SUBJECT AREA REPORT

2016 Soy Processing Sector Development in Afghanistan

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NUTRITION & EDUCATION INTERNATIONAL (NEI)
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Table of Contents

EXECUTIVE SUMMARY

Nutrition and Education International (NEI) introduced soybeans to Afghanistan in 2003 with a vision to eradicate protein-energy malnutrition (PEM), especially among women and children. NEI's mission is to establish a self-sustainable soybean industry in Afghanistan by developing a soybean value chain, which includes seed multiplication, soybean cultivation, soybean processing, and soy market development.

In collaboration with various Afghanistan government ministries, private sector partners, and the UN World Food Programme (UNWFP), and with the financial support of the Republic of Korea government, NEI continues to enhance and expand the self-sustainable soy industry to improve food security and reduce PEM, while simultaneously improving livelihoods and the local economy of Afghanistan.

Together with our partners, we have shown that we can achieve our vision of eradicating malnutrition in Afghanistan. NEI's nutrition-sensitive, agriculture value chain development efforts are at the forefront of sustainable development thanks to our dedicated and passionate staff who risk their lives to rebuild the beautiful country of Afghanistan. But, we are still far from our final goal. Further expansion of our soy program is necessary in order to provide many underprivileged Afghans with the tools they need to stand on their own feet and contribute to the future stability of their country.

This subject area report summarizes our efforts made in 2016 toward development of a sustainable soy processing industry in Afghanistan. We welcome your questions or comments on this report, or other aspects of NEI's program.

Sincerely,

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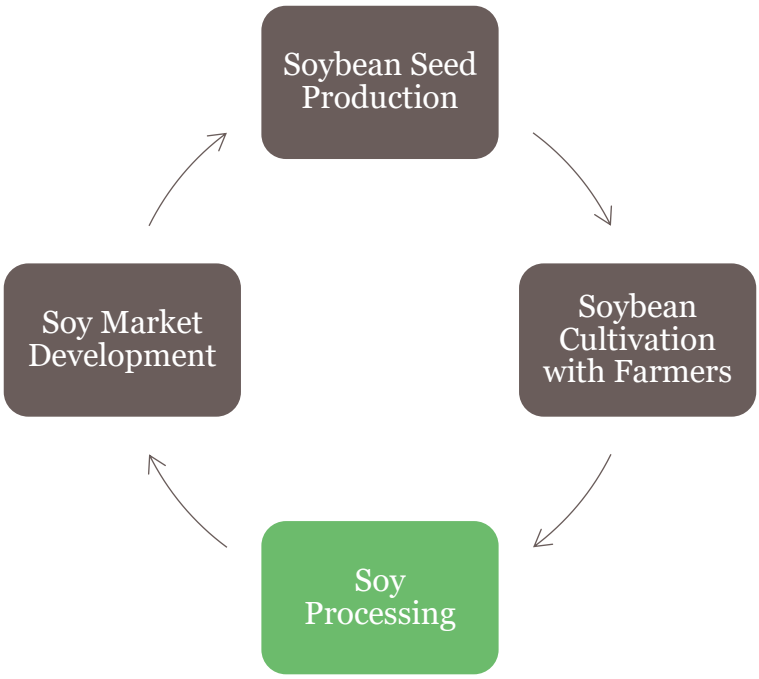
SOY PROCESSING STRATEGY

Soy processing, as seen in the diagram below, is one of the key areas in NEI's Soy Value Chain development in Afghanistan. Through the soy processing industry, rural farmers are able to sell a portion of their harvests to financially support their families. Soy processing factories use harvested soybeans to produce soy-based food products that are then made accessible to Afghans living in both rural and urban communities.



The soy processing sector plays a key role in the soy value chain by utilizing raw soybeans as inputs to produce nutritious soy products. These products range in manufacturing complexity – from more basic processing equipment and skills required to produce soy flour and roasted soybeans - to the high tech equipment and expertise required to produce soy milk and texturized soy protein (TSP).

SOYBEAN PROCUREMENT FROM FARMERS

Soy processing begins with soybean procurement from farmers – a coordinated effort involving several NEI departments. Farmers are encouraged to produce high quality soybeans through a grading system that establishes a price based on crop quality. This creates a financial incentive for farmers to follow best practices and grow higher quality soybeans to sell to the marketplace. This grading system also helps create a stable market for raw materials to be purchased by soy product manufacturers.

