ON THE AGRICULTURE AND VEGETAL FOOD ECONOMY OF KURA-ARAXES CULTURE IN THE SOUTH CAUCASUS

R. HOVSEPYAN

Abstract: *Agriculture dependent almost exclusively on cereal cultivation was practiced in the South Caucasus, beginning with the Kura-Araxes culture and continued for more than two and a half millennia (from the Early Bronze Age to the Early Iron Age). Although several dozen Early Bronze Age sites were investigated, extremely few or no remains of cultivated pulses or oil-crops were found. Global environmental changes at the beginning of the Early Bronze Age may have contribute in transforming the agriculture of the South Caucasus into cultivation of a few hardy cereals. But it seems more likely that anthropogenic factors played the decisive role, because pulses and oil-plants could have been grown along with cereals in the same conditions in foothills and plains, but they were not.*

Résumé : *L'agriculture de la culture Kura-Araxe constitua la première phase d'une période de plus de 2500 ans (du Bronze ancien au Fer ancien) où les cultures étaient caractérisées par une prédominance et parfois même une présence exclusive de céréales. Bien que plusieurs douzaines de sites du Bronze ancien aient été étudiés, très peu de restes (et parfois aucun reste) de plantes oléagineuses et de légumineuses cultivées ont été retrouvés. Les changements environnementaux globaux qui se sont produits au début du Bronze ancien ont sans doute joué un rôle majeur dans la transformation de l'agriculture dans le sud du Caucase vers une forme spécialisée dans la culture de quelques céréales résistantes. Mais il semble que le rôle décisif dans la spécialisation de l'agriculture Kura-Araxe soit le facteur humain, puisque les légumineuses et les plantes oléagineuses auraient pu être cultivées avec les céréales, dans les mêmes conditions, sur les piémonts et dans les plaines, alors que ce ne fut pas le cas.*

Keywords: *Archaeobotany; Kura-Araxes; Plant economy; Cereals.*
Mots-clés : *Archéobotanique ; Kura-Araxe ; Économie agricole ; Céréales.*

INTRODUCTION

The Early Bronze Age in the South Caucasus is represented by the Kura-Araxes culture starting around 3600/3500 cal. BCE and continuing until 2600/2500 cal. BCE (Badalyan 2014). The Kura-Araxes culture is not only known from the South Caucasus but also from sites in North-East Caucasus, Anatolia, Iran and the Levant (Avetisyan and Bobokhyan 2012).

It is worth mentioning that traces of early agriculture in the South Caucasus were recorded for the Late Neolithic period, the beginning of 6th millennium cal. BCE,[1] at the settlements of the Aratashen-Shulaveri-Shomu culture, marked with *tell*-like sites located in the lowlands of the Kura and Araxes river valleys. A formed agricultural economy existed already in that period, when most of the cultivated plants were already domesticated (Lisitsina and Prishchepenko 1977; Lisitsina 1984; Hovsepyan and Willcox 2008; Decaix, in Lyonnet *et al.* 2012; Kadowaki *et al.* 2015; Decaix *et al.* 2015, etc.).

The Late Neolithic and entire Chalcolithic periods of the South Caucasus, from the end of the 7th to the mid- 4th millennium cal. BCE, can be characterized by diverse agriculture, where various species of cereals, pulses and oil-plants were

1. Just recently, in autumn of 2013 and 2014, earlier layers (radiometric dating will be available soon) were unearthed in the Aknashen settlement (Badalyan *et al.*, pers. comm.). These older stratigraphical layers of Aknashen site werere investigated for archaeobotany by the author in 2014 and gave material attesting to presence of agriculture.

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cultivated. During the entire Bronze Age through the Early Iron Age, after the second half of the 4th to the beginning of 1st millennium cal. BCE, agriculture in the South Caucasus appears monotonous and quite specialized on cereal cultivation (details will be provided and discussed below). Starting from the Van Kingdom (Urartu), 9th–6th centuries BCE, regular cultivation of pulses re-started (lentil, pea, chickpea, faba bean, etc). It was also in this period that several previously unknown or poorly known crops, such as millets, sesame, rye, several fruit trees, etc., were introduced to the local agriculture. Thus, this later period is marked by highly developed viticulture and horticulture (Piotrovskiy 1950; 1952; 1955 and 1961; Tumanyan 1944).

MATERIAL AND METHODS

Archaeological remains of cultivated plants and vegetal food are the most reliable and trustworthy materials for the study of agriculture and vegetal food of the past.

This article summarizes the author's own data obtained during investigations at several Early Bronze Age sites on the territory of Armenia, and also archaeobotanical data published by various authors throughout years (table 1). As one would expect, the information presented in the mentioned publications also varies a lot (because of the amount of processed sediments, recovered material, accuracy of the identifications, names of recorded taxa, quantitative data and interpretations, stratigraphic interpretations, dating of the levels and sites examined, etc.). The resolution of the archaeobotanical data also varies greatly from site to site; it is quite high in some sites (mostly the ones excavated recently, *e.g.* Areni-1, Godedzor, Gegharot, Margahovit, Shengavit, Sotk-2, Maxta-1, Kültepe-2, Chobareti, etc.), while in the others (see mostly publications from the 20th century, *e.g.* Lisitsina and Prishchepenko 1977, etc.) there are notes only about records of certain plants. Given the situation it was not possible to come up with a table of high resolution archaeobotanical data. However, a table with the major cultigens (or groups of cultigens, *e.g.* wheats) marking the presence of those in certain sites is provided (table 2). Unfortunately the quality and volume of the archaeobotanical studies are not the

Table 1 – *Sites of the Kura-Araxes culture in the South Caucasus and Daghestan. Detailed chronological information is not available, so sites are presented according to broad geographical groupings.*

No.	Archaeological site	Approx. rainfall (x100 mm/ year)[1]	Geographical coordinates	Elevation (m asl)	Contexts examined	Number of samples (1-10 – "+", 10-100 – "++", >100 - "+++")	Processed sediment volume (0-10 liter – "+", 10-100l – "++", >100 l - "+++")	Cultivated plants findings (0-10 – "+", 10-100 – "++", 100-1000 - "+++", >1000 – "++++")	Source (Investigator and/or publication)
1	Ovçular Tepesi*	3/4	39°35'33" N 45°04'05" E	896	material from pits	+	+++	+++	A. Decaix, M. Tengberg and G. Willcox, in Berthon *et al.* 2013
2	Areni-1*	4/5	39°43'55" N 45°11'56" E	1024	vessels, pits, scattered remains, etc.	++	+++	++++	Hovsepyan 2009 and 2010;[2] Smith *et al.* 2014
3	Godedzor*	5/6	39°34'43" N 45°55'04" E	1800	floors, pits, fireplaces, scattered material, etc.	+++	+++	++++	Hovsepyan, in prep.
4	Gegharot	6/7	40°42'21" N 44°13'31" E	2124	grain hoards in vessels, floors, pits, fireplaces, scattered material, etc.	+++	+++	++++	Hovsepyan 2008 and 2009; in Badalyan *et al.* 2014; in prep.
5	Margahovit	6/7	40°44'06" N 44°41'10" E	1850	floors, fireplaces, scattered material, etc.	+++	+++	+++	Hovsepyan, in prep.
6	Lorut	6/7	40°56'17" N 44°46'21" E	1540	concentrations of grains	+	n/a	+++	Gandilyan 1998
7	Tsaghkasar-1	5/6	40°28'31" N 43°55'42" E	2080	pits, floors, fireplaces, scattered material	+	+++	+++	Hovsepyan 2011
8	Aparan III	6/7	40°30'10" N 44°25'54" E	1860	grain hoards in vessel	+	+	++++	Hovsepyan 2010
9	Elar (P3)	4/5	40°15'40" N 44°37'32" E	1427	charred grains from storage pits	+	n/a	n/a	Lisitsina and Prishchepenko 1977; Khanzadyan 1979
10	Voskevaz (Akhtamir)	3/4	40°16'18" N 44°17'49" E	1015	concentrations of grains	+	n/a	n/a	Yanushevich, in Wasylkowa *et al.* 1991
11	Shengavit	3/4	40°09'26" N 44°28'36" E	923	concentrations of grains, floors, pits, fireplaces, scattered material, etc.	+++	+++	++++	Tumanyan 1948; Hovsepyan 2007 and 2009; in prep.

