production. The participants included specialists from the Academy of Science and academics from the Agronomy Department of the S.A. Niyazov Turkmen Agricultural University.

Livestock Development Conference

As head of a discussion on opportunities and potential growth for Turkmenistan's livestock production, AgTech developed an international conference on the "Strategy of the Livestock Sector Development in Turkmenistan", which was organized jointly with the Ministry of Agriculture and the State Livestock Union of Turkmenistan.

The purpose of the conference was to discuss the main issues concerning the production and development of the livestock sector, State priorities and tasks in relation to the sector, latest technologies in genetics, breeding, production and management, and ultimately to discuss how the existing international organizations and companies in Turkmenistan can work together with the GOT to achieve rapid livestock development and production in the country.

The Livestock conference was held in the final months of project activity in December of 2014. Conference participants included members from all ministries and agencies related to the livestock sector, including specialists of the State Livestock Union and the State Veterinary Service of the Ministry of Agriculture of Turkmenistan. There were a total of 65 participants and the Project was able to organize three seminars that included topics such as: Livestock Development and Management, WTO/OIE Standards and Animal Genetics and Breeding.

Training/Capacity building program for advanced laboratory disease testing and diagnosis for the State Veterinary Service of Turkmenistan in Lithuania

To improve Turkmenistan's animal veterinary services and livestock standards, the GOT set an objective for the Central Lab of the State Veterinary Service to conduct tests for diagnosing twelve animal diseases and follow methodologies in compliance with the OIE requirements. A full compliance with the international standards set by the OIE would allow Turkmenistan to trade livestock on a regional and international basis.

However, during visits to the Central Laboratory of the State Veterinary Service of the MoA, AgTech identified gaps in conducting the tests. The Central Lab is equipped to conduct 4 out of 12 tests and requires training to conduct the remaining 8 State required laboratory tests. Pursuant to an inspection of the available lab equipment, AgTech concluded that no additional lab equipment was necessary to complete the examinations, but that lab specialists needed an extensive training on OIE procedures and disease testing methodologies. AgTech also suggested that certain reagents were needed and that the OIE instructions would have to be translated into local language.

In response to GOT efforts, AgTech, in agreement with the State Veterinary Service of Turkmenistan, planned a capacity building program for the lab specialists of the Central Lab. As part of this program, the project conducted a short training seminar led by an international consultant on OIE for the lab specialists of the State Veterinary Service in March 2014. During the training seminar, participants were informed of and trained in OIE's main standards and requirements, OIE compliancy, modern methodologies of laboratory testing for contagious diseases, and how to identify preventive vaccinations and medications.

As a follow on to this training seminar, AgTech sent two Central lab specialists to an OIE compliant reference laboratory in Lithuania for a 2-week training on animal disease testing methodologies and procedures that are compliant with the OIE requirements. Upon request from the GOT, disease-testing methodologies for several equine diseases was included in the training program. The training took place in the Lithuanian National Institute on Assessing Food and Veterinary Risks, in Vilnius city. All laboratory research and testing activity within the training program was carried out in accordance with the Council Directive 2009/156/EC of 30th November 2009 on animal health conditions, governing the movement and importation of farm animals from third countries.

Innovations in Animal Feed Production Technology Presentation

In January of 2015, the U.S. Embassy in Ashgabat hosted the U.S.-Turkmenistan Business Forum on in Ashgabat, Turkmenistan. Sessions included the following topics: Innovative Technologies in Agriculture; Innovative Technologies; and The Role of Finance in Economic Development. AgTech provided an experienced agricultural economist to deliver a presentation during the "Innovative Technologies in Agriculture" session of the event. The selected topic for the presentation was innovations in animal feed production technology, and included examples from which local farmers and businessmen and GOT representatives can use to improve Turkmenistan's meat and dairy production through more modern and effective feed operations. In addition to production aspects of feed management, the presenter covered feed mixing and approaches to maximizing nutrition for livestock, taking into account the local availability of feed inputs.

