
**INTERNATIONAL CENTER FOR AGRIBUSINESS
RESEARCH AND EDUCATION**



**Assessment of Training Needs and Skill Development of the
Armenian Winemakers**



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Acknowledgement

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Study Goal

The main goal of this research was to improve the perception of the experience and needs of winemaking companies in Armenia, as well as to identify training and technical assistance needs for wine technologists. The research also pursued the goal of involving winemaking companies in the modernization and reform of the existing academic curricula, identifying the preferences of the operating wineries in the winemaking educational programs. The study identifies the skills, abilities and experience that wineries expect from their new employees who have a potential of becoming winemaking technologists in the particular companies.

The first focal point of this study is the needs assessment for training of operating wine technologists, as a result of which it is envisaged to develop and implement training programs in winemaking sector jointly with well known foreign universities. The next focus was the curriculum of the specialty of fermentation technologies and winemaking. The technological education should be in line with the modern developments and meet the employers' needs. Therefore, the industry should have an active role in development and/or improvement of curricula. After all, one of the goals of this study was to quantify the preferences of Armenian wineries from the standpoint of educational programs focusing on preparation of future wine technologists.

Methodology

During the study, all wineries operating in Armenia were visited and face-to-face interviews were conducted with the directors and/or wine technologists. Despite the fact that there are contradictions in the official statistics regarding the real number of the winemaking companies operating in Armenia¹, the research indicated that as of August 2013, 27 companies operate in the winemaking sector in Armenia.

Two questionnaires were used during the study: the first one was to identify the training needs in the operating wineries, the current situation and problems in the wineries (WTNA), while the second one was focused on identification of skills, abilities and experience necessary for future winemakers for the purpose of improvement or development of new curricula or educational programs in winemaking (FWSA).

The second questionnaire was based on Litzenberg's and Schneider's AGRIMASS (The Agribusiness Management Aptitude and Skill Survey) conducted in 1980's and adapted and localized to Armenian conditions and modern winemaking principles. The survey tool was focused on total of 83 parameters that were grouped into the following 7 categories: 1. Wine production; 2. Viticulture; 3. Technical skills; 4. Communication skills; 5. Personal qualities; 6. Employment and work experience; 7. General experience in the higher education. The second survey was participated by 36 people – 21 directors or owners and 15 winemakers.

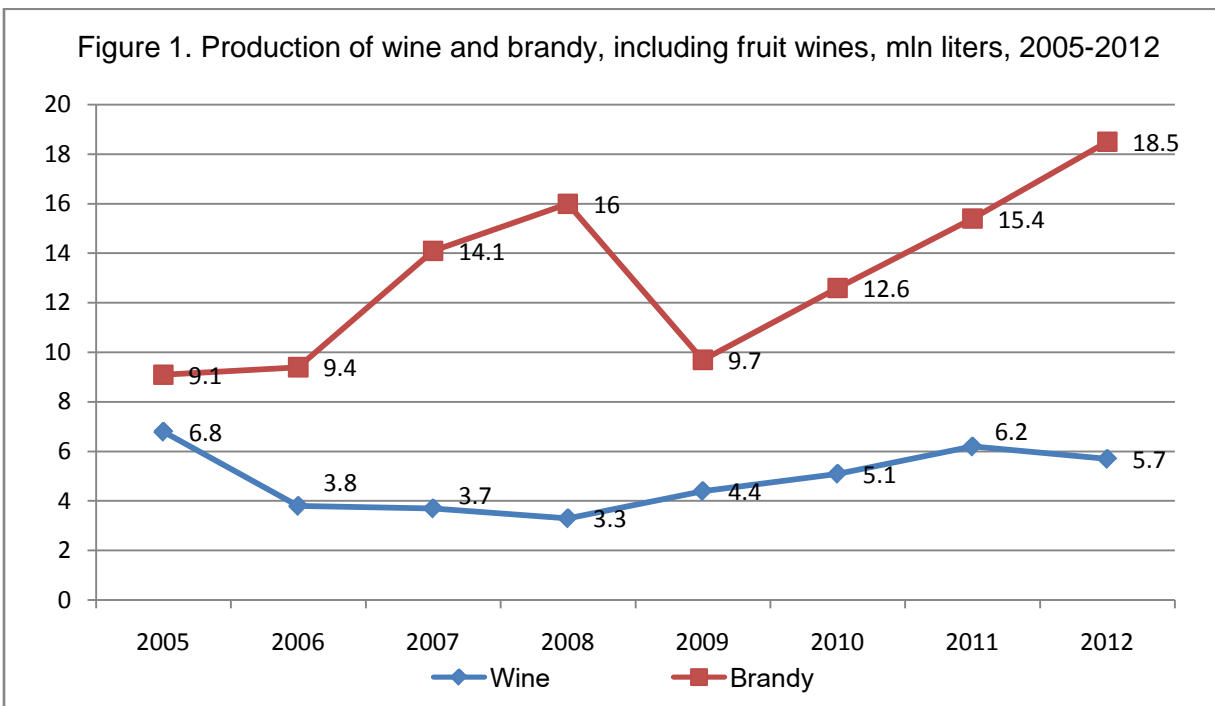
The methodology was based on ranking of those skills so that during curriculum development they could be taken into consideration according to their importance and included in new or existing courses.

¹ The RA Food Security Concept Paper (approved 18.05.2011) says 65 grape processing companies are in operation in Armenia. The website of the RA Ministry of Agriculture mentions 45 winemaking companies, EV Consulting's research claims about only 20 companies, and The RA National Statistical Service reports about 21 winemaking companies.

Through the 5-point Likert scale, the relative importance of each characteristic as well as the ranking of each category was shown. An average response and the general ranking (out of 83) were provided. For each category, p-value (actual level of significance observed through tests) was calculated and compared with the selected 0.05 level of significance, using the comparison of the response for each skill relative to the mean value. The results included also the difference of each response from the mean value and the general ranking of each skill.

Brief review of the Armenian winemaking sector

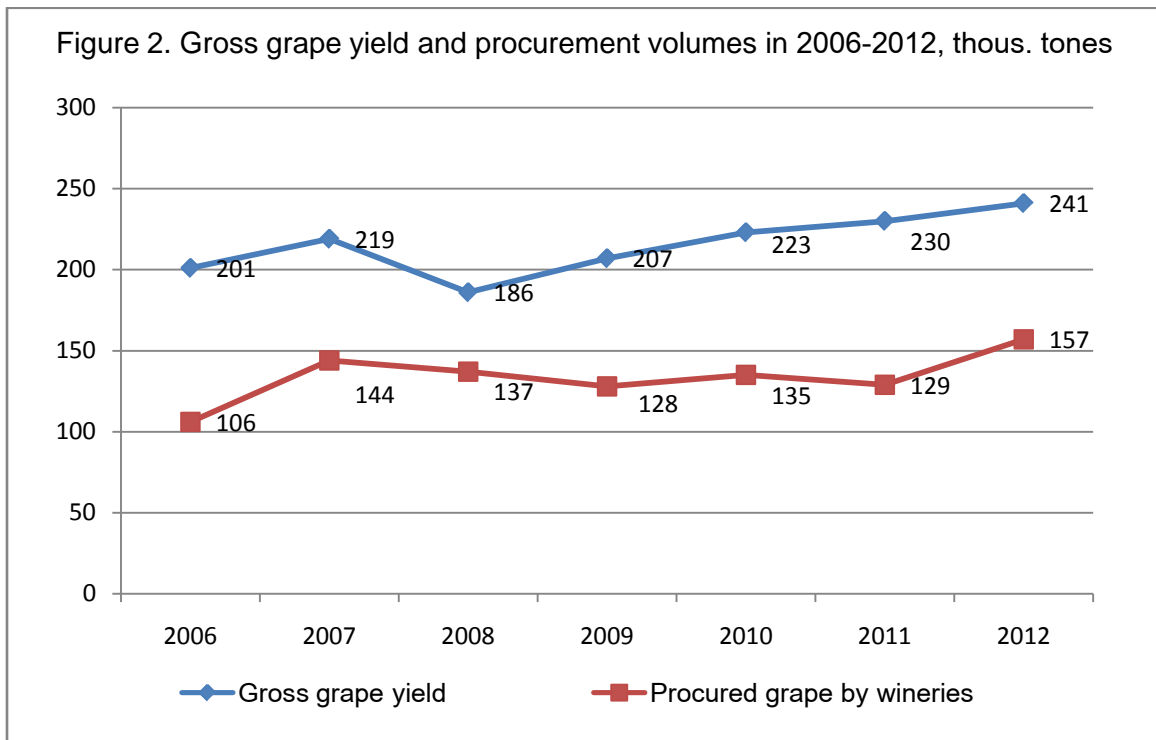
Prior to independence, 2 industrial unions, 3 large winemaking factories and 26 wine plants were involved in brandy and wine production². According to the data of the RA NSS, during the first 7-8 years of independence, wine production decreased more than 30 times in the country, the production of champagne – more than 3 times, and that of brandy – 5 times. In late 1990’s production of wine started to be rehabilitated, although in a small pace. Over the last 7 years, the wine production is within the range of 3.8mln - 5.8ml liters and is still lower than the highest level recorded in 2005 - 6.8mln liters. It’s worth mentioning that the wine production reached to its historical minimum level in 2008 - 3.3mln liters (see Figure 1). In 2007-2011, growth in the production volume was observed due to the increase in both local and foreign investments over the recent years. During the last few years, large investments were made in the winemaking sector, especially for purchasing progressive technologies and modernization of production processes. However, in 2012 decrease was recorded in the production again. The sector is negatively impacted also by unfavorable weather conditions and natural disasters.



Source: NSS.