No.	Archaeological site	Approx. rainfall (x100 mm/ year)[1]	Geographical coordinates	Elevation (m asl)	Contexts examined	Number of samples (1-10 – "+", 10-100 – "++", >100 - "+++")	Processed sediment volume (0-10 liter – "+", 10-100l – "++", >100 l - "+++")	Cultivated plants findings (0-10 – "+", 10-100 – "++", 100-1000 - "+++", >1000 – "++++")	Source (Investigator and/or publication)
12	Sotk-2	5/6	40°12'12" N 45°51'40" E	2100	pits, fireplaces, scattered material, floors, etc.	+++	+++	++++	Hovsepyan 2013
13	Norabak-1	5/6	40°09'28" N 45°51'40" E	2140	scattered material	+	++	+++	Hovsepyan, in prep.
14	Aygevan	3	39°52'10" N 44°40'41" E	852	concentrations of grains	+	n/a	++++	Gandilyan 1976
15	Maxta-1	2/3	39°35'24" N 44°56'55" E	830	fire-pits, ovens, floors, room fills	++	+++	+++	T. Earley-Spadoni, in Ristvet *et al.* 2011
16	Kültepe-1	3	-	965(~)	charred grains and spikelets	n/a	n/a	n/a	A.V. Kir'yanov and M.M. Yakubtsiner, in Lisitsina and Prishchepenko 1977
17	Kültepe-2	3	39°15'59" N 45°28'45" E	965	fire-pits, floors, hearths, ovens, room fills	++	+++	+++	T. Earley-Spadoni, in Ristvet *et al.* 2011
18	Baba-Dervish	3/4	41°04'48" N 45°29'13" E	453	charred grains from storage pits	n/a	n/a	n/a	Lisitsina and Prishchepenko 1977
19	Mentesh Tepe	3/4	40°56'31" N 45°49'58" E	357	pit	+	n/a	++++	Decaix *et al.* 2015
20	Mingechaur, settl. N1	3	40°54'57" N 46°58'12" E	211	grains and straw in clay	n/a	n/a	n/a	I.D. Mustafaev, in Lisitsina and Prishchepenko 1977
21	Chobareti	4/6	41°35'14" N 43°07'57" E	1610	pits, concentrations of grains	+	++	++++	L. Martin and C. Longford, in Kakhiani *et al.* 2013; L. Martin, in Messager *et al.* (2015)
22	Gudabertka	4/6	42°02'27" N 44°09'55" E	665	spikes	n/a	n/a	n/a	Lisitsina and Prishchepenko 1977
23	Khizanaantgora	4/5	42°00'45" N 43°58'28" E	632	charred grains	n/a	n/a	n/a	Lisitsina and Prishchepenko 1977
24	Kvatskhelebi	4/5	42°00'26" N 44°00'13" E	627	charred grains	n/a	n/a	n/a	Lisitsina and Prishchepenko 1977
25	Chirkey	4/6	42°58'09" N 46°51'48" E	377	charred grains from storage pit	+	n/a	n/a	Unknown specialist(s) from Dagestan Agrar. Inst., in Lisitsina and Prishchepenko 1977
26	Galgalatli-1	4/6	42°47'55" N 46°17'34" E	1649	charred grains from dwelling	n/a	n/a	n/a	Unknown specialist from Dagestan Agrar. Inst., in Lisitsina and Prishchepenko 1977
27	Khunzakh / Chinnab	6/8	42°32'25" N 46°42'09" E	1657	charred grains	n/a	n/a	n/a	Lisitsina and Prishchepenko 1977
28	Verkhnegunib	6/8	42°23'06" N 46°57'22' E	1242	charred grains and impressions on ceramics	n/a	n/a	n/a	N. D. Unchiev and D. S. Omarov, in Lisitsina and Prishchepenko 1977
29	Ginchi	8/10	42°22'43" N 46°36'17" E	1578	straw impressions on ceramics	n/a	-	n/a	Lisitsina and Prishchepenko 1977
30	Mekegin	4/6	42°23'42" N 47°27'43" E	1354	charred grains	n/a	n/a	n/a	D. S. Omarov, in Lisitsina and Prishchepenko 1977
31	Kayakent	2/4	42°23'07" N 47°54'25" E	178	impressions on ceramics	-	-	n/a	V. A. Petrova, in Lisitsina and Prishchepenko 1977
32	Gapshima	8/10	42°12'30" N 47°19'37" E	1642	grains impressions on ceramics	n/a	-	n/a	Lisitsina and Prishchepenko 1977
33	Gilyar	4/6	41°34'10" N 48°11'52" E	973	vessel with seed hoard	+	-	n/a	M. Zalov and D.S. Omarov, in Lisitsina and Prishchepenko 1977

* Chalcolithic and-or Chalcolithic-EBA transitional sites.

1. Approx. rainfall (x100 mm/year): Milyakov F.N., Gvozdetskiy N.A., *Physical geography of USSR. European part of USSR. Caucasus*. Moscow: Visshaya shkola, 1986; *National Atlas of Armenia. Vol. A*, 2006. Yerevan: Tigran Mets.

2. Hovsepyan R., Exploitation of natural vegetal resources in Chalcolithic Areni-1 cave settlement (Armenia), in *2nd International Workshop on Archeology of European Mountain Landscapes 'The construction of mountain territories resource exploitation and practice mobility'*, Maison de la Recherche, Toulouse 2 University, 8-11 October 2009, p. 34; Hovsepyan R., Smith A. and Bagoyan T., Preliminary data on archaeobotany of Areni-1 cave (Armenia), in *15th Conference of the International Work Group for Palaeoethnobotany*, Wilhelmshaven, Germany, May 31 - June 5, 2010 (www.nihk.de), p. 42.

only issue; the geographical distribution of the sites investigated also is not even (fig. 1). The sites mentioned in this study were excavated in different periods (starting from mid-20th c.), by various archaeologists having different scientific aims, using different methodologies or simply working styles and, most importantly, having different attitudes towards the importance of archaeobotanical investigations. Surely, quality and volume of the archaeobotanical investigations depended also on the preservation of plant remains, availability of archaeobotanist specialists, their qualifications and experience, and simply the period when the investigations were carried out.