SUCCESSES

- All seminars were successfully held in collaboration with State Associations in Turkmenistan, such as the MFA, the SLU, the MoA, the Main Veterinary Service of Turkmenistan, and included key stakeholders from the Turkmenmallory, the State Agricultural University, the Water Resources Ministry, the Food-Processing Association of Turkmenistan, and the Academy of Sciences of Turkmenistan.

Training Database Development

The project developed M&E tools to collect information from training participants served as the foundation for the development of a database to use to report on key PMEP indicators and other baseline information that may be useful to USAID.

However, due to new MFA restriction on travel and monitoring and travel, as well as the remote and sparse location of many livestock households, documenting data including the number of project calves became a challenge that could not be overcome. As well, poor record keeping, if any, on increases in milk yields and income, as a result of increased use of AI services and improved breeds was a problem.

COMPLIANCE WITH SECTION "IMPLEMENTATION PRINCIPLES AND KEY ISSUES"

Anti-Corruption

Importing equipment and materials into Turkmenistan requires many licenses and paperwork to move goods through customs successfully in a cost-effective manner. AgTech worked to outline the process of importing agricultural input products so that current and future entrepreneurs and farmers in Turkmenistan will have a guide by which to operate within the law. The project's focus was on helping the local population and businesses adapt to the laws that govern so that they may operate more efficiently and in a sustainable way.

Capacity Building of Local Staff and Sustainability

In Year 4, with home office project administrative support, the project appointed local chief of Party, Farhat Orunov. The home office conducted four management visits to Turkmenistan to ensure compliance with USAID and FAR rules, requirements and procedures. AgTech also hired and trained new staff in Year 4 to support the increased project activity expected from the celling increase and project extension.

Sustainability of AgTech activities in Turkmenistan can only occur through a transfer of tangible goods, skills and knowledge that can allow for AI services, livestock development and greenhouse production to continue to improve for years to come. By procuring high-tech inputs and capital goods for the AI infrastructure and using a lead farmer model, AgTech set a solid foundation for local farmers, veterinarians and businessmen to replicate project activities to continue economic growth in Turkmenistan's agriculture sector.

AgTech focused on extension service activities, training seminars for state veterinarians and livestock experts in collaboration with Turkmen ministries and institutions, a study tour on the OIE and on the WTO international standards in Lithuania and a U.S. based activity in California. All activities were carried out to build capacity and sustainable practices that would continue and have a positive impact following the project's closure.

Environmental Compliance Requirements

AgTech's Pesticide Evaluation Review and Safe Use Action Plan (PERSUAP) was submitted and approved in Year 2. Despite the insufficient and missing data, the project staff gathered information necessary for completing the PERSUAP. The ER Checklist was used in conjunction with the Leopold Matrix by the Agreement/Cognizant Technical Officer (AOTR/COTR) to determine that the proposed Liquid Nitrogen Generator poses low environmental concern. The checklist determined the scope and extent of additional environmental evaluation, mitigation, and monitoring necessary to fulfill federal U.S. environmental requirements.

AgTech procured and disseminate additional personal protection equipment for farmers when using pesticides. In Year 4 a pocket field guide with a list of permitted pesticides referred to in the PERSUAP was disseminated to greenhouse farmers. AgTech provided access to liquid nitrogen and artificial insemination services via extension activities. The project completed environmental checklists and the activities qualify for categorical exclusion. USAID determined that project activities for technical assistance, training, analysis, studies and information transfers qualified for a Categorical Exclusion under 22 CFR Part 216.2(c)(2) (no effect on the natural or physical environment) and, therefore, these activities were excluded from an environmental review. The environmental checklists pertaining to the livestock and horticulture components was approved and are as follows:

Livestock	Horticulture
1. Liquid Nitrogen Generator (LNG) 2. Artificial Insemination (AI) Center Construction 3. Dewar Flasks 4. Feed Production 5. Artificial Insemination (AI) Activities	1. Soil Testing/Greenhouse production training 2. Drip Irrigation systems 3. Pest control measures and application of fertilizers 4. Construction of demonstration greenhouses 5. Personal Protective Equipment (PPE)

Food Security

Although food security is not a major focus for this agricultural project, the Balkan region in particular is susceptible to price shocks as this is the one region that has no greenhouse horticulture. Prices for fresh produce are always higher in this region, and the rural population has a lower level of income. The project has been working on developing linkages between the Dutch seed supplier, "Rijk Zwaan" and project horticulture partners. Additionally, with project's support there are now 10 built and or reconstructed greenhouses in the Serdar district of Balkan region. The project also provided a seminar on forage crops, irrigation technologies and greenhouse best practices which provided opportunities to exchange ideas on agronomic techniques, plant protection and input supply possibilities to Turkmenistan.