Soybeans are evaluated on factors such as color, size, maturity, moisture content, and overall condition. In addition to promoting good farming techniques among farmers, this classification system also helps to ensure that soy processing factories are purchasing consistently high grade soybeans for the manufacture of soy products.

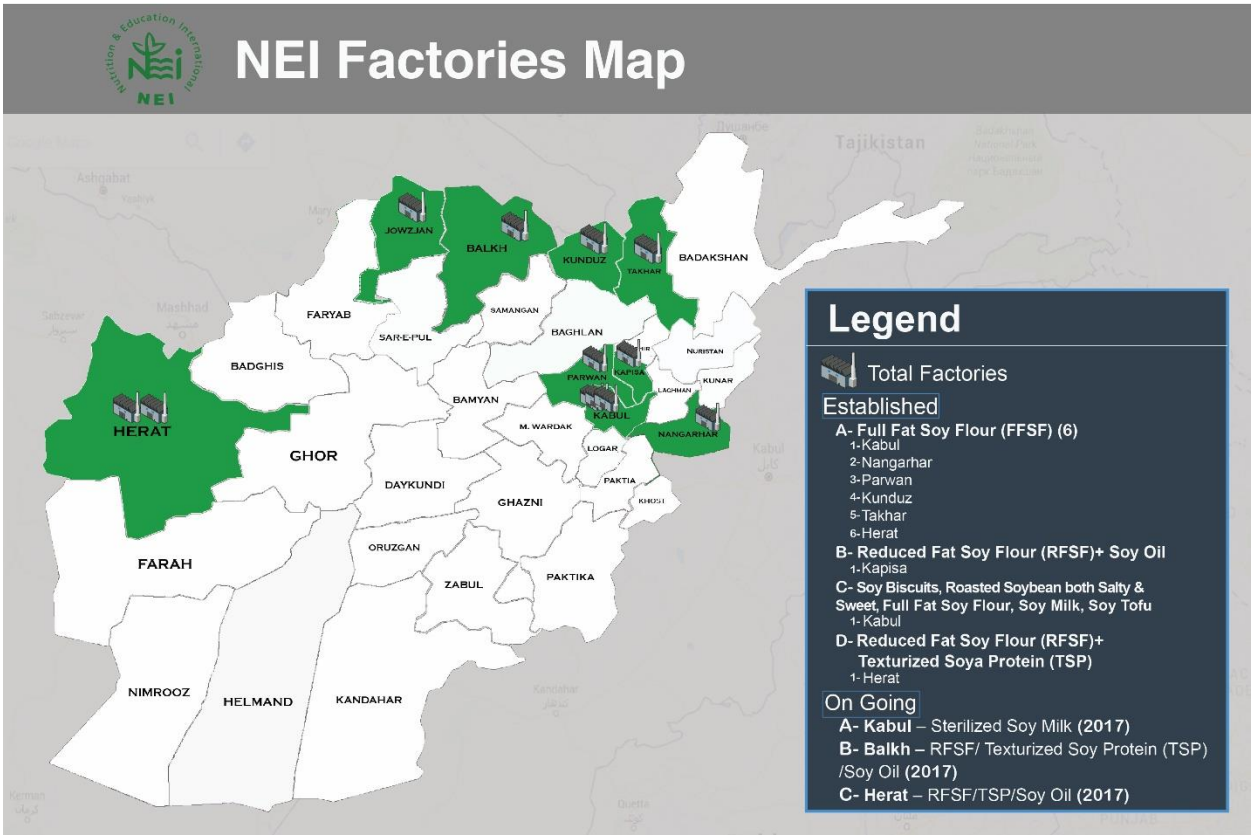
Soybean Farmer with Grade A Soybeans

After soybeans are purchased, they are sorted, cleaned, and bagged. Each bag contains relevant information about the soybeans including point of origin, grade, variety, and production year. This method ensures accurate inventory control so that stock is properly rotated.

STRATEGIC LOCATIONS

As a part of the soy processing sector development, NEI's strategy is to establish multiple small capacity factories throughout the provinces rather than one large factory. This decentralized approach benefits soybean farmers by putting them in close proximity to a regional factory, reducing transportation costs of both raw materials and finished products. It also promotes the development of self-sustainable relationships between farmers and soy processors at the local level.

The map below shows the soy processing factories located throughout northern, eastern, and western Afghanistan, where the majority of soybean farmers reside. Due to ongoing security concerns, NEI has not yet been able to establish factories in the south.