In the sites where the author worked, standard methods of flotation, using sieves with 0.25-0.30 mm mesh size and wet-sieving, using sieves with 1 mm mesh size were applied to recover plant remains from the cultural deposits of archaeological sites. At some sites, flotation was machine-assisted and at others simple bucket flotation was employed. In other instances plant remains were preserved *in situ* within ceramic vessels (*e.g.*, Gegharot, Aparan, Lorut, Aygevan, etc.). Both, the volume of the processed sediments and the preservation of recovered material are unequal in the sites where the author worked as well. Some of the data about sites situated on the territory of Armenia (table 1) and being investigated by the author are not published yet (*e.g.*, Gegharot, Shengavit, etc.), as investigations are still in progress (see 'in prep.' after authors surname). For the other studies, the information about cultivated plants and their remains from archaeological sites presented in the current work is mostly taken from Lisitsina and Prishepenko (1977; see table 1). Along with the recent reference carpological collection, the following publications were used for identifications as well as for taxonomical representation of recorded plants: Lukyanova *et al.* 1990 (barley); Zohary *et al.* 2012 (wheat and other cereals, pulses and other cultivated plants); Nesbitt and Goddard 2006; Jacomet 2006; Terrell and Peterson 1993 (Triticeae tribe in general); Takhtajan 1954-2010 (weedy and wild taxa). I adapted plant old names from earlier publications to new versions using references cited above. *Triticum aestivum* is represented as *T.* cf. *aestivum* and *T. durum* as *T.* cf. *durum* in Table 1 unless the identifications were done based on rachis internodes.

Thirty-five Early Bronze Age archaeological sites from the South Caucasus containing evidence about Kura-Araxes agriculture are presented in this article. The map (fig. 1) includes Kura-Araxes sites of the Northern Caucasus (Daghestan: 26-35) and pre-Kura-Araxes sites (Chalcolithic: 1-3) for comparative purposes. See Table 1 for details on sites and Table 2 for cultivated plants recorded for each site.

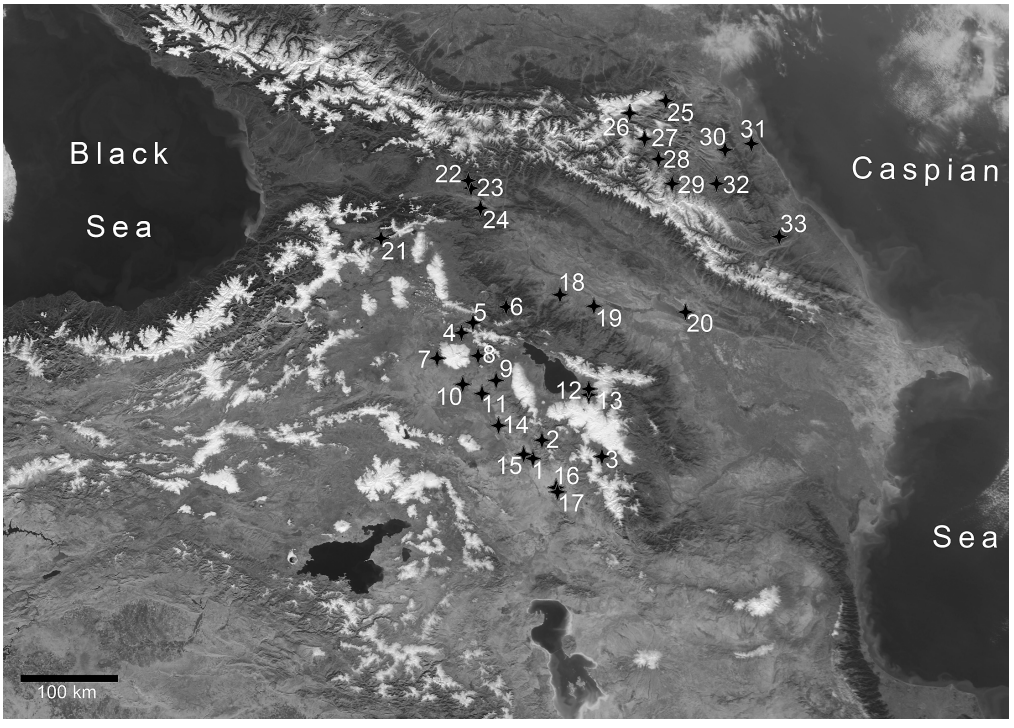

Fig. 1 – *Locations of Early Bronze Age sites of the South Caucasus revealing evidence about agriculture of Kura-Araxes culture people. 1) Ovçular Tepesi, 2) Areni-1, 3) Godedzor, 4) Gegharot, 5) Margahovit, 6) Lorut, 7) Tsaghkasar-1, 8) Aparan III, 9) Elar (P3), 10) Voskevaz, 11) Shengavit, 12) Sotk-2, 13) Norabak-1, 14) Aygevan, 15) Maxta-1, 16) Kültepe-1, 17) Kültepe-2, 18) Baba-Dervish, 19) Mentesh Tepe, 20) Mingechaur N1, 21) Chobareti, 22) Gudabertka, 23) Khizanaantgora, 24) Kvatskhelebi, 25) Chirkey, 26) Galgalatli-1, 27) Khunzakh or Chinnab, 28) Verkhnegunib, 29) Ginchi, 30) Mekegin, 31) Kayakent, 32) Gapshima, 33) Gil'yar.*

Table 2 – *Plants cultivated by people of the Kura-Araxes culture in the South Caucasus, Daghestan and some adjacent territories.*

	Map no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
No.	Site	Ovçular Tepesi[1]	Areni-1[1]	Godedzor[1]	Gegharot	Margahovit	Lorut	Tsaghkasar-1	Aparan III	Elar (P_3)	Voskevaz (Akhtamir)	Shengavit	Sotk-2	Norabak-1	Aygevan	Maxta-1	Kültepe-1	Kültepe-2	Baba-Dervish	Mentesh Tepe	Mingechaur, settl.N1	Chobareti	Gudabertka	Khizanaantgora	Kvatskhelebi	Chirkey	Galgalatli-1	Khunzakh / Chinnab	Verkhnegubin	Ginchi	Mekegin	Kayakent	Gapshima	Gilyar
1	**Cereals**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+?**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+**
2	**Barleys**	**+**	**+**	**+**	**+[2]**	**+**		**+**	**+**			**+**	**+**	**+**	**+[2]**	**+**	**+**	**+**	**+[2]**	**+**	**+**	**+**	**+?**	**+**	**+**	**+**	**+**		**+**					**+**
3	Hulled barleys	+	+	+	+	+			+			+	+	+						+		+												+
4	Hulled 2-row barley				+				+			+												+										
5	2-row barleys			+	+				+			+			+						+			+									
6	6-row barleys			+	+				+			+			+				+	+	+			+									
7	Hulled 6-row barley			+	+	+			+			+												+									
8	Naked barleys		+	+								+?			+?		+?											+?					+?
9	Naked 6-row barley		+	+																														
10	**Wheat**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+?**		**+**	**+**	**+**		**+**			**+**		**+**
11	Tetra- and/ or hexaploid wheats (naked and/or hulled)		+	+	+	+		+	+			+	+	+	+	+	+	+	+	+		+												
12	Naked wheats[3]		+	+	+	+	+	+	+	+	+	+	+	+			+		+		+				+				+			+		+
13	Naked bread wheat		+	+	+	+		+				+		+								+												
14	Macaroni wheat			+								+?																						
15	Hulled wheats			+	+			+						+	+					+		+												
16	Spelt type wheat			+	+		+?		+																									
17	Emmer		+	+	+	+			+			+		+						+	+	+				+								
18	Einkorn type				+																	+												
	Other Cereals																																	
19	Ryes			+	+	+																												
20	Broomcorn millet																+?					+?		+?										
21	Foxtail millet																				+?													
22	**Pulses**	**+**	**+**	**+**																														
23	Lentil	+	+	+																														
24	Pea	+		+																														
25	Bitter vetch			+												+?		+?																
26	Grass pea	+	+																															
27	Vetches (wild?)[4]		+	+	+	+						+	+																					
28	**Oil-crops: Flax**			**+?**								**+?**										**+?**												**+?**
29	**Grape**		**+**									**+**		**+?**						**+**				**+**	**+**									

