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## Investment Outlook: Production and Processing of Soybean in Armenia

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### ABSTRACT

The aim of this paper is to present a perspective microbusiness opportunity by introducing new products for Armenian market. Those products are soymilk and tofu. They are plant-based dairy alternative products and are viewed as one of the best substitutes for dairy products. The scope of this paper examines a close-cycle production suggesting potential investors in this field to inhouse all the value-chain stages. Overall, 34200 USD of capital expenditure and 12400 USD investment in working capital is required to run a business. The calculations show that after 5 years this type of investment opportunity promises 67700 USD of NPV and 57.3 % of IRR with 1.8 years payback period.

### Introduction

Although there are significant technological changes in agricultural production and processing worldwide, the problem still exists for some segments of population in Armenia to find appropriate food alternatives corresponding to their needs. This paper introduces quite new products for Armenian market. These are plant-based dairy alternative products: soymilk and tofu (cheese made from soymilk). Soy-based dairy products are almost super substitutes for protein containing animal-based products, since they contain huge portion of protein (Arnarson, 2019).

The main and popular sources of protein are animal-based food like meat, egg, dairy products, etc. On the other hand, there are specific groups among the population who could

not consume such kind of products because of physical, psychological or cultural reasons. Eventually, they are not getting the extremely important nutrition for their organisms. Vegans are the main segment of population who do not use any of these products and somehow they should fill in the protein ration in order to follow healthy lifestyle. Some people are lactose intolerant, that is they have troubles in digesting a sugar called lactose, which is the carbohydrate found in cow's milk (Migala, 2019). Since soymilk and tofu originated in Eastern countries, the main consumers of these products are Indians and Chinese. During the last several years, the number of Indians is constantly growing in Armenia. Soymilk and tofu are widely used and popular products in the world. Western countries are also major consumers of soy product. Year

by year Armenia is becoming more popular country for tourists. The increasing number of tourists expands the soymilk and tofu market sizes. The industry, opportunities in the market, operations and financial aspects are further discussed in detail. All the estimations and calculations examined in this paper are based on the projections and forecasts for the first 5 years.

## Materials and methods

### *Soybean*

In 2019, 336.5 million metric tons of soybean was produced worldwide (The Soybean Processors Association in India, 2019); 100 g of boiled soybean contains 63 % water, protein: 16.6 grams, carbs: 9.9 grams, sugar: 3 grams, fiber: 6 grams, fat: 9 grams, saturated fat: 1.3 grams, monounsaturated: 1.98 grams, polyunsaturated: 5.06 grams, omega-3: 0.6 grams and omega-6: 4.47 grams (Arnarson, 2019).

For 1 hectare of soybean production, the inputs are the following: soy seed - 60-90 kg, phosphorus and calcium fertilizer - 60 kg, nitrogen fertilizer - 45 kg, “Kristalon” - 2 liters, “Maxim XL” - 1 liter/ton, “Regent” - 10 liter/ha, “Pantera” -1.5 liters. The vegetation period lasts 75-200 days. Soybean yield is 2.5 tons per ha (Ministry of Agriculture of the Republic of Artsakh, 2018).

For production purposes, soybean is not cultivated in Armenia yet. However, there are several small soybean plants, which are used for scientific experiments (Ministry of Agriculture of the Republic of Artsakh, 2018).

### *Soymilk*

Soymilk is the best substitute for cow milk among plant-based dairy alternative products, since it contains approximately the same amount of protein. Also, soymilk is considered to be as a healthy food for diabetics and people who are in diet, since unflavored soymilk contains negligible quantities of sugar and low calories. Soymilk is also preferred by heart patients, since it lowers bad cholesterol level. It is naturally lactose-free and rich in iron (MACMILLAN, 2018).

The 225 g soymilk contains 80 to 100 calories, 4 grams of carbohydrate, 1 g sugar, 4 g fat, and 7 g protein. It also contains potassium, calcium, vitamins A, B-12, and D (Industry Europe, 2019).

Plant-based dairy alternative products have also environmentally positive impacts in terms of land and water use as compared to the cow milk. Production of

almond, oat, rice and soymilk reduces carbon emission about three times and decreases land utilization rate (Oakes, 2020).