BUSINESS PARTNER AND FACTORY SITE SELECTION

After identifying the province for a new soy processing factory, NEI develops a business partnership with a local entrepreneur. NEI seeks business partners who are capable of independently operating a soy processing factory as a long-term venture. NEI's role in the business relationship is to provide the technical and training support needed for equipment installation and initial production. However, the day-to-day operation of the factory, including manufacturing and personnel management, is the responsibility of the business partner.

NEI identifies and recruits potential business partners by utilizing sources such as the Afghan Chamber of Commerce & Industry, the Afghanistan Investment Support Agency (AISA), relevant business associations and entities, and NEI's soy industry business network. These contacts will be made via in person meetings, email, and/or phone calls.

NEI seeks business partners who can financially contribute to the venture in the long term. As such, a detailed financial review or "vetting" of each potential candidate is conducted at the beginning of the negotiation process. Additionally, business partners should have relevant industry experience sand be familiar with the required raw materials, manufacturing equipment, and also existing sales and distribution channels. General information relating to these areas is gathered through in-person meetings, site visits, technical assessments, and land surveys.

As part of the due diligence process, NEI meets with the prospective business partner's senior management team to identify any potential issues with the capacity, human relations, or

organizational soundness of the business partner's company or management team which could negatively impact the venture.

Once a business partner is finalized who meets all NEI's requirements, a mutually agreed contract is signed by both parties.

SOY PROCESSING INDUSTRY DEVELOPMENT IN 2016

Soy processing adds value to the soy value chain by making high protein soy products available in the marketplace to meet consumer demand. Part of this strategy is to develop a diverse line of soy nutrition products to provide more options for Afghans to improve protein intake. Currently, the soy processing sector is able to produce roasted soybeans, full-fat soy flour, reduced fat soy flour, soybean oil, TSP, soy biscuits, soy milk, and tofu. Further diversification of soy products will lead to increased soy consumption and improved nutrition of the Afghan people.

2016 FACTORIES AND LABS

In 2016, NEI completed a variety of soy processing factory installations to bolster commercial availability of soy products. As a result, soy processing capacity increased from 2,500 metric tons (MT) to 4,000 MT annually.

NEI established a factory in Herat with a private partner that can produce full-fat soy flour and an extrusion line for production of wheat soya blend (WSB) for preparation of nutritious porridge. In addition, NEI established a roasted full-fat soy flour factory with a partner in Jawzjan. Both factories created 20 jobs, including operation and management staff.

New WSB Factory in Herat

Importantly, 2016 marked the beginning of NEI's most ambitious soy processing project to date – Afghanistan's first sterilized soy milk factory. The factory will produce 40,000 pouches per day, with an annual production capacity of 10 million pouches. The factory is expected to create 45 new jobs for Afghan citizens, including women. The installation and commissioning of

equipment was completed in April 2017. The factory is in operation now to produce test products which will be subjected to several months' evaluation for the quality and microbial safety . The new protein-rich soy milk will be sold in 190 ml pouches in four flavors - banana, chocolate, strawberry, and sweetened plain, with a 10-month shelf life requiring no refrigeration.

SOY PROCESSING TECHNICAL DEPARTMENT

In order to establish an effective and sustainable soy value chain, NEI employs a Technical department whose responsibilities include product development, equipment and system engineering, manufacturing services, quality assurance, and technical support.

One of the main activities of the Technical department is capacity building by establishment of new factories to support soy product market growth. In addition, the department develops new products for future processing sector endeavors. All of these activities are completed with the ultimate goal of soy value chain self-sustainability.

The Technical department also works with established factories to increase their technical and management capacity to produce high quality soy products. The department has established standard operating procedures (SOPs) and good manufacturing practices (GMPs) for each factory. The SOPs not only provide step-by-step instructions, but also include indicators to evaluate proper adherence to procedures for the employee, equipment and product. SOPs are also used as audit tools for all factories to verify that programs and procedures are in place.

Capacity Building Training to Newly Established Factory Operators

The Technical Department consists of following groups:

ENGINEERING

The Engineering group is responsible for engineering tasks related to the factory, which includes factory layout, equipment selection and procurement, installation and commission. This process begins with a capacity model that considers the costs of running the factory and capacity necessary to ensure a successful business model for the factory owner. This is both an iterative and hands-on process, with the team visiting the suppliers to evaluate processing equipment prior to purchase. Once equipment is procured and received, the Engineering group leads the installation and commissioning phases.