Everywhere in this table higher taxonomical rank signed positive if a taxon from that particular group presents there (*e.g.*, the cells for unidentified cereals (Poaceae – Triticeae, no. 1), unidentified wheats (*Triticum* spp., no. 11) and hulled wheats (*Triticum* spp. (hulled), no. 13) marked positive if there is emmer (*T. dicoccum*, no. 22) in that site as emmer is cereal, it is wheat and it is hulled wheat).

+?: Belonging to EBA layers (or identification) is doubtful for the author.

1. Chalcolithic or Chalcolithic / Early Bronze Age transitional sites.

2. Bottle shaped barley – *Hordeum lagunculiforme* is noted for these sites. The author does not consider that this is valid species. Grains similar to ones described for this species can be formed under unfavorable ecological conditions (author's observations).

3. Followings are included in this category: naked bread wheat, common bread wheat, club wheat, round-grained wheat, macaroni wheat, unless identifications are done based on rachis remains.

4. Vetches (Viceae spp./ *Vicia* spp., no. 27) were added to this table just to show that other large seeded wild representatives of Viceae tribe could grew in the EBA period, while cultivated ones were not grown. There is no evidence that vetches were cultivated.

DATA INTERPRETATION AND DISCUSSION

PLANTS CULTIVATED FOR FOOD[2]

Cultivated cereals (*Triticeae gen.* spp.; table 2, no. 1)

Grains and their fragments, glumes, internodes and other spike remains of cultivated cereals (*i.e.,* wheats, barleys, rye, etc.) of unidentifiable genus are included in this group. Practically all remains from this group and the other groups of cultigens are charred; the table also includes a few impressions from various sites.

Cultivated barleys (*Hordeum vulgare* L.; no. 2)

Preservation of grains from this group does not allow us to identify either their position in the barley spikelet triplet or whether the grains are hulled or naked. Charred grains of cultivated barley are the most frequent archaeobotanical findings for the entire Bronze Age of the South Caucasus.

Hulled cultivated barley(s) (no. 3)

Either or both, hulled six-rowed barley or/and hulled two-rowed barley. This category comprises spike triplet position unidentifiable and/or triplet middle hulled grains. As both two-rowed (no. 5) and multi-rowed (no. 6) subspecies of barley have triplet middle grains it is not possible to identify them having only charred triplet middle grains at hand.

In the instances when there is a sufficient (*e.g.*, 100 and more) number of well preserved barley grains[3] it is possible to distinguish six-rowed and two-rowed subspecies (Godedzor, Gegharot, Shengavit, etc.; tables 1-2). While the finding of barley triplet lateral grain alone is enough to certify the presence of six-rowed subspecies, some statistics is necessary to attest the presence of barley two-rowed subspecies in archaeological material. In general, there can be three cases concerning two-rowed and six-rowed barleys appearance based on the ratio of triplet grains. All of them require well-preserved grains in sufficient quantities (more than a hundred, the more the better for statistics).

– Case 1: only **two-rowed barley** (*Hordeum vulgare* subsp. distichon (L.) Koerm.; no. 5); there are only triplet middle position grains.
– Case 2: only **six-rowed barley (***H. vulgare* ssp. *vulgare*; no. 6); minimum 2/3 of the grains are barley triplet lateral grains (ideally, 1/3 should be triplet right grains, 1/3 triplet left grains and 1/3 triplet middle grains).
– Case 3: mixture of two- and six-rowed barleys; there are triplet lateral grains and more than 1/3 of all grains are triplet middle grains.

Hulled six-rowed cultivated barley (*Hordeum vulgare* ssp. *vulgare* convar. *vulgare*; no. 7): presence of this variety of barley is confirmed by the record of lateral slightly asymmetric and bent hulled grains of the barley triplet (see above).

Barley, particularly hulled barley (no. 3), was the most common cultivated plant found on sites of the Early Bronze Age Kura-Araxes culture (table 2). In the case of Kura-Araxes culture of the South Caucasus, both two-rowed and six-rowed subspecies were recorded (*e.g.*, thousands of grains were recovered *in situ* in vessels at Early Bronze Age Gegharot and Aparan III sites in Armenia). As most of barley grains findings from Armenia are larger than average size triplet lateral grains and do not show asymmetry and convolution, I assume that mostly **hulled two-rowed barley** (*H. vulgare* ssp. *distichon* (L.) Koern. convar. *distichon*; no. 4) has been cultivated by Kura-Araxes culture people at least on the territory of Armenia. Hulled barley was very scarce on the territory of Armenia in Neolithic period, but in Chalcolithic period its ratio begun to rise and since the Early Bronze Age practically all barley records bear on hulled varieties.

It is noteworthy that the **naked variety of cultivated barley** (*H. vulgare* var. *nudum*; no. 8) has been reported for some Bronze Age archaeological sites of the South Caucasus (*e.g.*, Lisitsina and Prishchepenko 1977; Ghandilyan 1998). But barley grains often lose their fragile grain covers (the hull, *i.e.* lemmas and paleas) after charring and appear dehulled; this phenomenon often leads in the base of misidentification of barley grains taxonomical belonging and they referred to naked variety.[4] The author suppose that only or mostly hulled barley has been cultivated at the territory of Armenia, and free-threshing (naked) barley, which has been cultivated in Neolithic and Chalcolithic periods (the naked six-rowed barley – *H. vulgare* L. subsp. *vulgare* convar. *coeleste* (L.) A. Trof.; no. 9), had been pushed out from cultivation because of still unknown natural or anthropic factors.