² A. Harutyunyan – Viticulture and winemaking in Armenia, 2007

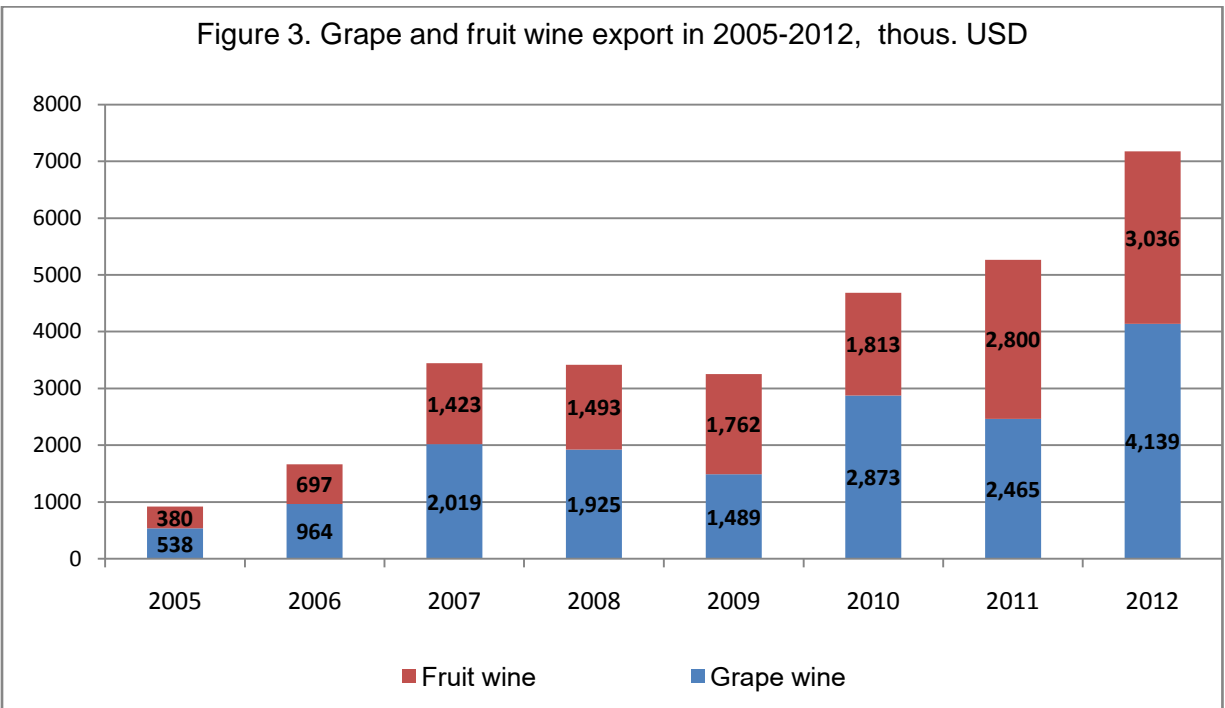
While the gross yield and the volumes of procurement by wineries were increased, decrease in the wine production was recorded in 2012 (see Figure 2). These fluctuations in the quantities of wine production are largely the result of the lowered internal demand, while export of wine, even though increased during the recent years, does not show signs of forming any specific tendencies or sustainable markets. There is little or no culture of wine consumption in Armenia given the fact that per capita the country annually consumes only 1.4 liters of wine (Wine Institute - 2010). In recent years, growth of the share of wine in the structure of alcoholic beverages is noticed: 11% in 2010 vs. 7.6% in 2005 (EV Consulting, 2012). Most of the Armenian consumers don't have strict requirements for the quality of wine, which is yet another constraint in the sector's development. The wineries feel this too and are more likely to produce brandy rather than wine. Many winemaking companies insist that wine is not or not so profitable, so they shift to production of brandy.



Source: NSS.

Wine export has been rapidly growing in the recent years. Over the last 7 years, this growth is on average about 34% annually. The export growth rate of fruit wines slightly exceeds that of grape wines: 35% (see Figure 3). In 2012, compared with 2008, 2.5 times more wine (in tons), was exported from Armenia, and in the first half of 2013 the growth rate was almost doubled (see data of www.customs.am). In 2012 1.2 mln liters of grape wine (62% more than in 2011) and about 1 mln liters of fruit wine was exported from Armenia (15% growth as compared with 2011).

The geography of wine export is almost unchanged: the traditional markets, the Russian Federation and the CIS countries, predominate. The geography of export tends to expand towards China and some African countries. However, there is no periodical export of Armenian wines to these countries, plus mainly small quantities are exported.



Source: www.customs.am

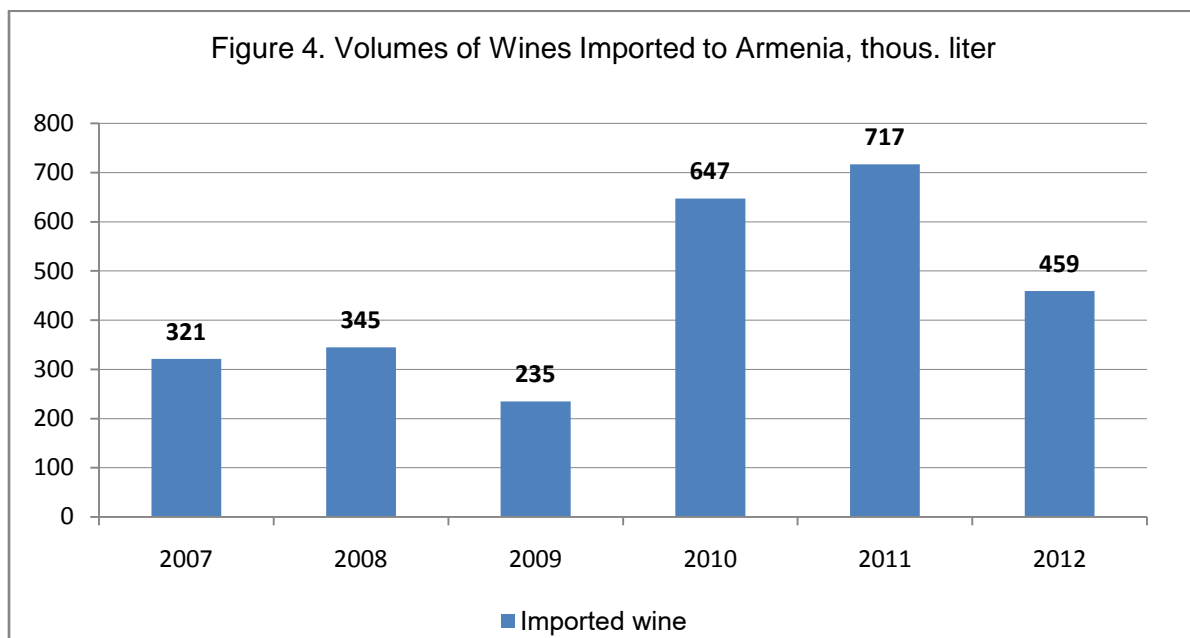
The table below shows that more than 80% of the exported grape wine and about 65% of fruit wine is the share of the Russian Federation. In 2012, a noticeable growth of grape wine export to Belarus, Germany, Lithuania, Kazakhstan, Ukraine, Czech Republic and, surprisingly, to Georgia and France was observed. Apparently, the factor of the Armenian Diaspora plays an important role in the last cases. Compared with 2011, in 2012 mainly the volume of fruit wine export was decreased to the US, Germany, Ukraine, and China (see Table 1).

Table 1. Wine export, by countries

			2011	2012
Belarus				
	Grape wine	th. l		11.7
Bulgaria				
	Grape wine	th. l		2.6
Germany				
	Grape wine	th. l	1.4	6.2
	Fruit wine	th. l	80.2	71.8
Italy				
	Grape wine	th. l		1.1
Poland				
	Grape wine	th. l	4.4	5.5
	Fruit wine	th. l	3.5	8.4
Lithuania				
	Grape wine	th. l	17.4	31.9
	Fruit wine	th. l	23.8	56.1
Cameroon				
	Grape wine	th. l	11	

Kazakhstan				
	Fruit wine	th. l		10.7
USA				
	Grape wine	th. l	55.7	46.8
	Fruit wine	th. l	187.1	135.5
Ukraine				
	Grape wine	th. l	4.5	7.9
	Fruit wine	th. l	42.6	31.3
Czech Republic				
	Grape wine	th. l	6.8	13.1
	Fruit wine	th. L	3	7.2
China				
	Grape wine	th. L	0.3	3.8
	Fruit wine	th. L	12.9	1.1
The Russian Federation				
	Grape wine	th. L	571.5	962.6
	Fruit wine	th. L	494.9	655.7
Slovakia				
	Fruit wine	th. L	10.4	
Republic of Georgia				
	Grape wine	th. L	11.6	20.8
Tajikistan				
	Grape wine	th. L		1.6
France				
	Grape wine	th. L	9.1	19.9
	Fruit wine	th. l	3.9	4.8

Source: www.customs.am



Source: www.customs.am

As to the wine imported to Armenia, its volume, which was growing during the recent years, recorded a sharp decrease in 2012 – by about 35% (see Figure 4). This can perhaps be explained by the decrease of the purchasing power demand of the population and by the growing emigration.

The wineries in Armenia still have a number of problems. The production and quality management systems still do not meet to the international standards. Despite the investments made in the sector during the recent years, a large number of wineries continue using outdated technologies, which, undoubtedly, affects the quality of wine.

In this study we will focus on one of the problems – professional training of winemaking technologists.

The previous studies have shown that the wineries themselves prefer to prepare specialists through on-the-job training and rarely through other trainings. Some enterprises prefer to invite specialists from abroad (EV Consulting, 2012).

Below are the data of the 27 companies having participated in the study.

Table 2. Armenian winemaking companies that have participated in the survey.