Gender and Youth

As observed through the last four years of project activities, many of the farmers are men; however, women and children often help in planting and harvesting the crops, as well as milking and looking after the cattle. Without a separate formal training program, inclusion of more female beneficiaries was a challenge. In Year 4 the project focused more on extension activities and seminars because of the GOT's request and restrictions on travel and monitoring activities. Nonetheless, the AgTech tried to ensure to the best of its abilities that third country trainings involved female beneficiaries and youth.

LESSONS LEARNED AND RECOMMENDATIONS

Lessons Learned

AgTech worked under the USAID's agreement with the GOT signed in 1993. None of the USAID's projects are registered in Turkmenistan. Now, based on new presidential decree on foreign technical and financial aid enacted from the January 2013, all foreign projects and grants had to be registered at the Ministry of Economy and Development. Lack of registration of the AgTech project created many challenges for the project to fulfil its activities, such as frequent interferences from the local authorities in the provinces, lack of and late approvals of project planned activities and inability to directly engage with the project private beneficiaries, especially during the final year. AgTech also learned that because of new

regulations on foreign technical aid local banks in Turkmenistan, including the National Bank of Pakistan (where AgTech has its project account), would not open project accounts for any unregistered projects.

MFA's approval process of the AgTech project activity plans was inconsistent and unpredictable. Some of the activities planned in quarterly plans or even entire quarterly plan submitted for approval were not responded to, without any explanation from the MFA. MFA also granted approval of some activities only two-to-three weeks prior to the time of conducting. This inconsistency made project activity planning ineffective, creating budget expenditure difficult and recruiting and deploying international consultants challenging. USAID's own internal requirements and delays in regional approval process of work plans and associated budget realignments served as a factor to slow activity implementation.

The project examined opportunities to use local consultants when MFA approvals were received late and a quick deployment of consultants was required. However AgTech found there were few qualified and experienced local consultants on livestock and horticulture. As well, even when project was able to local qualified consultants, the USAID local rates for consultants (USAID 2008 Local Compensation Plan) meant that the best local consultants were reluctant to work for the project.

Recommendations

Throughout the project, local and home office staff recognized certain aspects of the project that could have helped implementation of project activities. These are summarized as follows:

- Any future USAID project in Turkmenistan should try to get registered in the country from the kickoff, but USAID would need to negotiate and agree a blanket agreement with the GOT for all its projects, otherwise separate attempts by each project and/or contractor would lead to a very complicated and long process of collecting documents for submission and waiting indefinitely for the outcome.

- Based on new regulation on foreign technical aid, new projects would be assigned a local counterpart organization, which actually plays a key role in the registration process. However, to facilitate project functioning and receive approvals for project activities after the registration it is recommended to agree on and assign a responsible contact person for the project from the counterpart organization at the very beginning of the registration process.

- Projects need to be flexible enough and prepared in consultation with the USAID country office to carry out multiple work plan revisions, targets and deliveries revisions as well as budget modifications over the course of their implementation. The USAID's regional office could facilitate overcoming these challenges by expediting the approval process for consultant approvals and requests for work plan and budget modifications occurred as a result of significant changes in policies or requests of the host country.

- USAID's local compensation plan for Turkmenistan needs a revision and adjustments based on current local labor market rates.

*ATTACHMENTS:

**Due to the attachments' size, a copy of all presentations, reports, documents, multimedia, brochures and information booklets has been stored on a CD-ROM and submitted to USAID/Turkmenistan along with the Final Report*

Annex 1A PMEP Results

Annex 1B Data Tables

Annex 2 Environmental Compliance Documents