2. Numbers in the text match with the ones in Table 2.
3. Findings of barley rachis fragments in general were very rare in the sites investigated by the author in Armenia.
4. The author has recorded only single grains of barley with free-threshing features (one naked grain amongst several thousand hulled ones) at Bronze Age sites from the territory of Armenia. In addition, re-examination of all available material (by the author) previously identified as naked barley—*e.g.*, Aparan III (Gandilyan in Badalyan 2003), Aygevan (Gandilyan 1976), Metsamor (Gandilyan, unpublished report), Jujevan (Gandilyan 1998), Shengavit (by photos, Tumanyan 1948)—showed that they are hulled ones, even if they lack lemmas and palleas.

Wheat(s) (*Triticum* spp.; no. 10)

Due to strong morphological similarities and overlapping of morphological features after carbonization differentiation of tetraploid and hexaploid wheats by grains is considered subjective (see Zohary *et al*. 2012 for general reference). That is why in Table 2 there are two general groups of wheats findings: 'hexa- or tetraploid wheats' (no. 11) and 'naked wheats' (no. 12).

Hexa- or tetraploid wheats *Triticum aestivum* L./ *turgidum* L.; no. 11) group include grains findings, which are not enough preserved to distinguish is it free-threshing wheat or not, *i.e*. practically all wheat species except einkorn could appear in this group.

Naked wheats' group (no. 12) shows findings of naked wheat grains and identifications/reports of the following free-threshing taxa and categories: *Triticum* cf. *aestivum* L. (naked), *T.* cf. *vulgare* Vill [=*T.* cf. *aestivum* L. ssp. *vulgare* (Vill) MacKey], *T.* cf. *compactum* Host [=*T.* cf. *aestivum* ssp. *compactum* (Host) MacKey], *T.* cf. *sphaerococcum* Perc. [=*T.* cf. *aestivum* ssp. *sphaerococcum* (Perc.) MacKey], *T.* cf. *durum* Desf. In addition to regular size naked wheat grains, there are also smaller grains with the same morphology collected under this group, which in all probability are apical grains from naked wheats spikelets.

Reports/findings of club wheat (*T.* cf. *compactum*), round grained wheat (*T.* cf. *sphaerococcum*) and macaroni wheat (*T.* cf. *durum*) grains usually are not frequent (at least in the territory of Armenia). Some investigators of these reports distinguish compact and nearly spherical forms of hexaploid wheats as *T. compactum* and *T. sphaerococcum*, but it suffices to say that the broad category *Triticum aestivum/durum* includes many compact forms. Club wheat is comparably dry resistant and was largely cultivated in the South Caucasus until our days (Stoletova 1930). Presence of *sphaerococcum* wheat still needs to be confirmed by stronger evidences, *i.e*., rachis remains, better preserved and large amount of grains, etc.[5]

Naked bread wheat (*Triticum aestivum* L. s.l.; no. 13) and **macaroni wheat** (*Triticum durum* Desf. [=*T. turgidum* conv. *durum* (Desf.) MacKey]; no. 14) are noted here (table 2) only if the identifications were done based on rachis internodes,[6] else or in cases details of identification are unknown, reports of *T. aestivum* and *T. durum* are merged in 'naked wheats' (no. 12).

Hulled wheats (no. 15): there are two main candidates in this group, emmer and spelt wheat. **Spelt wheat** (*Triticum* cf. *spelta* L. [=*T.* cf. *aestivum* ssp. *spelta* (L.) Thell.]; no. 16): this hulled wheat, like einkorn, is less common in the South Caucasus assemblages than in European ones.

Emmer (*Triticum dicoccum* (Schrank) Schuebl. [=*T. turgidum* L. subsp. *dicoccum* (Schrank) Schuebl.]; no. 17) is traditional for the South Caucasus and has been cultivated there since Neolithic period. It always accompanied bread wheat, but never outdid the latter in scales of cultivation or economic significance.

Einkorn (*Triticum* cf *monococcum* L. [= *T.* cf. *monococcum* L. subsp. *monococcum*]; no. 18) has always been present in the territory of Armenia and other parts of South Caucasus in very small quantities unlike Europe, where this species has been cultivated since the Neolithic period in large quantities and competed with emmer.

Other cereals

Other cereals were not common for the Early Bronze Age South Caucasus. **Rye** (*Secale cereale* L. / *Secale* spp.; no. 19) has always been present in the sowings of wheat and barley and is considered a weed plant (by modern apprehensions). However, it is also cultivated as an independent crop. Cultivation of rye as independent crop in Bronze Age is less likely than the case of einkorn, macaroni wheat, spelt wheat and compact forms of wheat. Anyway, rye and the above mentioned less frequent species of wheat and barley recovered in small quantities are always accompanied by the main crop(s) in different ratios. Those cereals are being sown, cultivated and used in food with the main crop(s). Starting from the Iron Age (sometimes even earlier) such plants were selected and cultivated in the region as independent crops as it was in cases of rye, false-flax, etc.

Evidence on presence of millets, **broomcorn millet** (*Panicum miliaceum* L.; no. 20) and **foxtail or Italian millet** (*Setaria italica* (L.) Beauv.; no. 21) on the territory of Armenia in Bronze Age period is very scarce and mostly concerns Late Bronze Age. Millets cultivation in the South Caucasus for the period earlier than Late Bronze Age is doubtful particularly under the light of new investigations on millet early cultivation in Europe and accompanied by direct radiocarbon dating of millet grains (Motuzaite-Matuzeviciute *et al*. 2013; Valamoti 2013). It is possible that grain remains recovered from earlier

5. The round grained wheat is native for India and Pakistan (Zohary *et al*. 2012). After carbonization kernels of club wheat and round grained wheat can look quite similar and there is a strong possibility that identifications of *sphaerococcum* wheat for the South Caucasus are misleading: *i.e*., grains identified as *T. sphaerococcum* are *T. compactum* (or even *T. vulgare* and *T. durum*) for real.

6. See Jacomet 2006; Zohary *et al*. 2012 and other relevant publications mentioned above (see in "Material and methods") for ID criteria.

periods from the South Caucasus belonged to other taxa of Paniceae tribe of poaceous plants, *e.g.* to species of *Setaria* or *Echinochloa*, which are widely spread weeds growing everywhere or represent intrusions from overlying later (*e.g.*, Iron Age) sediments.

Pulses (Fabaceae, no. 22)

Lentil (*Lens culinaris* Medik.; no. 23), **pea** (*Pisum sativum* L./*Pisum* sp.; no. 24), **bitter vetch** (*Vicia ervilia* (L.) Willd.; no. 25) and **grass pea** (*Lathyrus* sp./ *L. sativus* L.; no. 26), which present in earlier or transitional period sites (table 2) apparently were not cultivated in the Early Bronze Age South Caucasus.[7] Lentil and pea are the most common cultivated pulses in the region in prehistoric times. But, cultivation of pulses has not been a continuous practice in the South Caucasus: in the Neolithic period it was quite intensive, for Chalcolithic period we notice a decline of pulses cultivation, and since the Early Bronze Age there are practically no pulses in archaeobotanical record. Later on, large-scale cultivation of pulses resumed in period of the Kingdom of Van (Urartu).

Oil-crops

Flax or linseed (*Linum* sp.; no. 28) is noted for some Early Bronze Age sites of the South Caucasus (table 2), but findings are very few and identified only to genus level.[8]

Cultivated grape (*Vitis vinifera* L.; no. 29)

Grape has been known in the South Caucasus since the Neolithic period.[9] It is the most constant cultigen after cereals in prehistory of the South Caucasus (Lisitsina and Prishchepenko 1977; Hovsepyan and Willcox 2008; Hovsepyan 2009).