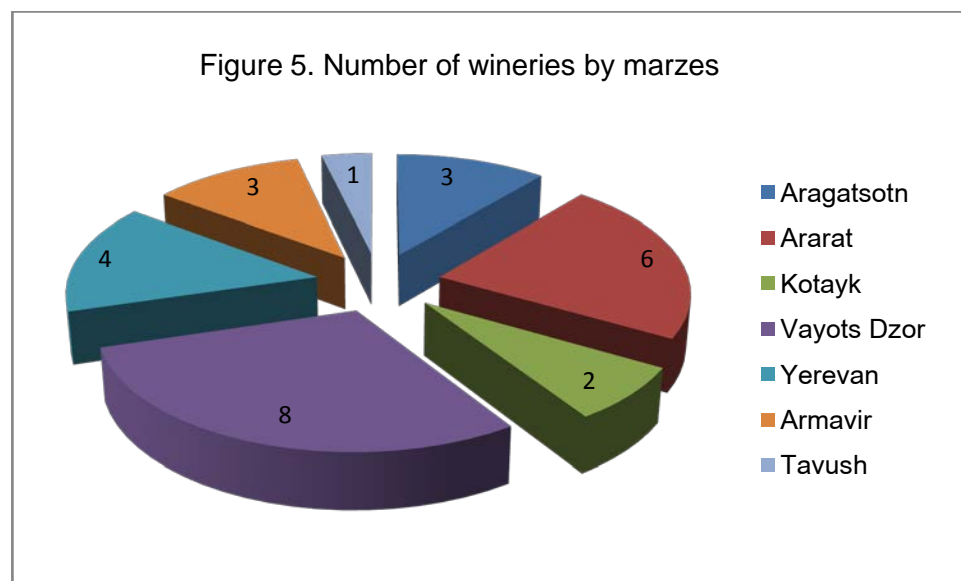
#	Company name	Location
1.	Voskevaz Winery LLC	Voskevaz, Aragatsotn marz
2.	Artsahat Wine Brandy Factory CJSC	Artashat, Ararat marz
3.	Golden Grape Armas LLC	Nor Yedesia, Aragatsotn marz
4.	Yerevan Champagne Wines Factory OJSC	Yerevan
5.	Glanzh Alco LLC	Aramus, Kotayq marz
6.	Vedi Alco LLC	Ginevet, Ararat marz
7.	Armenia Wine LLC	Sasunik, Aragatsotn marz
8.	Ijevan Winery CJSC	Ijevan, Tavush marz
9.	Shahumyan Vin LLC	Shahumyan, Ararat marz
10.	Getap Winery (Vedi Alco LLC)	Getap, Vayots Dzor marz
11.	Getnatun LLC	Yeghegnadzor, Vayots Dzor marz
12.	Kimley LLC (Areni Village Wines)	Areni, Vayots Dzor marz
13.	Maran LLC	Parakar, Armavir marz
14.	Metrs Syuniq CJSC	Aghavnadzor, Vayots Dzor marz
15.	Vayq Group CJSC	Vayq, Vayots Dzor marz
16.	Saki and Sons CSJC (Zorah Wines)	Rind, Vayots Dzor marz
17.	Arpa Alco LLC (Areni Winery)	Areni, Vayots Dzor marz
18.	Gold Var LLC (Ginevan Winery)	Abovyan, Kotayq marz
19.	Van 777 LLC	Tapetakan, Ararat marz
20.	MAP CJSC	Lenughi, Armavir marz
21.	Ararat Winery LLC	Ararat, Ararat marz
22.	Alvan Alco LLC (Lukahsin Winery)	Lukashin, Armavir marz

23.	Edvag Group LLC (365 Wines)	Yerevan
24.	Shato Arno LLC	Ayntap, Ararat marz
25.	Proshyan Brandy Factory LLC	Yerevan
26.	Mancho Group LLC (Astafyan Winery)	Yerevan
27.	SAR-KOP LLC (Vagharshapat Winery)	Echmiadzin, Armavir marz

Source: ICARE.

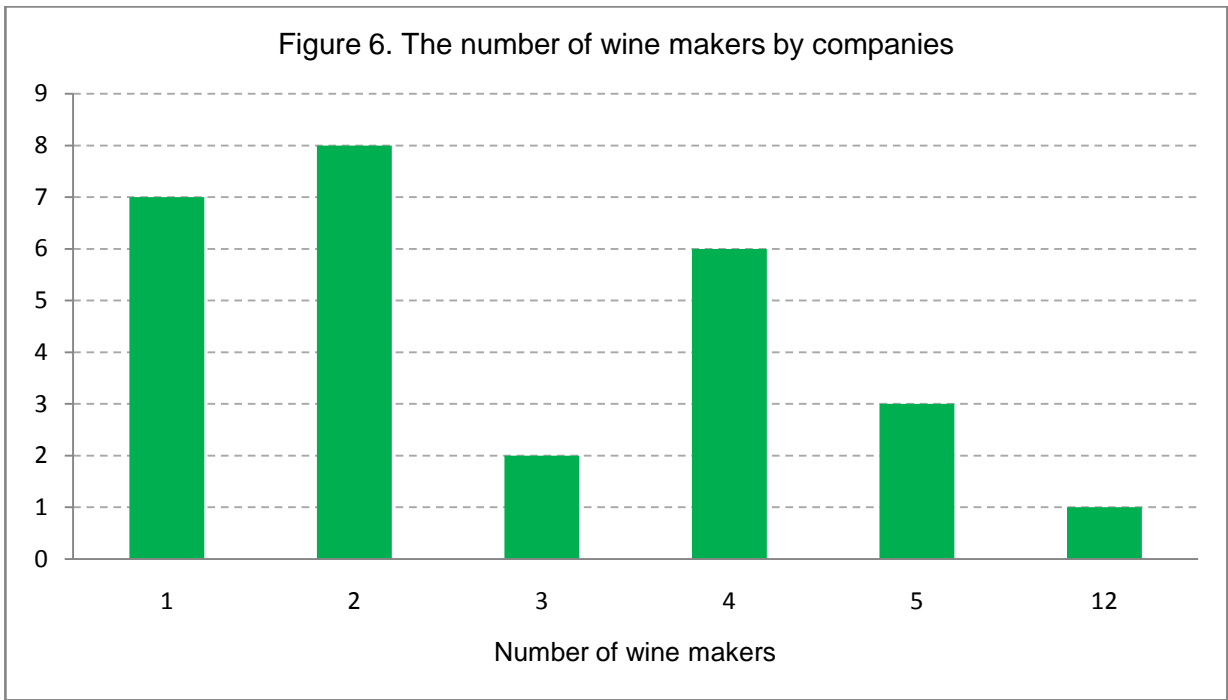
General description of winemaking companies

The table show that about 30% of the wineries are in Vayots Dzor marz, and 22% are in Ararat marz (see Table 2). The distribution of the wineries by marzes is shown in the below figure:



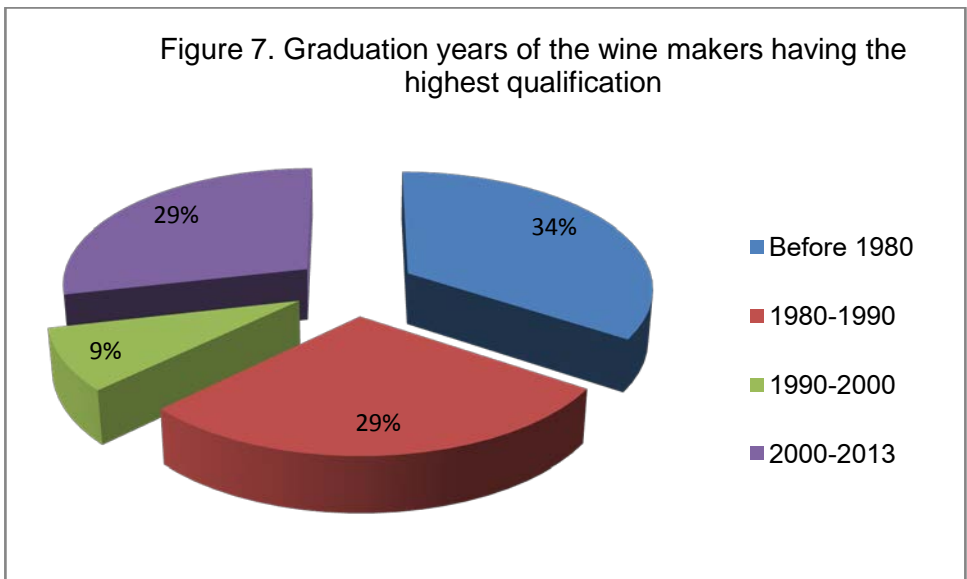
Source: ICARE.

The oldest company is Artashat Wine Brandy Factory established in 1905, and the youngest company is Golden Grape Armas established in 2012. Total of 79 winemakers work in the wineries. About 55 percent of the wineries have only one or two winemakers, while some others have 4 and more winemakers.



Source: ICARE.

One of the wineries had even 12 winemakers (see Figure 6). All winemakers in all wineries are actually winemakers by profession and almost all of them are graduates of the Armenian National Agrarian University (formerly Armenian Agricultural Institute, Armenian Agricultural Academy and Armenian State Agrarian University). Two wineries had foreign (Italy, France) winemakers.



Source: ICARE.

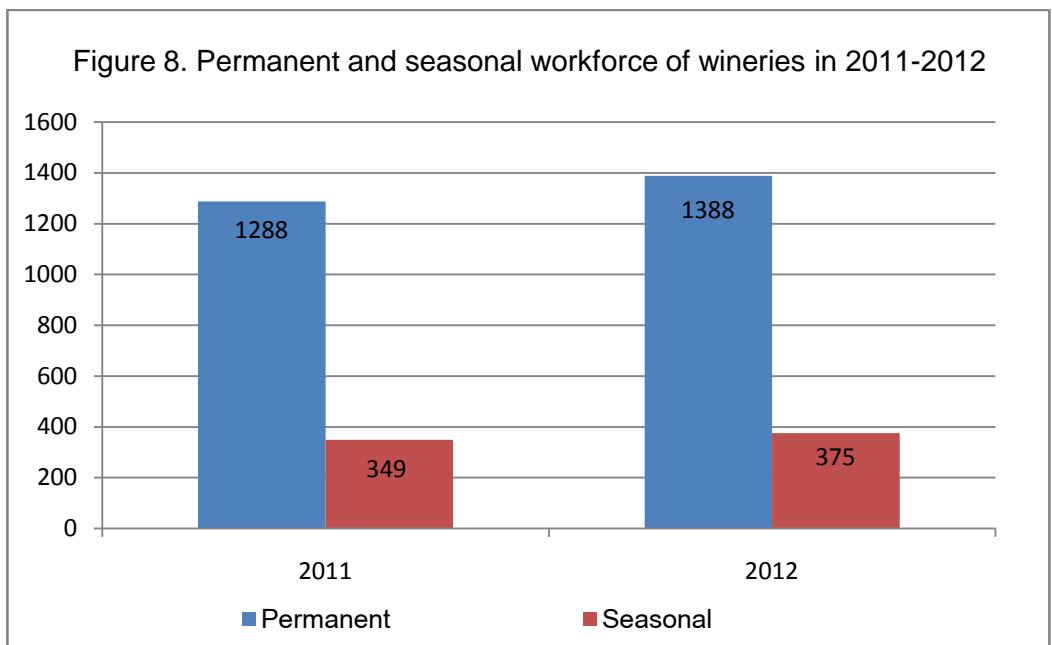
Thirty-four percent of winemakers having the highest qualifications are graduates of the Armenian Agricultural Institute graduated before 1980 and 29% graduated during the period of 1980-1990. Thus, about 63% of winemakers have graduated before the collapse of the Soviet Union. About 29% of the

winemakers with the highest qualification have graduated ASAU or ANAU in 2000's, which is good (see Figure 7).

The winemakers with highest qualification working in wineries have average of 23 years of work experience (minimum 1 year, maximum 50 years). The work experience in a particular winery is on average 12 (minimum 2 months and maximum 50 years). There are many winemakers who work in the same winery over 30 years.