The main ingredients for soymilk production are water and soybean. For producing 1 liter of soymilk, 100 g soybean is required.

### *Tofu*

Tofu, cheese made from soymilk or soya curd, is produced by curdling soya milk with a coagulant. It is nutrient rich, easy to digest, cholesterol reducing and isoflavones-rich product having all the useful characteristics as soymilk. In order to make 300 grams of tofu, 1 liter soymilk is needed (Soya 2020).

The main ingredient of tofu is soybean. In refrigerator tofu can be kept up to 60 days (Frey, 2019).

### *Production leftover*

While making soymilk, production leftover appears in the form of curd. It is a protein-rich mass which the majority of producers just throw away. Nevertheless, the others use it to make other soy products like cottage cheese, etc. For the examined investment opportunity, it is suggested not to throw away the production leftover, since it is considered to be very nutritional animal feed. It can be used in the farms, animal shops or in Yerevan zoo. The quantities of production leftover are very limited. After producing 100 liters of soymilk, only 4 kg of leftover appears.

### *Industry overview*

In 2018 soymilk market value amounted to 15.33 billion USD worldwide. In 2025, market value is forecasted to be 23.2 billion USD (Shahbandeh, 2018, Market value of soymilk worldwide from 2018 to 2020). The CAGR of soy beverages market in Asia-Pacific region is expected to grow by 5.9 % during 2018-2023 (Shahbandeh, 2018).

For Armenia, soymilk and tofu are new products in the market. However, soybean is widely used in food manufacturing industry, particularly in meat processing factories as an important ingredient. Soybean is imported to Armenia. The quantities and prices for the last 19 years are presented in Figure 1.

It is visible that import quantities and prices had cyclical pattern during the last 19 years. The maximum quantity, 1537 tons of soybean, was imported in 2005 and the minimum quantity of import was in 2016. So, the import quantities and prices are forecasted to be mainly the same

during the upcoming 5 years. The quantities vary from 20 to 23.8 tons and the price per ton is approximately 520 \$ (in the boarder, without tax, transportation, overhead and other costs). The CFD data, generated from simulated results, have shown that the chance of import price being higher than expected price is 60 %.

The research was conducted in Yerevan's supermarkets and big retail stores. Tofu was not found in any supermarket or store. Only imported (from Germany) soymilk was noticed in "SAS" supermarket with a very high price (1450 AMD). The producer is "Alpro GmbH" multinational company.

In addition, a survey was conducted with randomly selected 150 respondents. It has shown that more than 80 % of population has no information about soy products and approximately 30 % hasn't even heard anything about soybean. After additional informative description about characteristics of soy products, the question was asked to respondents: "Would you switch from dairy products consumption into soy-based dairy alternative products?" The results show that people are mostly ready to switch from dairy products consumption into soy products if the taste (48 %) and price (28 %) were preferable for them.

#### Target market

Protein is considered to be one of the most important nutrition for people's health. The daily requirement for protein depends on age, weight, sex and other factors. Animal-based products like meat, egg and dairy products are the main sources of protein. However, there are specific groups among the population who could not consume such kind of products because of physical, psychological and cultural reasons. In order to fill in the protein requirement

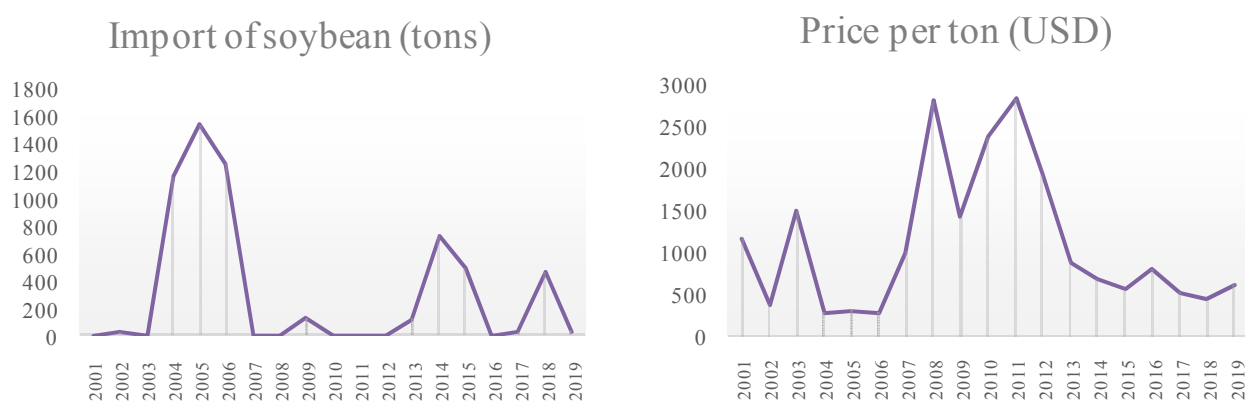
and get the important nutrition, these people consume plant-based products, which are considered to be a source of protein. Soy is one of the richest protein containing plants and different products made from soybean are widely used across the world.