7. Several seeds of bitter vetch are found in Maxta-1 and Kültepe-2 (T. Earley-Spadoni, in Ristvet *et al*. 2011). I do not reject possibility that bitter vetch has been cultivated in these two settlements, but under this circumstances better to have more findings accompanied with direct radiometric datings to be sure that this pulse has been cultivated locally.
8. Only single seeds of flax (*Linum* sp.) are found in Godedzor and Shengavit, flax (and hemp) fibers in Chobareti (by E. Kvavadze and I. Martkoplishvili, in Kakhiani *et al.* 2013), and findings and their quantity is not specified for Gilyarskoe (Lisitsina and Prishchepenko 1977).
9. Grape has been recorded in the following Neolithic sites of the South Caucasus: Aratashen (Hovsepyan and Willcox 2008), Aknashen and Masis Blur settlements in Ararat valley (Armenia), Shulaveri (Georgia), Shomutepe (Azerbaijan) (Lisitsina and Prishchepenko 1977). None of the found grape pips have been radiocarbon dated.

PLANTS THAT MIGHT HAVE BEEN GATHERED FOR FOOD

WILD AND WEEDY PLANTS

Wild and weedy plants probably appeared in the sites with harvested crop or may have originated in dung fuel (*e.g.*, Miller 1984), but they can be also utilized as food. Young shoots of the plants included in this group are still gathered and used for food by local population. Sometimes they are even stored for later use (in winter, a recent example is *Rumex*, whose dried bride like prepared shoots are found in local villages until spring). Most of these and other species from the mentioned genera have supposedly been gathered and used for food: *Rumex crispus, Rumex* sp., *Polygonum aviculare, Chenopodium, Chaerophyllum*, *Urtica, Capparis spinosa*, etc.

Moreover, seeds of some other plants could be gathered and used for food in extreme conditions, *e.g.* in case of famine, etc.: species of Poaceae, including wild species of *Triticum*, *Hordeum*, *Avena*, *Aegilops*, *Bromus*, *Setaria* and other species from Paniceae tribe; large seeded pulses from Viceae tribe, small seeded leguminous plants, members of the Polygonaceae family, *e.g. Rumex*, *Polygonum, Polygonum aviculare*; *Thlaspi*, *Bunias*, *Alyssum* and other Brassicaceae, members of the Cyperaceae, *e.g.* species of *Scirpus* and *Carex*; *Althaea* sp. (Malvaceae); *Chenopodium, Chaerophyllum*; members of the Asteraceae family, etc.

EDIBLE WILD ARBOREAL PLANTS

Charred nutlets of *Rosa* sp. (rose hip) and *Rubus* sp. are the most frequent remains of arboreal plants fruits at Kura-Araxes culture settlements of the South Caucasus (Chobareti, Gegharot, Sotk-2, Shengavit, etc.). Fruits of hip rose berries of many species of *Rubus* are known amongst locals for their taste and nutritional value and traditionally have been gathered and used for food in fresh or dried state.

DISCUSSION

In some cases hoards of cereals grains are found *in situ* in ceramic vessels, *e.g.* in Early Bronze Age settlements in Armenia—*e.g.* Gegharot (Hovsepyan 2008), Aparan III (Hovsepyan 2010) and Shengavit (Tumanyan 1948). A mixture of hulled barley, free-threshing bread wheat, club wheat,

emmer and rye grains were present in all intact vessels. We suppose that those cereals come from mixed cultivation. Seeds of weeds are very few or practically absent in the aforementioned samples, suggesting application of certain weed removal techniques during cultivation, harvest and/or afterwards. Archaeological plant remains dispersed in the site matrix and clear concentrations of *in situ* cultigens share the same species and have similar ratios.

The only substantial difference in crop assemblage at investigated sites presently recorded is the ratio of wheat and barley, which depends on the geographical position of the sites. The higher the elevation of the site the more the ratio of hulled barley is over wheat and vice versa. For example, in Gegharot site situated *ca* 2100 m above sea level, barley portion is 80-90% and even more. As for Aparan III site barley portion is around 56% on altitude of 1860 m asl, while in Shengavit site situated on 930 m asl barley portion drops less than 35% and wheat prevails.[10]

There is a certain pattern in prehistoric agriculture of the South Caucasus,[11] where specialization in agrarian economy in the Bronze Age, particularly in the Early Bronze Age, is notable. Thus, the situation with plants cultivation is as follows: the population of Kura-Araxes culture in the South Caucasus cultivated mainly, if not only, cereals, mostly varieties of bread wheat, hulled barley and emmer, and sometimes grape as well.

Pulses and oil plants were domesticated at the same time with cereals and accompanied them during almost all periods and everywhere in the world (Zohary *et al.* 2012). The absence of pulses in archaeological record of the South Caucasus is rather strange and needs explanation.

Talking about farming and herding along the Euphrates, N. Miller (1997) not only posits a correlation between precipitation and cereal choice (more wheat where it is wetter, more barley where drier), but also that the charred remains reflect the broader agricultural system. About prehistoric South-West Asia A. Butler (1998) writes that from the Epipalaeolithic onward, pulses have been recovered at virtually every site, which has yielded remains of cereals. She also writes that lentil appears to have survived and to have been exploited throughout all periods, even when the vegetation is likely to have been highly restricted (Butler 1998). Miller noted a drop-off in legumes after the PPNB in the Near East, attributed to a combination of changes in processing/cooking technology (with pottery, pit roasting is not necessary), and the advent of domesticated animals who provided protein to the diet, and fertilizer to the fields (Miller 2002). According to S. Riehl's (2008 and 2009) summary of archaeobotanical data from the Early and Middle Bronze sites of Near East, cultivation of pulses and oil-crops considerably dropped in the Bronze Age, but lentil, bitter vetch, pea, grass pea, chick pea and linseed were still cultivated there. The sites providing information about ancient crops are mostly situated in lowlands and middle mountainous zone or concentrated within the Fertile Crescent, especially in the western part of it (Riehl 2008 and 2009; there are extremely few sites investigated for archaeobotany in the western part of the Armenian Highland, Eastern Anatolia). Zohary *et al.* (2012) also mentioned archaeobotanical situations somewhat similar to the South Caucasus, from other regions of the Old World. Particularly, they note that hulled barleys were common in South-West Asia during the Chalcolithic and Bronze Age and that in these periods they show a tendency to outnumber the wheats (p. 57). Concerning pulses, they note that pulses seem to have been a consistent element in Neolithic and Bronze Age food production throughout West Asia and Europe and a common companion of wheat and barley since earlier periods (p. 81), but at the same time they point out that in many Bronze Age settlements in Europe pulses seem to be sparser than in Neolithic times (p. 86). An increase in findings of pulses in Europe for Iron Age settlements is stated as well (Zohary *et al.* 2012).