As compared with 2011, growth of both fulltime and seasonal labor was observed in 2012, which is a positive trend. According to the data provided by the wineries, 1288 people worked in the wineries in 2011, while in 2012 - 100 people more (see Figure 8). On average the number of the fulltime employees made 61 people (minimum: 2, maximum: 350, most frequent number: 12) in 2011. In 2012, the wineries had on average 58 employees. As of 2012, about 60% of the fulltime employees are young (up to 35 years old), and the share of young in the total number of seasonal workers is 77%.

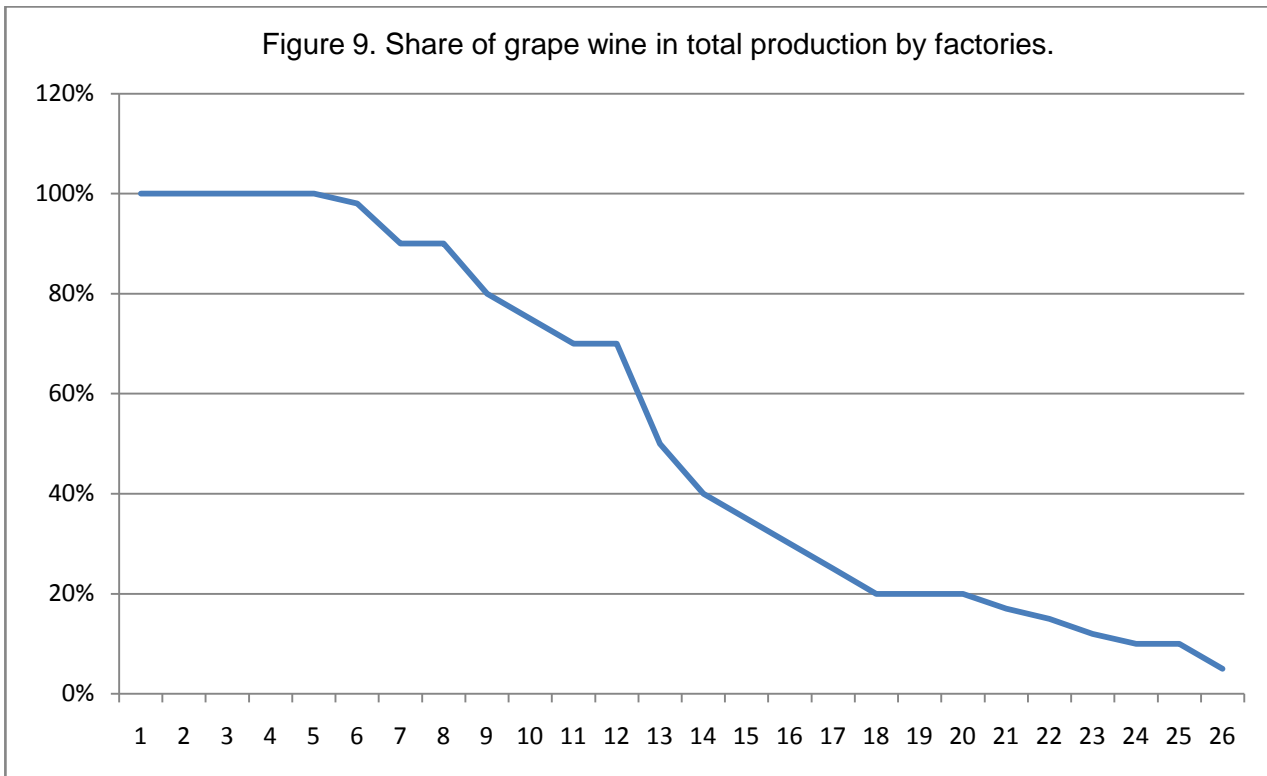
There is still unused capacity in the wineries. The wineries use on average 53 percent of their production capacities. Of course, there are wineries (26%) that use their total capacity, up to 100 percent, however more than half of the wineries use only 50 percent of their production capacity.



Source: ICARE.

In addition to grape wine, the wineries of Armenia produce also fruit wines, brandy and vodka. In 2012, the share of grape wines in the total wine production was on average 53% (minimum 5%, maximum 100%). In about 48% of the wineries, the share of grape wine in the total amount produced was more than 70%. Only five companies are completely focused on production of grape wine only (see Figure 9).

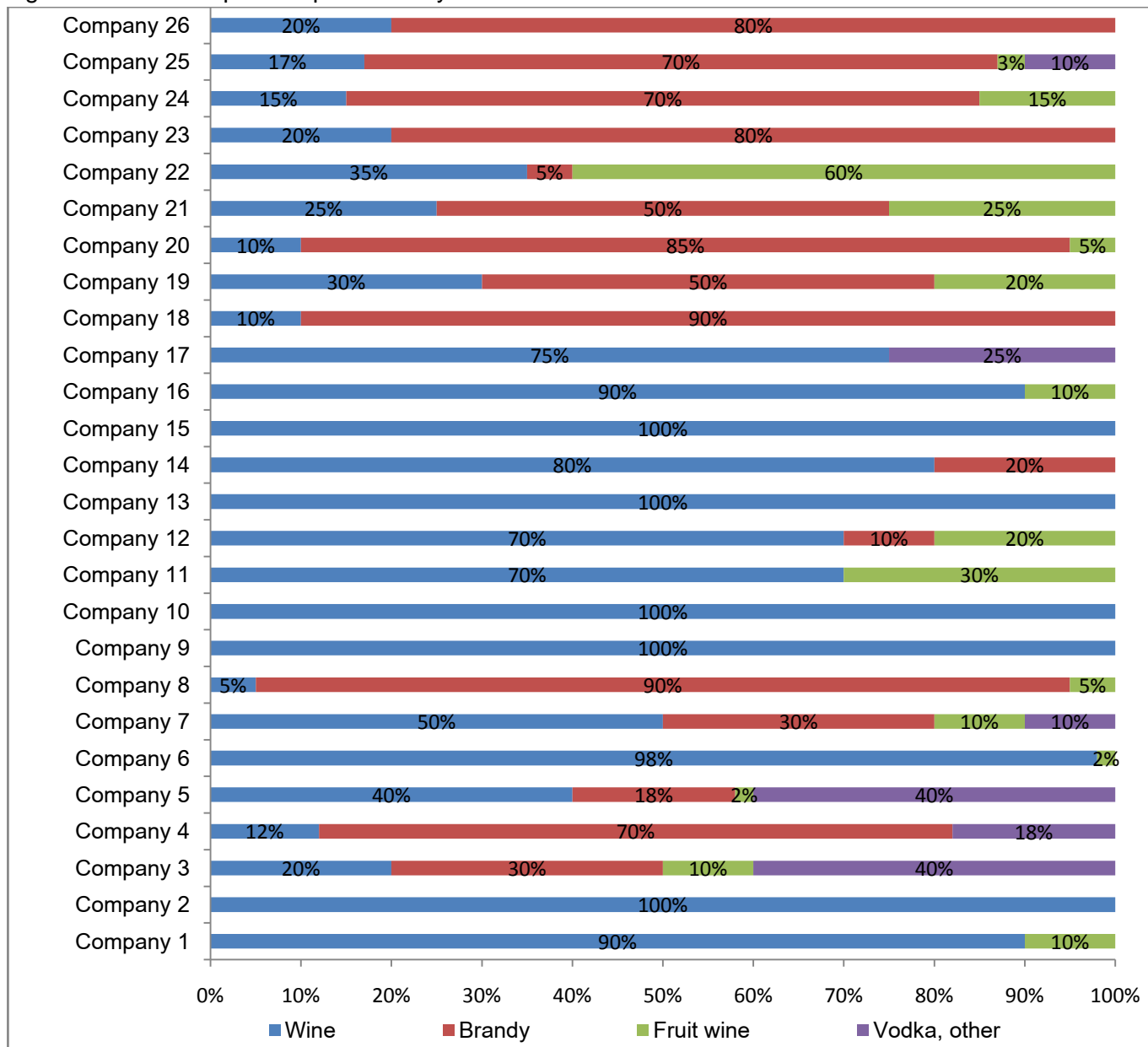
Figure 9. Share of grape wine in total production by factories.



Source: ICARE.

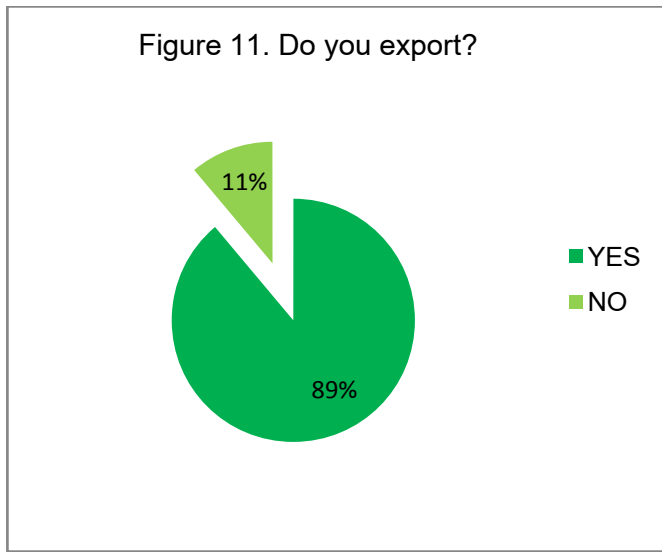
Below are the shares of each product by wineries. A large number of wineries produce more brandy than wine. This is mainly due to the higher level of profitability of brandy and export opportunities (see Figure 10).

Figure 10. Share of product produced by wineries

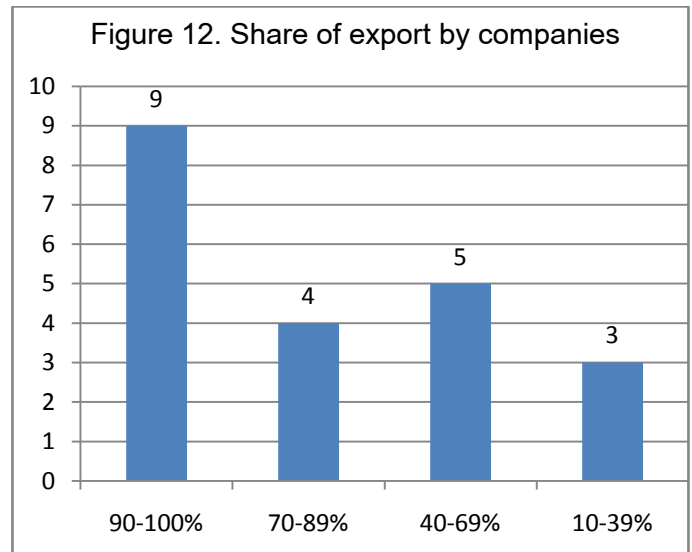


Source: ICARE

About 90% of the wineries are involved in export of its products. Only 3 wineries do not export yet. The share of export in the total produce is rather high. About 38 percent of exporting companies export 90 and more percent of its produce. Four wineries export 70-89 percent of what they produce (see Figures 11 and 12).