The direct target group for soymilk and tofu are vegans who do not use any animal-based food. Somehow, they should fill in their protein ration in order to follow healthy lifestyle. There are more than 47 vegan or vegetarian cafes and restaurants in Armenia. They are considered to be a direct market, where the targeted customers can be found. By comparing Armenia with other countries with the same sizes and culture, it is estimated that approximately 2 % of population in Armenia are vegans or vegetarians.

Some people are lactose intolerant, which means that they have troubles with digesting a sugar called lactose, which is the carbohydrate found in cow milk (Migala, 2019).

About 15 %-30 % of population in Armenia is lactose intolerant, which means that they exclude cow milk from their food ration (NOBBS 2020). Those are considered to be in the target group for soymilk, but for the initial stages it is not suggested to include lactose intolerants in direct target group. However, they could be still viewed as a potential market and in long run could be included in the target group. Another potential market to be targeted are Indians (living in Armenia), since soymilk and tofu originated in their region and are the important ingredients in their cuisine and culture. In 2019, approximately 15000 Indians migrated to Armenia for work.

Soymilk and tofu are widely used and popular products in the world. It is forecasted that soymilk market would boost in the coming years (Grand view research, 2019).



**Figure 1.** Soybean import quantities and prices per ton (2001-2019) (*Statistical Committee of the Republic of Armenia (2001-2019)*).

More and more tourists are visiting to Armenia each year. Some part of the tourists might be soymilk or tofu users. So, the tourists are also considered to be a part of target group. In 2019, the total number of tourists visiting to Armenia was 1894377 (Ministry of Economy of the Republic of Armenia, 2020).

On average 6 % of tourists visiting to Armenia are expected to be vegans or just soy products' customers. So, the increasing number of tourists expands the soymilk and tofu market sizes. It is calculated that the total demand in the market for soymilk in Armenia is 760 liters (excluded lactose intolerant people) and for tofu 380 kg per day. The calculation is shown in Table 1.

Vegans are mainly found in Yerevan. As was mentioned, approximately 2 % of population in Armenia are vegans. The population in Yerevan in 2019 was 1081800 and 2 % of it was equal to 21636 vegans. According to the Ministry of Economy of the RA, the number of tourists visited to Armenia in 2019 was 1894377. On average 6 % (113663) of tourists visiting to Armenia are soymilk and tofu users. In 2019, 1907 Indians were registered in Armenia by getting living right. In the same year, 15422 Indians migrated to Armenia as workforce. They spent approximately 8 months in Armenia, from March to October.

On average, Armenians consume 20 liters (50mg daily) of cow milk and 10 kg (25 g daily) of cheese annually (Statistical Committee of the RA, 2019). Since soymilk and tofu are new products and market needs to adapt to these products, the expectations regarding to consumption rate are not the same as cow milk and cheese. The expectations are a little bit pessimistic and it is anticipated to have 20 g of daily soymilk consumption and 10g of tofu consumption in Armenia.

**Table 1.** Daily demand for soymilk and tofu in Armenia\*

Target groups	Number of people in targeted market	Daily use of soymilk (liter)	Daily use of tofu (kg)
Vegans	21 636	432.7	216.4
Tourists	113 663	87.2	43.6
Indians	1 907	38.1	19.1
Indian workforce	15 422	202.8	101.4
Total	152 627	760.8	380

\*Composed by the author.