Thus the above-mentioned situation suggests certain similarity between the South Caucasus and neighboring regions. But, while only similar tendency was recorded in the other parts of the Old World as well, in the South Caucasus Early Bronze Age agriculture seems to be based only on cereal cultivation, which tends to be a characteristic feature for Kura-Araxes culture at least in the boundaries of the South Caucasus.

As we compare the situation recorded for the Bronze Age and Early Iron Age agriculture in the South Caucasus with agriculture of predating and following periods—and also put it in regional context—, a question arises: why was Early Bronze Age agriculture in the South Caucasus so specialized in cereal cultivation?

But, before proceeding with this problem, let us first discuss another crucial question: why were only cereals recovered from Early Bronze Age archaeological sites of the South Caucasus? Several hypotheses could account for skewed samples:

– Not all of the archaeological sites were specifically investigated for archaeobotany, so only chance finds are recorded;

10. It is possible that these values will be somewhat changed during future investigations.

11. R. Hovsepyan, Preliminary data on the prehistoric agriculture of the Southern Caucasus (the main phases of development). *In*: *15th Conference of the International Work Group for Palaeoethnobotany*, Wilhelmshaven (Germany), May 31 - June 5, 2010. Abstract book: 41.

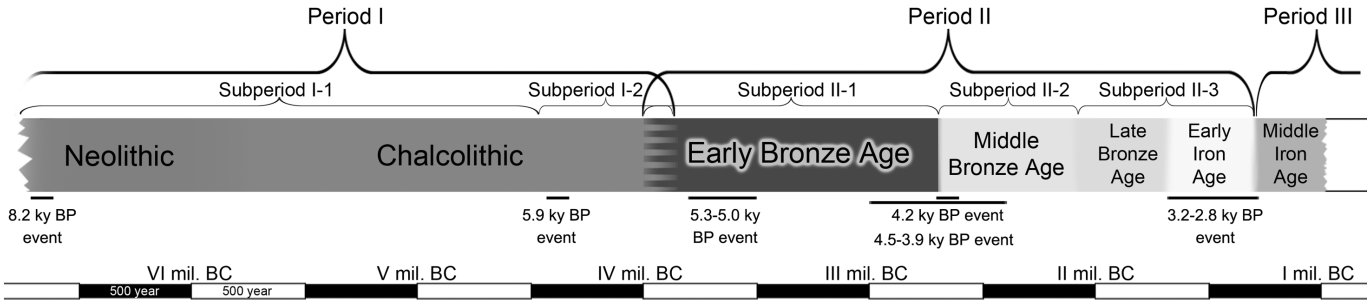

Fig. 2 – *Major climatic events, archaeological periods and stages of agriculture in the South Caucasus.*

– Not all of cultural sediments of excavated archaeological sites were examined for plant remains;
– Other crops were not preserved due to taphonomic conditions;
– Other crops are not found because of the methodology implemented for the recovery of plants remains;
– Other crops were cultivated by the Kura-Araxes people but they did not bring them to their settlements;
– No other crops were cultivated and used.

Some of these presumptions do not stand criticism in the wake of the following arguments. More than 30 Early Bronze Age sites were investigated in the South Caucasus and Daghestan (table 1). Many of those sites were investigated systematically (see references cited in Table 1). Other crops, pulses and oil-crops, were preserved and are found from layers of other periods of the same sites or other sites, which had similar bio-climatic and soil conditions. The same methods were used for all the instances (flotation or simultaneous use of flotation and wet-sieving methods). There is very little chance that plants were cultivated and utilized outside of the settlements. So, in all probability other crops were indeed not cultivated and we have to return to the main question: why are only cereals cultivated?

There are many environmental and anthropogenic factors that could have influenced the formation of such a specific agriculture in the South Caucasus. Amongst environmental factors the limiting one for plants is mostly climate. Changes in the plant economy of the South Caucasian people at the beginning of Bronze Age overlap with the beginning of Subboreal period of Holocene when climate grew even dryer and slightly cooler. Generally, the major climatic events clearly correspond with the beginning of prehistoric agricultural and archaeological periods (fig. 2).[12]

Were specificities recorded in agriculture conditioned only by nature, particularly by natural (ecological) selection? Is it possible that drought and cold were selective limiting factors for pulses and oil-plant cultivation?

Before going further with discussion of agricultural characteristics of Kura-Araxes culture, here are some ethnobotanical notes from Armenia. Nowadays, the cereals under discussion (bread wheat, hulled barley, emmer) are the main or the only crops cultivated in high mountainous zones of Armenia. In many places people cultivate those cereals mixed in the same fields, use the crop as fodder and buy wheat grain or flour from regions situated lower. As mentioned by one of Vavilov's students, E. Stoletova (1930), who worked on ethnobotany of Armenia in the beginning of the twentieth century, the population of the high mountainous zone practiced mixed cultivation of cereals consisting mostly of wheat and barley. Stoletova argues that people preferred mixed cultivation of cereals to ensure at least moderate harvest as barley and wheat have slightly different ecological preferences and are susceptible to different extreme factors. She also mentioned that the tradition of making their own bread is very strong amongst Armenians and they sown cereals every year even if crop periodically failed. Compared to late Soviet and post-Soviet times, in the beginning of the 20th century, in Armenia wider range of field crops were cultivated along with cereals in high mountainous zones (2100 m asl and higher) characterized with severe climate: lentil, false-flax, rapeseed, lallemantia, etc. (Stoletova 1930). Nowadays old people from highland settlements also confirm that they cultivated pea, flax and other cultigens even in Soviet times. Residents of the high mountainous zone

12. See Staubwasser and Weiss (2006) for detailed references on climatic events; Connor and Kvavadze (2008), Sayadyan (2009), Connor (2011) and Joannin *et al*. (2014) for Holocene history in the territory of Georgia and Armenia; Avetisyan and Bobokhyan (2012: Fig. 2, p. 18) for overview of archaeological periods in the region. Change of climate coinciding with Early Bronze Age is clearly followed on the comparison chart of some late Quaternary palaeoclimatic trends from West Asia (Connor and Kvavadze 2008: Fig. 10; 2014) and particularly from Armenia / Georgia (Joannin *et al*. 2014).

(Armenia) explain that the absence of pulses and oil-crops cultivation in the present time is due to the lost knowledge about cultivation, absence of special machinery for harvesting and threshing, low yield (yield from cereals is higher) and the risk of crop failure, low local demand, availability of cheaper imported products in market ("it is cheaper to buy the imported one"). I consider low yield and risks of crop failure the main (but not the only!) reasons for avoiding cultivation of non-cereal crops on upper parts of middle mountainous and entire high mountainous zones (fig. 3).