Source: ICARE.



70 percent of wineries have wine tasting rooms; however few of them regularly work with touristic agencies.

Professional development needs of winemakers

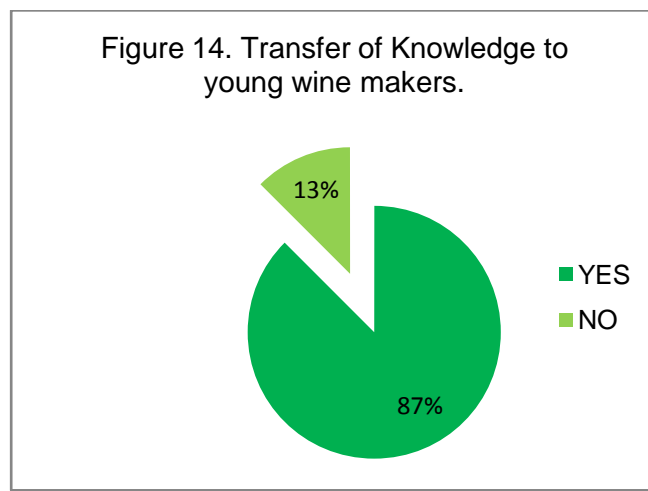
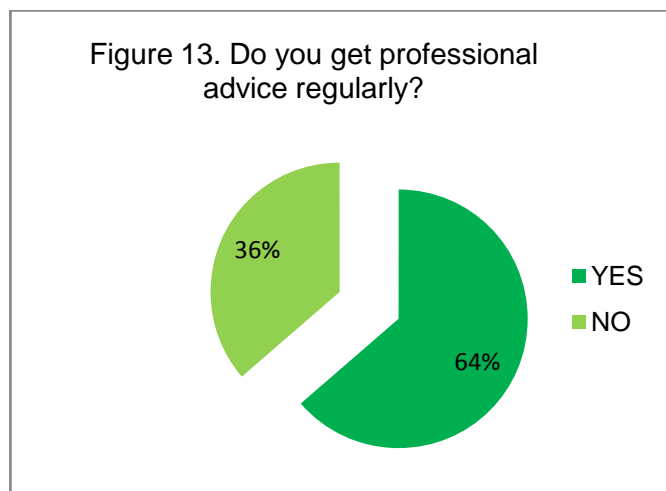
The results of the research revealed that during the last 3 years about 48% of winemakers working currently in wineries have not participated in any training or professional development course. Those who participated were having hard time to recall the particular training topics, although about 83 percent of participants assured that their knowledge was considerably improved thanks to the trainings.

The training mainly took place in abroad, in particular in Italy, France, Georgia, Poland, and Greece. The following training topics were mentioned: general winemaking; semisweet wines; production of champagne; food safety, new technologies and equipment, marketing and tourism.

About 41% of the wineries whose winemakers have participated in trainings have implemented significant improvements with the help of those training courses, and about 47% has implemented some improvement. Nonetheless, about 78 percent of the winemakers who have participated in the trainings think that they really need follow up training within the scope of the same topics, and 17 percent thinks that there is some need for further training.

About 58% of wineries are not provided with any professional literature. And those wineries that regularly get professional literature have stated that it is mainly the winemakers who get such literature, i.e. those are rather personal books than purchased through the initiative of the company. Few wineries have stated that they are using the literature owned by the ASRC and the Union of Brandy Makers. Those who don't use literature mainly mention the factor of lack of time.

The picture is somewhat different when it comes to professional advice. 64% of wineries regularly get professional consultancy and are fully satisfied with the quality of the professional advice received (see Figure 13).



Source: ICARE

The wineries are mostly using the professional advice of foreign (Georgian, French, Italian) experts. Interestingly, some of the wineries get their professional advice from other local experienced winemakers.

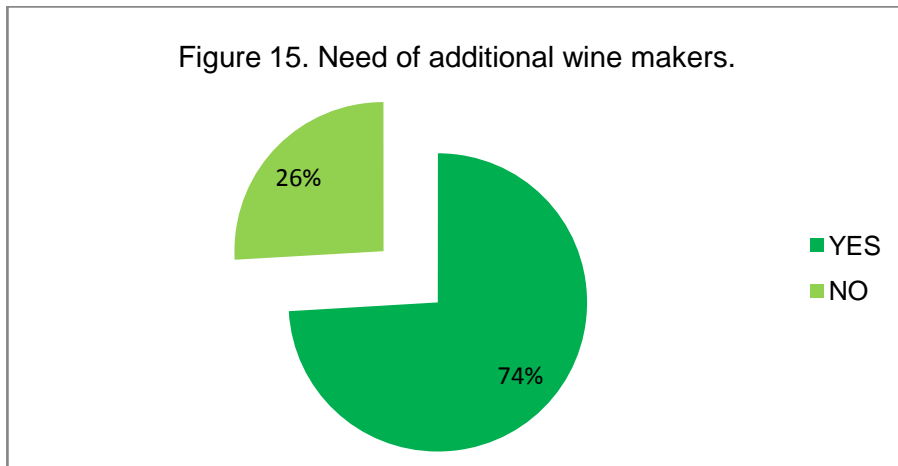
It was pleasant to observe the culture of knowledge transfer in the wineries. About 87% of the wineries have stated that after the training, the trained winemaker transfers the acquired knowledge to younger or less experienced winemakers (see Figure 14).

When revealing the main work duties of winemaking technologists, generic responses were received. In fact, we can state that the winemakers are involved in all issues “from the raw product purchase to bottling” (this was the response from 48 percent of wineries) or “everything connected with winemaking” (33%). “Cleanness of containers, control of proper state of equipment or general control of wine preparation” were mentioned among the core work duties. As secondary duties, some wineries mentioned: visits to orchards, study of the yield, engineering issues, sales, checking the cleanness of bottles, etc.

About 73% of wineries are satisfied with the work done by its winemaking technologist, and the remaining 27% is somewhat satisfied. As a comparison, for example, in the canneries this indicator makes 60 percent (EDMC/ICARE 2013).

Nonetheless, during the last five years, outflow of winemaking cadre has been observed in 37 percent of wineries, while 63 percent do not have this problem.

Figure 15. Need of additional wine makers.



Source: ICARE.

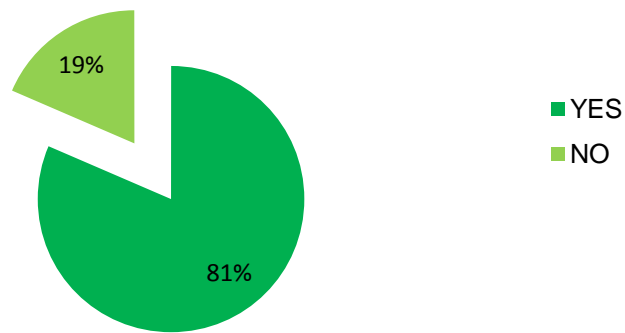
About 74 percent of the wineries need additional winemakers (see Figure 15). As we saw, winemakers working in the wineries are mostly middle-aged people, and in future these wineries will need young and knowledgeable personnel for the shift of generations. Here is where we face the issue of ensuring high quality education for youth that would meet the modern technological requirements, which should be under the control of those who are responsible for the sector. The issue becomes even more current for companies operating in marzes.

In addition to winemaking technologists, the winemaking companies need also the following specialists:

1. Laboratory specialist – 6 vacancies
2. Marketing specialist – 8 vacancies
3. Mechanic – 6 vacancies
4. Production manager – 2 vacancies
5. Accountant - 3 vacancies
6. Barrel maker – 1 vacancy
7. Agronomist – 2 vacancies
8. Cellar manager - 1 vacancy
9. Guide - 1 vacancy
10. The wineries also need seasonal laborers.

Although most of the wineries are satisfied with the work done by their winemakers, about 81 percent of the wineries mentioned that their winemakers certainly need training and periodical upgrading of their knowledge (see Figure 16).

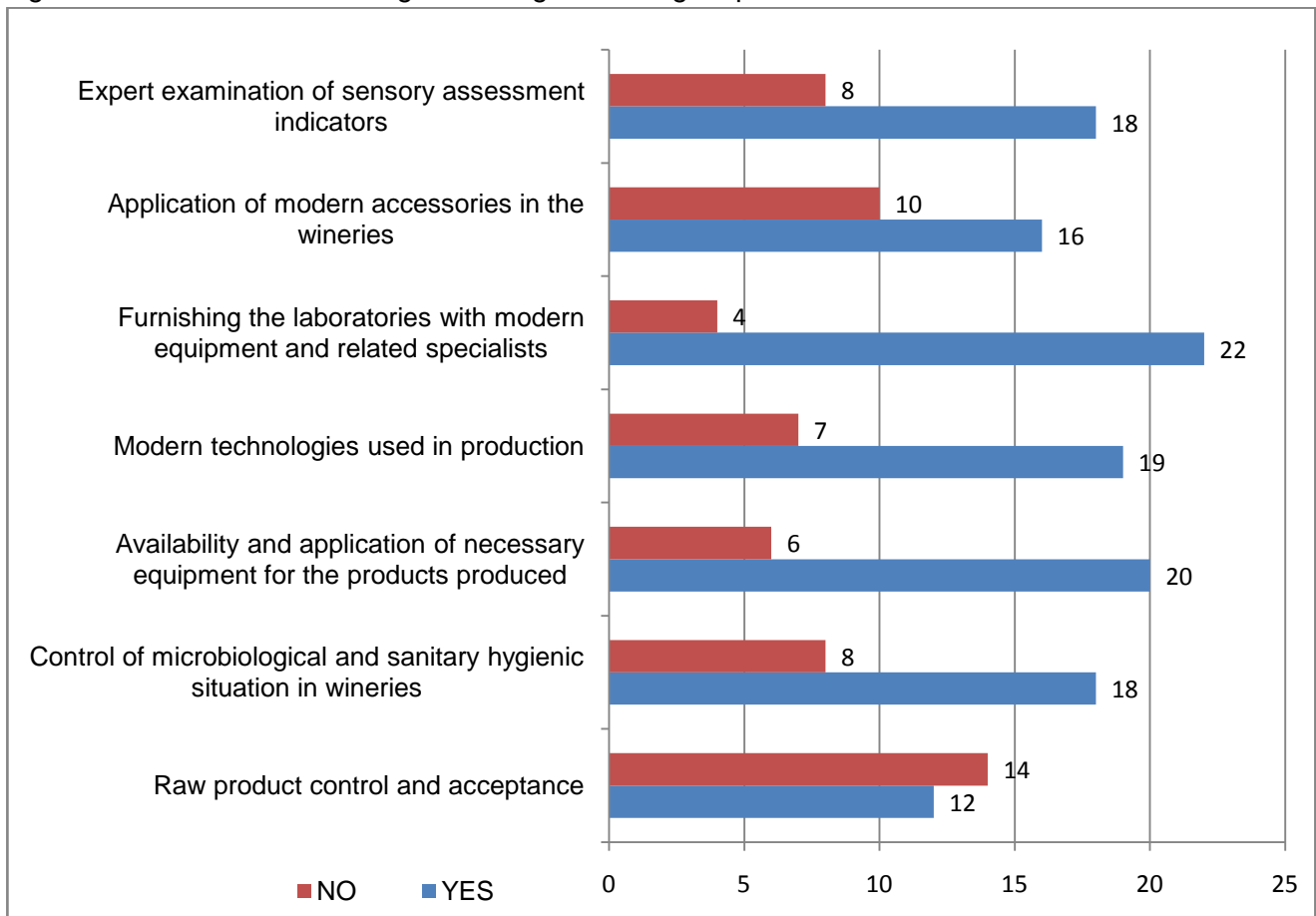
Figure 16. The need of training and periodal upgrading of winemakers' knowledge.