#### *Production and sales volumes for the 5 years*

For the first 5 years, the assumption was made to cover 25-30 % of the total demand given the capacity to produce 630 liters of soymilk daily. Because it is unknown how the market will react to the new products, for the first 4 year company will produce less than its maximum capacity and in the 5th year it is going to produce in its maximum. First year of operations, by covering 25 % of market, 200 liters of soymilk and 90 kg of tofu should be produced daily. Each year the production is going to increase by 6 % since more and more people will be informed about soymilk and tofu. Production quantities are shown in Table 2. They are in line with the monthly demand.

#### *Operation plan*

Before starting the operations, there is a need to obtain the following assets: land for soybean cultivation, building for organizing the production and warehousing the soybeans, soymilk and tofu making machine, bottling machine, refrigerator for keeping the inventory, other equipment and materials used for production, a vehicle with refrigerator for final product delivery and other non-tangible assets like certification, company's logo, design, etc. Since it is a microbusiness opportunity, the capital expenditures are minimized. For example, in order to promote plant cultivation, government provides agricultural rental land for 99 years with a very affordable and attractive price. So, instead of making large capital investment and buying 10 hectare land, it is better to rent land for soybean production. First, it is cost effective, second in case of losses the business will be liquid and could quickly shut off. The soymilk making and bottling machines will be imported from Russia. The capacity of soymilk and tofu making machine is 80 liters per hour spending 10.5 kw electricity.

**Table 2.** Production volumes for 5 years\*

Product	Production Volume				
	Year 1	Year 2	Year 3	Year 4	Year 5
Soymilk (liter)	150 000	159 000	168 600	178 500	189 000
Tofu (kg)	27 273	28 909	30 727	32 636	34 727
Production leftover (kg)	6 000	6 360	6 744	7 140	7 560
Soybean (kg)	10 000	9 100	8 140	7 150	6 100



In order to start operations, 120 sq. meter building including production, warehouse and office area is required.

The cost for 1 ha soybean production is 1240 USD. After harvest in November, the soybeans can be transported to warehouse. Then, the main production of soymilk and tofu can start. Since working day is 8 hours, the maximum daily capacity for making soymilk is 640 liters. For making 1 liter of soymilk 100 grams of soybean needs to be grinded with water. After grinding process, the soymilk making machine boils the milk with steam, then by filtering the mass, machine gets the final milk. Meanwhile, during the process some extracts could be added into the milk in order to change the specific smell of soybean. After producing the soymilk, the predetermined quantity passes to the next stage of production. The milk as final selling product goes to bottling process and the rest goes to tofu making process. After bottling, soymilk goes to refrigerator room.

For tofu preparation, coagulant is added to the milk, with gently stirred soymilk to be mixed for 15 minutes. After small white curds of tofu appear in an amber liquid, it is time to transfer the coagulated dispersion into a mould lined with cheese cloth. After water filters from curd, the mass should be held under pressure about 20 minutes with the special form. In order to give extra texture to tofu, it needs to be covered with water and taken to refrigerator. In order to make 300 grams of tofu, 1 liter soymilk is needed.

As a result, 20 kg of production leftover appears in the end of each day. Every day the produced soymilk, tofu and production leftover can be delivered to distribution centers. Soymilk could be delivered to fitness clubs, hotels, coffee shops, big supermarkets and some small retail stores located in the areas where Indians usually live. Tofu would mainly be delivered to restaurants, hotels and again the same stores where soymilk is delivered. After each year, the unused soybean will be sold to food manufacturers, specifically to meat processors. The total soybean yield is expected to be 25 tons yearly (2.5 tons per hectare).

### Marketing activities

Soymilk and tofu are in introductory stage and by entering the market producers should start actively inform the targeted customers about characteristics of product. As was mentioned, the target groups for soymilk and tofu customers are vegans or vegetarians (both local population and tourists) and Indians living in Armenia. It is calculated that approximately 167000 USD is required to spend on marketing campaign for the first 5 years of operations. The budget is preferable to spend on website development, local events, where the business could present itself against business community, targeted social media marketing,

participating and presenting products on TV shows related to cuisine, participation in international expos twice a year in order to be informed about the latest developments, new players and overall trends in the market. The proportion of each marketing activity is shown in Figure 2.