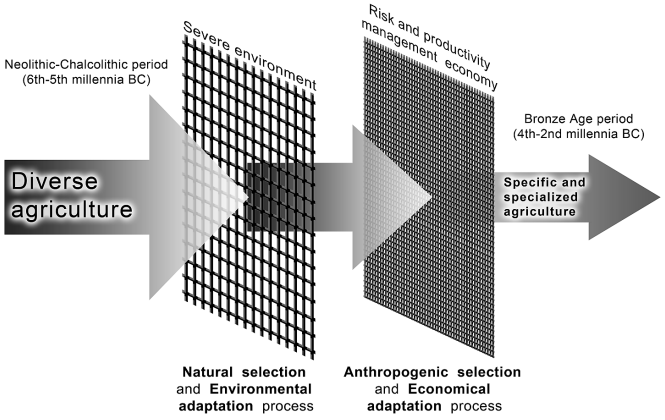

Fig. 3 – *Formation of Bronze Age agriculture in the South Caucasus.*

In the light of the present day considerations, we can assume that the situation was similar during Early Bronze Age. In fact, the archaeobotanical situation in high mountainous zones looks similar for all periods. But how to explain the same image for sites situated in foothills and in lowlands? What factors could induce people living in comparably large settlements in lowlands with warmer climate and situated on the banks of rivers to practice the same kind of agriculture as people from highlands?

Of course, there is also possibility that pulse cultivation ended completely because of some legume-specific disease, failure of nitrogen-fixing bacteria, etc., but the presence of large seeded weedy/wild pulses in archaeobotanical assemblages of the studied Bronze Age sites (table 2, no. 27) and the presence of wide range of leguminous plants, including wild relatives of cultivated pulses and oil-plants at the studied territory (Gabrielian and Zohary 2004) make us believe that the existence of a 'legume-specific natural limiting factor' is quite improbable. In addition, many mesophile or hydrophile and thermophile plants, which could not survive in current conditions of high mountainous zone, grow in lowlands, foothills and middle mountainous zone of the South Caucasus.

It is worth mentioning that the assemblage of recorded prehistoric and modern native weedy species is the same in the studied region, which suggests there have been no substantive changes in agrocenoses. The number of archaeologically known weedy taxa increases every year as a result of systematic excavations and subsequent archaeobotanical studies, but the plants are the same ones that grow in the environs, in the present day. At the same time, the crop assemblage is the same from site to site and within the sites.

For this case I believe that the most likely explanation of agricultural specificities in the Bronze Age of South Caucasus is the human factor.[13] Changes occurring in the agrarian economy of the South Caucasus people between Neolithic period and Early Bronze Age might represent a replacement of higher risk (for mountains) farming with pastoral strategies. Here are arguments for this hypothesis:[14]

- Animal husbandry could have been preferable than agriculture in general, because in times of unpredictable environmental changes, for example periodical drought, pastoral production could give more flexibility and ability to manage risks, as people with animals could move to better places;[15]
- Cereals recorded for the Bronze Age agriculture of the South Caucasus are more resistant to severe bio-climatic conditions and they need less care than most of other field-crops. Thus cereal cultivation required less effort and was less risky;
- Proteins (produced by pulses) and fats (oil-producing plants) necessary for human vital activity as well as fiber material (fiber crops) necessary for cloth-making could have been replaced and mainly provided by animal products—*i.e.*, meat, milk, wool (Riehl 2009).

Concerning the phenomenon of the decline and putative secondary role of agriculture from the 4th-3rd to

13. It is known that even changes in wild vegetation can be caused by people. For example, according to Connor *et al*. (2007 and 2008) decline of chestnut (*Castanea*) dominated forests and their replacement by alder (*Alnus*) swamps 4500 years ago in Colchis (West Georgia) caused not by climatic changes, but by Black Sea level fluctuations and human impact.
14. Just for comparison, hulled barley and bread wheat were the main and often the only crops cultivated by Kurds (and Yezidi) of Transcaucasia, which main direction of agrarian activity was transhumant pastorialism (Aristova 1966).
15. There are paleopalynological and paleoenthomological data from high mountains of North-West Iran suggesting practice of transhumance still during the Neolithic – Chalcolithic/Early Bronze Age periods (Ponel *et al*. 2013).

the 1st millennium BCE period in the South Caucasus (Transcaucasia), B. Piotrovskiy (1961) wrote that after Eneolithic period in Transcaucasia animal breeding predominated over agriculture, because in the mountains it proved to be an easier way to produce necessary food. According to him, the animals' pace of growth made it necessary to find new pastures to feed them, so the population turned to a semi-nomadic lifestyle, where they left their settlements in valleys in summers and went to the mountains. Thus, already in the 2nd millennium BCE agriculture faded (p. 112). Piotrovskiy wrote also about the revival of agriculture in Transcaucasia in the beginning of the 1st millennium BCE and correlated it with the Van Kingdom in the southern parts of Transcaucasia (p. 115-119). Although ideas of Piotrovskiy are quite logical and natural and correspond to the conclusions I made after my studies (Hovsepyan 2009), in the first half of 20th century those were speculations based on extremely few material evidence compared with the amount of material and the sites studied at present. In addition, those ideas are considered relevant mostly to Middle Bronze Age (A. Bobokhyan, personal comm.).

Taking into account similarity of cultivated plants assemblage in all investigated Early Bronze Age sites at the South Caucasus and attribution of that assemblage to mountainous zones, I suggest one more working hypothesis: it is possible, that the origin of the agricultural traditions of people of Kura-Araxes culture in the South Caucasus, dominated by cereal cultivation to the exclusion of most other crops, stems from mountains.

This raises the question of why people from lowlands started to follow agricultural, household and dietary traditions of high mountainous populations during the Chalcolithic period. Perhaps during a time of climate aridification, higher rainfall (*i.e.*, water availability) in the upland regions allowed those people to have a better quality of life, more chances to survive the drought. Since they could control water sources from upstreams, they also exercised power over people depending on those water sources. Moreover, perhaps people living in lowlands periodically lost their crops to droughts and later obtained seed material from neighbors from highlands *via* trade and barter.

The above mentioned process of population transformation could have been gradual and agricultural traditions of people from highlands were obliged to people of lowlands or it just have been adopted by them spontaneously as a result of highlands people's elite dominance.

SUMMARY

The agriculture of Early Bronze Age people in the South Caucasus was focused on the cultivation of cereals, which possibly was the only direction of their farming activities.

Mostly hulled two-rowed barley and varieties of bread wheat were cultivated; hulled multi-rowed barley, emmer, club wheat and rye were used in lesser quantities. Mixed cultivation of the above-mentioned cereals was practiced as well, thereby reducing risk of total crop failure. According to the present data, barley predominated on higher altitudes and the ratio of wheat was often less than 10%, while in lowlands the wheat ratio rose and even exceeded barley's proportion.

Absence or scarcity of non-cereal crops in agriculture of Bronze Age and Early Iron Age population of Armenia may have been conditioned by the limited availability of cultivable lands and by giving priority to the quantity (but not diversity) of the food first of all.

Changes in agriculture, particularly cultivation choices for certain plants by people of Kura-Araxes culture, were related to climatic changes, but economic efficiency and cultural choice of certain agricultural products and traditions have a decisive role in the formation of Early Bronze Age agriculture of the South Caucasus.

I suggest a working hypothesis that the agriculture of the Kura-Araxes culture, characterized by a limited range of crops (*i.e.*, cereals) and correspondingly strong emphasis on mobile or semi-mobile pastoral production originated in the mountainous zones of the Lesser Caucasus and the Armenian Highland.

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Roman HOVSEPYAN
Institute of Archaeology and Ethnography National Academy of Sciences
15 Charents str. – 0025 Yerevan
REPUBLIC OF ARMENIA
roman.hovsepyan@gmail.com

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