Source: ICARE.

The research clearly shows the necessity of training and skill development for winemakers in the following professional fields:

Figure 17. The need for training according to the target spheres.



Source: ICARE.

The figure obviously shows that “Furnishing the laboratories with modern equipment and related specialists” is the most current for the wineries, and about 85% of wineries think that their winemakers need training or skill development on particular topics. The next important training field is “Availability and application of necessary equipment for the products produced” (77%), followed by “Modern technologies used in production” (73% think there is a need of training in this field) (see Figure 17).

In addition to identification of training needs according to target fields, the research also revealed the priority areas in the wineries where winemakers need to be trained. The complete picture is provided below.

Table 3. Rating of training fields according to priority.

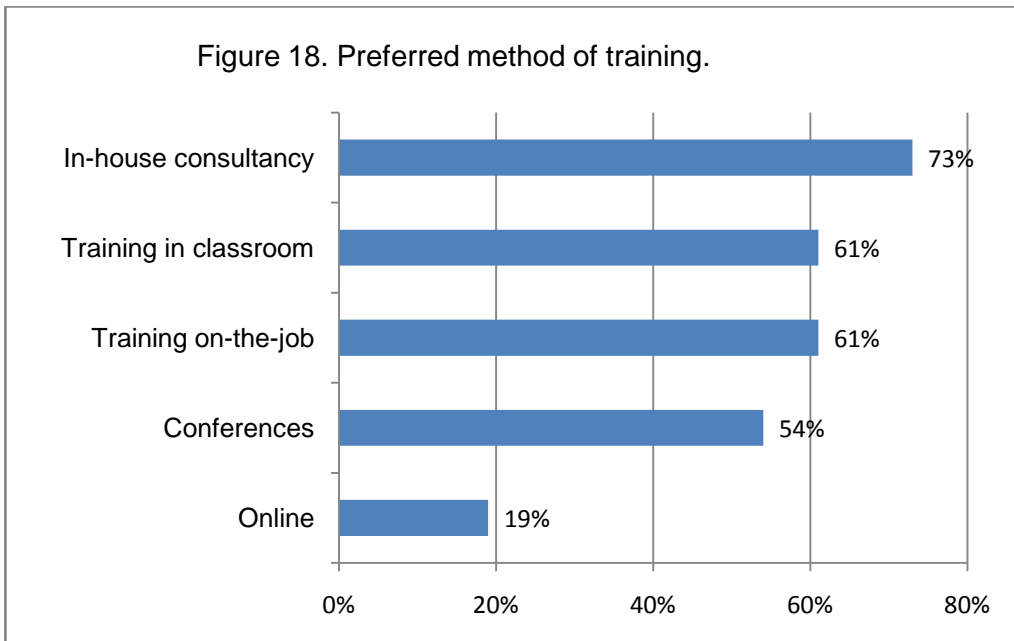
Target field of training / consultancy	Number of companies that ranked 5 *
Raw product control and acceptance	8
Control of microbiological and sanitary hygienic situation in wineries	14
Availability of equipment necessary for the products produced and application thereof	12
Modern technologies used in the production	13
Furnishing of laboratories with modern equipment and related specialists	12
Application of modern accessories in the wineries	9
Expert examination of sensory assessment indicators	10

* 1= not important fields, 5= primary fields

Source: ICARE.

The table shows that the wineries consider the following fields as the primary ones for their winemakers a) Control of microbiological and sanitation and hygienic situation of the winery, b) Modern technologies used in the production, g) Availability and application of the equipment necessary for the products produced.

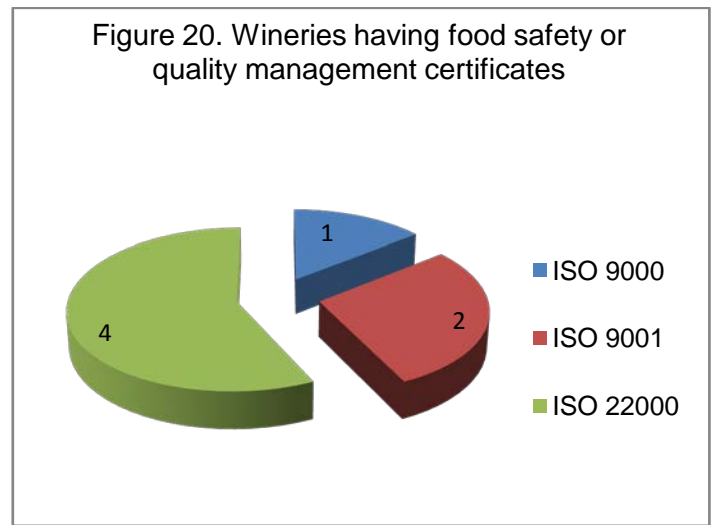
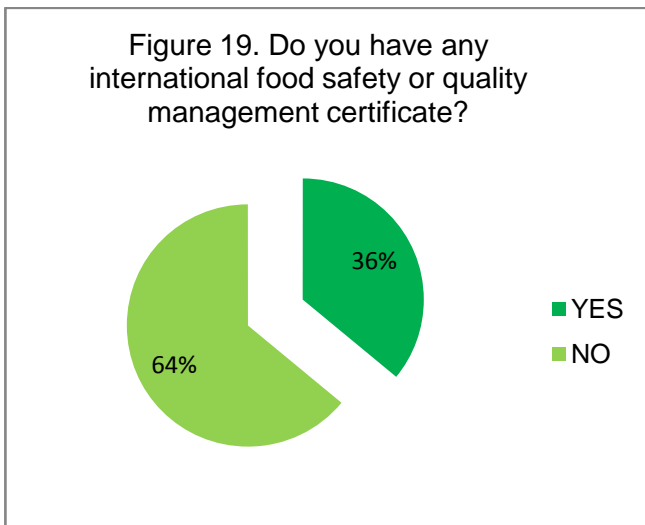
The best approach in implementation of trainings would be compiling pertinent thematic courses according to the priority and ranking of the target fields.



Source: ICARE.

The survey revealed that among the preferable training methods, the wineries value in-house consultancy, equally followed by training in classroom or on-the-job formats. 54 percent of the wineries value also participation in conferences. Only 19 percent prefer online training using modern information technologies (see Figure 18).

For in-house consultancy, the wineries prefer the period from November through July, with the duration of 5–10 days. For classroom training, the wineries prefer the period between March and August, with the duration of 3-10 days, and for the on-the-job training, the preferable period for the wineries is the period between October and May, again with 7-10 day duration.

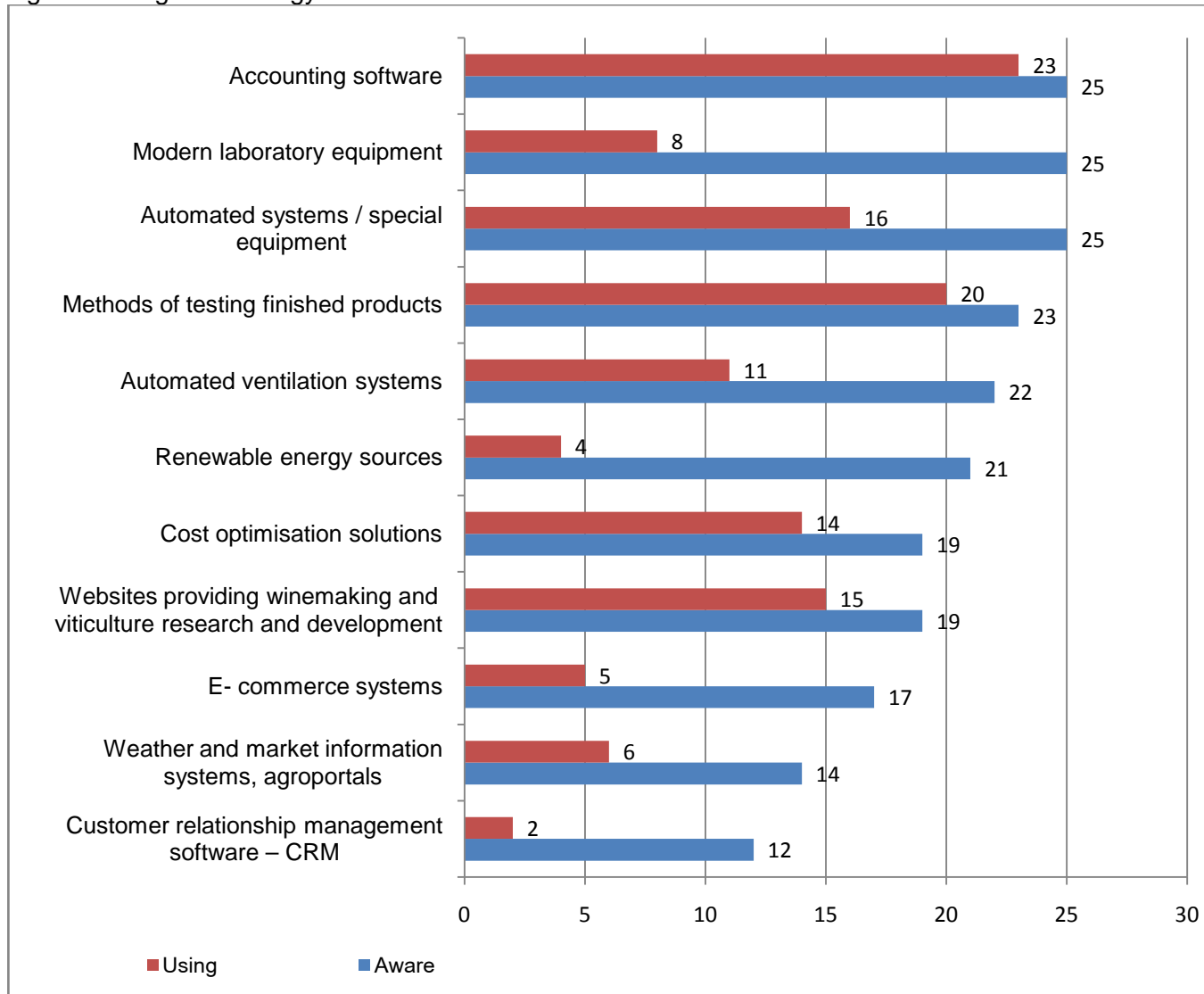


Source: ICARE.