FOOD TECHNOLOGY

The Food Technology group oversees the research and development of new product with close collaboration with Marketing. In 2016, the following recipes were developed:

- Wheat soy blend recipe
- Four different soy biscuit recipes
- Four sterilized soy milk recipes (chocolate, banana, strawberry & plain)

All the above mentioned recipes are prepared based on the taste, energy and market requirements to provide shelf-stable and high energy soy products to customers.

In addition to new product development, the food technology group oversees development of norms for the acceptability of products for testing by the quality assurance group.

Sterilized Soy Milk Recipe Development at Product Development Lab - Korea

MANUFACTURING SERVICES

The Manufacturing Services group is responsible for supporting the factory operation and training of the operators. They also conduct plant trials n new product and commercialization. The Manufacturing Services group makes regular audit of the factories, in conjunction with the Quality Assurance group.

QUALITY ASSURANCE

Quality assurance testing occurs regularly during all phases of factory production to ensure all standards are met prior to the release of product from the factory. This involves testing of the raw materials and finished products and inspection of the process lines. There are numerous factors that are evaluated against the quantitative set standards.

Kabul QC Central Lab – Special Analysis Section

FUTURE PLANS

Soy value chain self-sustainability is possible with proper support from all participants in the soy value chain. For example, farmers' willingness to grow soybeans is a cornerstone of NEI's success in Afghanistan. Looking to the future, farmer efforts must be supported through strong growth in the soy market at all access points, including retailers, wholesalers, institutional partners, and government authorities. Market demand is necessary for the future success of the program. This aspect will be dealth more closely in the subject are report for 2017 soy market development.

NEI has taken an active role in driving demand through soybean awareness campaigns, and by working directly with retailers and wholesalers to provide access points for Afghan consumers to buy soybeans and other soy products. These efforts have started driving demand, but large-scale contracts are needed to further support farmer inventory and factory capacity going forward.

GOALS

SHORT-TERM

In 2017, NEI has recently established the first sterilized soy milk factory in Kabul, Afghanistan. This factory will produce 7,600 liters per day of four different flavors (chocolate, banana, strawberry and plain). In addition, NEI is currently establishing, with local business investors, two additional factories in Kabul and Mazar-e-Sharif each designed to produce reduced fat soy flour, soybean oil, and texturized soy protein (TSP).

NEI is constructing two new quality control (QC) labs to support its focus on providing nutritious, premium, and safe soy products. These include a QC lab at the sterilized soy milk factory and a microbiology lab at the Nutriana's Kabul factory. These facilities will develop and test new product concepts – particularly new soy milk formulations to meet consumer demand. They will also ensure the quality of soy milk products through periodic inspection throughout all production phases, including testing of raw materials, inline quality control tests, and inspection of finished products.

Sterilized Soy Milk Factory: Retorting System (2 Sets)

Sterilized Soy Milk Factory: De-hulling Equipment by Daesung Food Tech (Korea)

LONG-TERM

Self-sustainability is a foundational goal of NEI's work in soy food processing. Therefore, the Food Technology department will continue providing support to business partners, with a focus on coaching for self-reliance in day-to-day operations. As business partners become more expert in their operating their soy processing factories, the need for NEI's support will naturally decrease, whereas quality control assessments will maintain an independent and routinized schedule as required to maintain the SOP and GMP adherence.

NEI will also continue developing new soy food products to meet the needs of those Afghan's requiring more protein in their diet. In doing so, NEI will further its goal to eradicate protein malnutrition by actively participating in the food culture of the country.

IMPACT MADE IN AFGHANISTAN

As of December 2016, there were eight soy processing factories in operation in eight provinces of Afghanistan. Three more will be built by the end of 2017. Major impacts made by establishing the eight factories regionally (including pre-existing four) include the following.

- Processing capacity was increased from 2,500 MT /year to 4,000 MT/year. This increased demand requires more farmers to grow soybeans. This ongoing upward cycle results in the health and financial well-being not just for soy farmers, but for all Afghans engaged in the soy value chain.
- By building ten soy factories regionally, not at central with large capacity, both the processors and farmers will be eased in selling/procuring and transporting soybeans from farm gate, thus local economy can be developed in a sustainable manner.
- Establishment of the state of the art quality control and testing laboratories will not only support ensuring quality soy products manufacturing though chemical and physical testing and microbiological assays, but also can serve Afghan food industry, which lacks testing ability, to produce consumer confident food products.