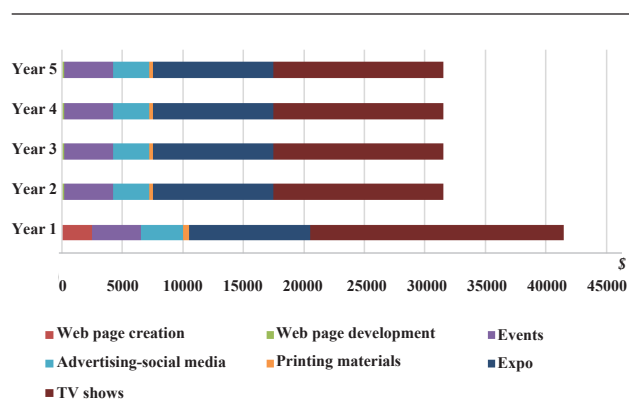


Figure 2. Marketing expenses (composed by the author).

### Risk assessment

Soybean production and its further processing for making soymilk and tofu contain mainly external risks. The main risk is associated with market reaction to soymilk and tofu, since they are new products for Armenian market. Even though the active marketing campaign would start in early stages of the business, however market may not accept them.

The business model was developed based on the assumption that each year the entity would cultivate the soybean and then use it for soymilk production in the next year. Soybeans will be cultivated in open field and there is always risk of loss because of plant diseases, weather instability, etc. There is no insurance package in Armenia for soybean cultivation yet. It could significantly reduce the losses. This is the second external risk that is hard to control without insurance. The risk management template is presented in Table 3.

### Results and discussions

Soymilk and tofu are the core products presented in this investment outlook paper. This paper suggests organizing a close-cycle production, in view to cultivate soybean for further processing and soymilk production. It will significantly decrease the costs, mitigate several risks and ensure constant high quality products. In the frame of this paper the cultivation of soybean is examined within 10 hectares of land area.

**Table 3.** Risk management template\*

Risks	Consequences	Description	Response action	Risk response	Actions for risk response
Problems with soy production and processing technology	Additional costs to find proper technology, potential losses during production	Low	Needs corrective action within 1 month	Reduce the risk	To talk with the top experts and scientists, try to find the best and most efficient production technologies
Finding relevant staff	Added costs on trainings, retention costs, etc.	Low	Needs corrective action within 3 months	Reduce the risk	Choose staff with relevant education and constantly develop their knowledge and working abilities
Plant diseases and insects	It is a cost to fight against insects and diseases. As a result entire yield could be damaged and cause huge losses.	Moderate	Needs corrective action within 1 month	Reduce the risk	Properly and timely fertilize, irrigate and cultivate the land and plants
Market adaptation	Market could not accept the product, business would make no sales.	High	Does not currently require corrective action	Reduce the risk	Start an aggressive marketing campaign and inform people how useful and healthy goods are soy products
Weather instability	The whole yield could be damaged stopping business operations and causing significant losses.	High	Needs immediate corrective action	Transfer the risk	It is the most uncertain risk in agriculture. For risk mitigation we can start soy production in land which has anti-hail station near it, protect plants from freezing, etc.
Imported low cost soy and soy products	Sales will drop significantly	Low	Does not currently require corrective action	Accept the risk	This is a risk, which we could not control. So the only tool is to be effective in order not to let imported products compete with us.

**Table 4.** Profit maximization problem with Excel add-in\*

<b>Variable values to manipulate</b>	310	100			
<b>Names of decision variables</b>	Profit milk	Profit tofu	SUM		
<b>Objective to maximize</b>	1.109831	2.5976588	603.8135		
<b>Capacity for milk and tofu</b>	1	3.3	640	≤	640
<b>Demand for milk</b>	1		200	≥	250
<b>Demand for tofu</b>		1	90	≥	100
<b>Nonnegative constraint</b>	1	1	0	≥	0

\*Composed by the author.