Sixty-four percent of the winemaking companies do not have any international certificate in the fields of food safety or quality management (see Figures 19 and 20).

Only 4 wineries have ISO 22000, and 3 wineries have ISO 9000 or ISO 9001 certificates. The companies greatly valued inclusion of information on food safety standards, normative legal acts defining related safety indicators pursuant to the generally accepted international requirements, and HACCP in the training program.

Figure 21. High technology solutions used in the wineries.



Source ICARE.

We can state that accounting software have already been introduced in the winemaking companies. 85 percent of the companies have introduced accounting software (the main company providing such software is the Armenian Software), while the remaining companies are planning to introduce in the near future.

Twenty-three companies are familiar with the methods of testing the finished products, of which 20 actually apply those methods in the wineries.

19 companies are aware of websites providing winemaking and viticulture research and development, however only 15 companies use the information available in these websites. Agricultural portals providing information on weather conditions and market prices are familiar to 14 wineries, however only 6 of them are actually using these portals. Nearly all companies know about modern laboratory equipment, however only 8 companies actually have such equipment. The reason, perhaps, is the lack of finance.

Client relationship management (CRM) software, electronic sales systems are known to comparatively less number of companies, while they are used by only a few companies (see Figure 21).

Many wineries are envisaging in their short-term and long-term plans to purchase different equipment, high technology solutions, for which they need financial and technical assistance. The companies have the following needs in technological re-equipment or additional investment:

- Ion exchangers for wine processing
- Presses for grape acceptance-processing
- Automated systems of heat stabilization
- Membrane filters
- Automated production lines
- Barrels
- Containers
- Laboratory devices
- Bottling lines, and others.

Part of the companies will step by step accomplish these investments on their own, while others are expecting technical (18% of the companies) and financial (20% of the companies) assistance.

85 percent of the wineries have participated in international exhibitions during the last 3 years. And 74 percent of wineries have participated in an international exhibition in 2013. About 83% of winemaking companies that have participated in exhibitions participated in the ProdExpo exhibition in 2013 held in Moscow, Russia. According to the wineries, their expectations from the exhibitions were justified. Some companies have participated also in other international exhibitions held in France (the Best Muscats of the World), Italy (Wine Italy), Germany (Green Week), and Ukraine. The companies usually present their entire assortment at the exhibitions.

Among the local exhibitions, the winemaking companies participate in the ArmProdExpo and, again, present their full assortment. Unlike the international exhibitions, during or after the local exhibitions the expectations of the companies are not fully justified.

Figure 22. Do you cooperate with other wineries?

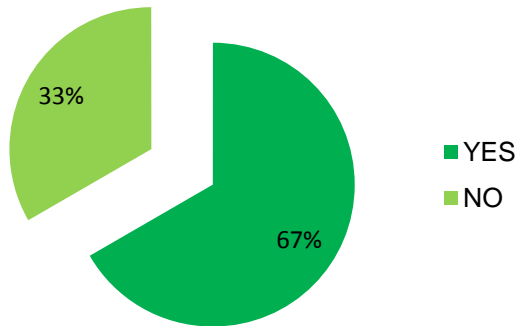
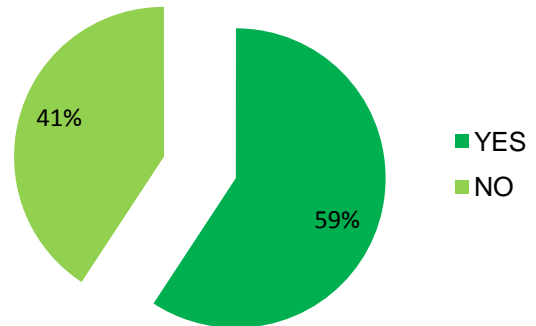


Figure 23. Do you cooperate with ANAU?



Source: ICARE.

Sixty-seven percent of winemaking companies mentioned that they cooperate with other wineries. As cooperation fields, the following were mentioned: technical issues, sales and purchase of raw product, experience exchange, bottling, tasting, and professional consultancy. This cooperation was ranked 3.8 (average) by the wineries in a 5-scale system, which can be considered a good result (see Figure 22).

About 60% of the companies have cooperated with the Armenian National Agrarian University, however – only in organization of student internships. The level of cooperation with ANAU was ranked 4.2 by the companies (see Figure 23).

The relationship between the Government and the winemaking companies was ranked 3.7 (according to the scale 1 = unfavorable, 5 = favorable). The winemaking companies would like to see definite changes in the tax legislation regulating the sector. The main problem is the load of excise tax, which they think is fairly high. The companies complain also about the high interest rates of loans. Some of the companies suggest easing the wine export procedures. Only a few companies think that the state must not intervene or interfere with the process of grape purchase.

Skills, qualities and experience needed for future winemaking technologists

Table 4 provides the numerical results of 36 respondents asked about 83 skills and experiences included in total of seven categories. A mean response and the general ranking (out of 83) are provided for each skill or characteristic. P-value (actual level of significance observed through tests) for each category was calculated and compared with the selected 0.05 level of significance, using comparison of response received for each skill within a particular category with the mean value. The results include also the difference of each response from the mean value as well as the general ranking of each skill.

Managers and the operating winemakers of the winemaking companies ranked these seven categories as follows (the mean ranking of a particular category according to 5-point scale where 1 = the lowest requirement and 5 = the highest requirement):

(1) Communication skills	[4.294]
(2) Personal qualities	[4.280]
(3) Wine production	[4.086]
(4) Viticulture	[3.641]
(5) General experience in higher education	[3.500]
(6) Technical skills	[3.407]
(7) Employment and work experiences	[2.456]

Among the package of skills, qualities and experience, the winemaking companies value communication skills, personal qualities and then the set of skills required in wine production considerably more than other skills and experiences included in the survey.

Table 4. Skill proficiency for Armenian wine makers.

(low level of the demand for skills = 1 and high level = 5)

Ranking in the particular category	DESCRIPTION OF SKILLS	Mean response	Difference from mean	p-value	Final ranking
A	Wine production				
1	Sanitation in the winery	4.583 *	0.50	0.000	5
2	Fermentation production and microbiology	4.583 *	0.50	0.000	6
3	Chemical composition of grape and wine	4.556 *	0.47	0.000	7
4	Technology of producing red table wines	4.556 *	0.47	0.000	8
5	Identification of deficiencies and diseases of wines and methods of preventing thereof	4.472 *	0.39	0.001	13
6	Control, acceptance and processing of raw product	4.417 *	0.33	0.004	17
7	Methods of processing of wine materials. Application of modern accessories	4.417 *	0.33	0.004	18
8	Technology of producing white table wines	4.389 *	0.30	0.008	19
9	Aging of wines: cellar processing	4.389 *	0.30	0.008	20
10	Wine chemistry	4.333 *	0.25	0.025	22
11	Classification of wines	4.250	0.16	0.124	25
12	Technological equipment and their application in wineries	4.056	-0.03	0.769	35
13	Bottling of wines	4.000	-0.09	0.410	38
14	Expert examination of sensory testing of wine produce: tasting technique	3.972	-0.11	0.278	42
15	Technology of producing fruit wines	3.917	-0.17	0.113	43
16	Application of modern research methods in wineries	3.889	-0.20	0.068	45
17	Technology of producing special wines	3.806 *	-0.28	0.012	48
18	Laws and legal acts on winemaking	3.528 *	-0.56	0.000	56
19	Quality management system: GMP, HACCP	3.528 *	-0.56	0.000	57
20	Wine tourism	3.111 *	-0.97	0.000	70
21	Organization of wine marketing	3.056 *	-1.03	0.000	71
	The mean in this category	4.086			3
B	Viticulture				
1	Grape ripening phases	4.194 *	0.55	0.001	28
2	Ampelographic description of local varieties	4.194 *	0.55	0.001	29
3	Harvesting	4.056 *	0.41	0.006	36
4	Grape diseases, their identification and means of control	3.889	0.25	0.066	46
5	Biological basics of grape	3.722	0.08	0.516	51
6	Impact of the environment in the growth of grape	3.611	-0.03	0.806	54
7	Ampelographic description of international grape varieties	3.472	-0.17	0.189	61
8	Justification of selection of land area for establishing a grape orchard	3.361 *	-0.28	0.042	64
9	Planting of grape orchards	3.194 *	-0.45	0.004	66
10	Pruning, propagation and cultivation of grape sprouts	3.194 *	-0.45	0.004	67
11	Management of irrigation and fertilization	3.167 *	-0.47	0.003	69
	The mean in this category	3.641			4
C	Technical skills				
1	Basics of safety of vital activity	4.194 *	0.79	0.000	30
2	Technology of production and processing equipment	4.000 *	0.59	0.000	39
3	Food processing technology	3.778 *	0.37	0.008	49
4	Computer-based mechanical processes	3.667 *	0.26	0.048	52
					25

5	Basics of Physics and Heat Technology	3.639		0.23	0.073	53
6	Biology, biotechnology, and biochemistry	3.528		0.12	0.327	58
7	Computer operational systems (MS office, Windows)	3.500		0.09	0.447	60
8	Food transportation and distribution systems	3.444		0.04	0.756	62
9	Professional analytical software (e.g. Best winery)	3.333		-0.07	0.547	65
10	Specialized horticultural production systems	3.194		-0.21	0.097	68
11	Basics of mathematical modeling	2.972	*	-0.43	0.003	72
12	Basics of agribusiness management	2.889	*	-0.52	0.001	74
13	Chemical composition and properties of soil	2.861	*	-0.55	0.001	75
14	General horticultural production systems	2.694	*	-0.71	0.000	76
The mean in this category		3.407				6

D Communication skills						
1	Listen and perform instructions	4.778	*	0.48	0.000	1
2	Read and understand technical information	4.639	*	0.34	0.004	4
3	Listen and briefly present voluminous oral material	4.556	*	0.26	0.016	9
4	Give clear and brief instructions to others	4.278		-0.02	0.854	24
5	Orally express creative ideas	4.250		-0.04	0.626	26
6	Knowledge of foreign languages	4.222		-0.07	0.433	27
7	Clearly and briefly speak about technical information	4.167		-0.13	0.181	31
8	Professional skill and ethical conduct in telephone conversation	4.139		-0.16	0.111	33
9	Write technical reports and e-mails	4.000	*	-0.29	0.009	40
10	Express creative ideas in written	3.917	*	-0.38	0.002	44
The mean in this category		4.294				1

E Personal qualities						
1	Loyalty to the organization	4.722	*	0.44	0.001	2
2	Self-motivation	4.667	*	0.39	0.002	3
3	Positive working attitude, individuality, ability to work hard	4.556	*	0.28	0.016	10
4	High ethical criteria	4.528	*	0.25	0.027	11
5	Ability to work in diverse conditions	4.500	*	0.22	0.045	12
6	Leadership and decision making ability	4.444		0.16	0.121	14
7	Work with others and be part of the team	4.444		0.16	0.121	15
8	Manage people and delegate tasks	4.361		0.08	0.428	21
9	Ability to work with no control	4.306		0.03	0.799	23
10	Self confidence and ability to "seize the chance" as well as to smooth tension (failure, denial)	4.167		-0.11	0.276	32
11	Capability to use technical skills and information in the problem solution process	4.083		-0.20	0.070	34
12	Ability to defend your views and ideas	4.000	*	-0.28	0.015	41
13	Recognize the business opportunities	3.750	*	-0.53	0.000	50
14	Fund raising for new and existing initiatives	3.389	*	-0.89	0.000	63
The mean in this category		4.280				2

F Employment and work experience						
1	Work experience in winemaking operations	3.611	*	1.15	0.005	55
2	Work experience in viticulture	2.972		0.52	0.103	73
3	Work experience in food processing operations	2.667		0.21	0.464	77
4	Employment in an international agribusiness company	2.389		-0.07	0.810	80

5	Employment in a family agribusiness	2.111	-0.35	0.246	81
6	Employment in a retail agricultural business	2.028	-0.43	0.162	82
7	State (public) positions	1.417	*	-1.04	83
The mean in this category		2.456			7

G General experience in higher education					
1	Internship in local enterprises	4.444	*	0.94	16
2	Internship in abroad	4.056		0.56	37
3	Experience in studying abroad	3.889		0.39	47
4	General education in culture, humanitarian sciences, arts and other fields	3.528		0.03	59
5	Work experience of a teaching assistant or part time university job	2.639	*	-0.86	78
6	University outreach work, including managerial positions and functions in student clubs	2.444	*	-1.06	79
The mean in this category		3.500			5

*It is significant on 0.05 level where it is checked whether the averaged response is essentially different from the mean value of the particular category. The provided p-value is based on the criterion of double sampling since deviation from the mean value can be both negative and positive.

The “**Communication skills**” category received the highest ranking; the participants of the survey greatly valued the first 3 skills of this category:

1. listen and perform instructions;
2. read and understand technical information;
3. listen and briefly present voluminous oral material.

These skills are also among the top ten. Overall, the top 20 of the highest ranked skills appeared to include the following:

- | | |
|--------------------------------------------------------------------------------|----------------------|
| 1. Listen and perform instruction | Communication skills |
| 2. Loyalty to organization | Personal qualities |
| 3. Self motivation | Personal qualities |
| 4. Read and understand technical information | Communication skills |
| 5. Sanitation in the Winery | Wine production |
| 6. Fermentation production and microbiology | Wine production |
| 7. Chemical composition of grape and wine | Wine production |
| 8. Technology of producing red table wines | Wine production |
| 9. Listen and briefly present voluminous oral material | Communication skills |
| 10. Positive work attitude, individuality, ability to work hard | Personal qualities |
| 11. High ethical criteria | Personal qualities |
| 12. Ability to work in diverse conditions | Personal qualities |
| 13. Identification of deficiencies and diseases of wine and prevention methods | Wine production |
| 14. Leadership and decision making ability | Personal qualities |
| 15. Work with others and be part of the team | Personal qualities |

16. Internship in local enterprises	General exp. in higher education
17. Control, acceptance and processing of raw product	Wine production
18. Methods of processing wine materials. Application of modern accessories	Wine production
19. Technology of producing white table wines	Wine production
20. Aging of wines: cellar processing	Wine production

The above results of the research can be used in Armenia to develop curricula of winemaking specialty or to modernize the existing curricula.

The skills that received high rankings should, as much as possible, be included as courses or course modules and taught in a classroom or factory situation.

However, there are also other skills and characteristics which are difficult to teach as a course. The managers of educational programs should, based on the wishes expressed by the professionals of the sector, develop the list of the mentioned characteristics and then make it clear how the students should develop these skills. For example, the characteristic that received number one ranking is “Listen and perform instructions”, which is among the category of communication skills. The skills under this category can be developed through several courses, e.g. Technical Writing, Conduct of Negotiations, Communication, etc.

“Loyalty to organization” is ranked the second. Although this is difficult to teach as a course, however, through other teaching activities, students should be informed about the importance of this skill and create such a learning environment where the students will learn these kinds of skills or at least will learn about such practices. Loyalty to organization is a topic that can be emphasized in case studies, examples on business principles. The communication skill that was ranked high (Listen and perform instructions) is also a skill which can be emphasized in the classroom, not necessarily together with the theory or principles but with the help of examples of practical implementation. For example, instructions can be orally made in the classroom, valuing the need for students to get experience and to understand this skill. Some high ranked skills, such as “High ethical criteria”, “Positive attitude to work/individuality/ability to work hard”, etc., can be included in syllabi of such courses like Business Ethics, Leadership and Management, and the instructors should use teaching methods that encourage the group work, delegation of duties, stimulating the students and involving them in the practical process of decision making.

Category A, “Wine production” was ranked 3rd. It is necessary to include the top 10 skills in this category in the curricula (by the way, all of them are statistically significant). In this category, the characteristic “Winery sanitation” requires high ranking, i.e. high level of proficiency. The students should have high level of proficiency in terms of these skills. These skills can be taught through the existing courses or by introducing new courses, for example, Wine Sanitation, Wine Evaluation, Management of Winemaking Procedures, and others.

Category B, “Viticulture”, was ranked 4. In this category, the highest ranked 3 characteristics are: “Grape ripening phases”, “Ampelographic description of local varieties” and “Harvesting”. These characteristics were not ranked high in the list of general skills, however they require high level of proficiency; therefore,

it is necessary that future winemakers ensure proper level of proficiency at least in these 3 fields of Category B during their study years.

The category “**General experience in higher education**” was ranked 5th. The skill that received the highest rank in this category, “Internship in local enterprises”, was among the top 20 skills, therefore it is necessary to pay attention on this since employers value the work experience in local enterprises. The managers of educational programs should organize the student internships on a proper level, closely cooperating with winemaking companies. The characteristic that was ranked first in **Category F** also indicates this – “Work experience in winemaking operations”. Although this characteristic belongs to the “Employment and work experience” that was ranked the last, we can nonetheless conclude that winemaking companies expect definite work experience in winemaking operations, which can be provided by internships.

The **Technical skills** category was ranked 6th. The highest ranked characteristics in this category are: “Basics of safety of vital activity”, “Technology of production and processing equipment”, “Food processing technology” and “Computer-based mechanical processes”: these skills should be included in curricula.

Conclusions and recommendations

A definite activation in the winemaking sector is observed over the recent few years connected with both domestic and foreign investments. Despite the increased gross output of grape and increased sales volume, the quantities of wine production do not show stable growth yet. Most of the winemakers are more qualified in brandy production than in wine since brandy is easier to market and export, and its profitability is incomparably higher.

During the recent years, wine export is rapidly growing, with the export geography tending to expand. Nonetheless, the wineries operating in Armenia still face a number of problems. Production and quality control systems are still behind the international standards. Despite the investments made during the last years in the sector, many wineries continue using obsolete technologies, which surely affects the quality of wine. The wineries have unused potential. The wineries use on average only 53 percent of their capacities.

During the last 2 years, new jobs have been created in the sector, however in future it will become an issue to prepare winemaking technologists ready to substitute the middle and old age winemakers who are currently working in the wineries. The wineries face also outflow of winemaking personnel, which means that winemaking technologists are not satisfied with their salaries, and they are ready to change their workplace even for a slightly higher salary. Most of the wineries also need additional winemakers. In addition to winemakers, the companies also need other specialists, for example, laboratory specialist, mechanic, etc.

Most of the winemaking companies believe that their winemakers need to periodically get trained and upgrade their knowledge.

The research revealed the training and skill developments needs for winemakers according to target professional sectors. Most of the companies valued implementation of training courses for their winemaking technologists on the topics of “Furnishing of laboratories with modern equipment and related specialists”, “Availability and application of proper equipment necessary for the products produced”, and “Modern technologies used in the production”. According to the priority, the following target fields for training were ranked the highest: a) Control of winery’s microbiological and sanitation/hygienic situation, b) Modern technologies applied in production, c) Availability of the equipment necessary for the products produced and their application.

Therefore, the best approach for implementation of trainings will be compiling pertinent thematic courses according to the priority of the target sectors and the ranking, taking into account the training period and duration preferable for the companies.

The companies have strongly valued inclusion of information on food safety standards, normative legal acts defining related safety indicators pursuant to the generally accepted international requirements, and HACCP in the training program. Only a few companies had international certificates in food safety.

The level of high technologies used in the wineries is not so satisfactory. More than half of the companies do not use cost-effective solutions, which would help decrease the production cost and production-related and unrelated losses. The companies do not have sufficient means to shift to modern automated systems and acquire modern laboratories. The sector needs both technical and financial assistance.

The study that was focusing on identification of skills, experience and personal qualities necessary for future winemaking technologists revealed interesting results. These results can be used to develop curricula for winemaking specialty in Armenia or modernize the existing ones.

The skills that were ranked high should, as much as possible, be included as courses or course modules and should be taught in classroom or on-the-job formats. And students should be informed about those skills that are not possible to involve as courses in the curricula. Faculty should create a favorable learning environment using such modern teaching methods that are student-centered and encourage the team work, delegation of responsibilities, stimulation of students, and involve them in the actual process of decision making.

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