The harvested soybean will be used for soymilk and tofu production. Some portion of soybean will be sold to meat processing companies as an ingredient for their production. Finally, during production of soymilk, very useful, protein-rich production leftover appears which could be sold as animal feed. It will be an additional source of revenue and mitigate the risks of loss.

The target groups for soymilk and tofu are mainly vegans or vegetarians, lactose intolerants, Indians and soybean based product user tourists. Total daily market demand is projected to be 760 liters for soymilk and 380 kg for tofu. Given the demand and capacity constraints, profit maximization problem was solved with “Solver” Excel add-in, which has shown that for the first year 200 liters of soymilk and 90 kg of tofu should be daily produced (Table 4). As a result, 20 kg of production leftover appears in the end of each day. The import quantities and prices of soybean are forecasted (by Simetar Excel add-in) to be mainly the same during upcoming 5 years.

The quantities vary from 20 to 23.8 tons and price per ton is approximately 520\$ (in the boarder, without tax, transportation, overhead and other costs). The CDF data, generated from simulated results, have shown that the chance of import price being higher than expected price is 60%. So, comparing with price imported soybean could not compete with locally cultivated one.

Since in this paper microbusiness opportunity is examined, the financial requirements are also humble. For starting the business operations, 34 200 USD capital investment is required. The capital is required to cover the following pre-production costs: purchase of building, repair of the building in order to satisfy all the requirements obligatory for organising food production, machinery and equipment for soymilk and tofu production, machine for soymilk bottling, refrigerator for warehouse, vehicle for final product distribution and other marketing and legal costs (certification, company logo, etc.). The costs are presented in Table 5.

**Table 5.** Capital expenditures (USD)\*

Name	m/u	quant	price	Total value
<b>Production area</b>				
Building across Yerevan	Sq.m	120	100	12 000
Repair	Sq.m	120	50	6 000
<b>Total Factory</b>				<b>18 000</b>
<b>Equipment</b>				
Machinery for making milk	unit	1	2 037	2 037
Machinery for bottling	unit	1	1 360	1 360
Refrigerator for warehouse	unit	1	200	200
Other equipment			1 000	1 000
<b>Total Equipment</b>				<b>4 597</b>
<b>Machinery</b>				
Vehicle	unit	1	7 000	7 000
<b>Total Machinery</b>				<b>7 000</b>
Company logo/design/certification/other costs				4 600
<b>Total Capex</b>				<b>34 197</b>

\*Composed by the author.

Besides, for producing soybean in 10 hectare (25000 tons of yield) land area, 12400 USD is required (the cost for 1 ha is presented above). Based on 5-year financial results, net present value (NPV), internal rate of return (IRR) and payback period for this type of business opportunity were calculated. The weighted average cost of capital was calculated to be 14.67 %. For the 5 years' projections, NPV is equal to 67700 USD, IRR is equal to 57 % and payback period is 1.8 years. So, the financial part of the business is more than attractive as it is profitable and IRR is greater than WACC.

Also, soy products open a wide range of creativity in relation with new products' introduction to the market. One of the main reason is the fact that soy milk or tofu themselves have no any specific flavor. They take the smell and flavor of a meal with which they are used or mixed. For example, by frying tofu with meat, tofu would have the same taste as meat. The same process could be organized during soy milk and tofu production processes. Different tastes and smells could be added to products and presented to the market satisfying all the customers' wants and needs.

## Conclusion

The successful microbusiness opportunity is presented in this investment outlook. Even though the market and products (soy products) are new for Armenian market, there is an unsatisfied demand in the market for these products. There is a need to actively inform targeted groups about healthy and useful characteristics of soy-based dairy alternative products. Since market is in introductory stage, it is recommended to inform about products as many people as possible in the first 5 years of business operations.

For the start of soybean cultivation in 10 hectares of land area and for its further processing, overall 46600 USD investment is required among which 34200 are capital investments and 12400 USD are working capital expenditures. After 5 years, business NPV is forecasted to be 67700 USD and IRR - 57.3 % which is quite high comparing with 14.67 % WACC.

However, business is closely linked to agriculture and final products (soymilk, tofu) are new in Armenian market, thus, the business contains several risks.

By summing up the business opportunity, the overall impression is positive. It is a real, viable and prospective investment opportunity in the worldwide growing soybean market.

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