

The Feature of ATR and ATR Harmony in Nilo-Saharan Languages of Ethiopia

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Abstract. Within the prominent vowel systems in Nilo-Saharan languages, Advanced Tongue Root (ATR) feature plays significant part in the phonological system of the languages. This review attempts to assess the studies on ATR contrasts and ATR harmony in the phonetic and phonological characteristics of the languages in Ethiopia. Some of the languages with accessible study outputs were considered under analysis in this review work; based on the studies, the fundamental ATR related characteristics of the languages were provided, and the relevant discussions were made accordingly. The information from the relevant studies is presented systematically and comparatively so that the readers find it easily understood; hence, the paper will have its intended linguistic value for the further researchers and other beneficiaries. Finally, some generalizations were drawn and recommendations were forwarded.

Keywords: harmony, ATR systems, Nilo-Saharan, vowel, phonology, phonetics

1 Introduction

1.1 Background and Justification

As a part of vowel system in phonological phenomena of languages, the vowel feature that is called Advanced Tongue Root (ATR) has been confirmed to be the widely attested system in Nilo-Saharan languages especially in Africa (Billington, 2014; Ko 2012; Casali, 2008). This paper attempts to provide extended definition of ATR contrast and to assess ATR harmony in some Nilo-Saharan languages in their formal and functional characteristics. Nilo-Saharan languages are spoken in eastern Africa stretching to the central and northern-half part with the speakers of about 60 million Nilotic people (2010 figure). Many languages constituting about 206 in number are members of the Nilo-Saharan family in the east and central Africa (Ethnologue) some of which are located in the southern and south-western Ethiopia; the paper focuses on the

Ethiopian Nilo-Saharan languages. The Ethiopian Nilo-Saharan languages are spoken by the minority groups most of which are recently attracting the attention of linguistic researchers. From the Ethiopian Nilo-Saharan languages, my sketchy assessment touches upon Nuer, Majang, Mursi, Murle, Gumuz, Komo, Me'en, Baale, Anywa¹, and Shabo, whose phonological property, as a proto-linguistic phenomenon, is relevant for distinguishing vowel systems on the basis of the Tongue Root in identifying vowel sounds as groups.

The ATR feature was first attested in Niger-Congo languages in 1960's, and it was later found in the overwhelming majority of Nilo-Saharan languages which is, nowadays, considered as the main feature in its compatibility with their vowel systems as of most languages in the family (Aralova, 2015). In the earlier times before the ATR terminologies were introduced, description of vowels were done by using "raised"/"unraised" distinctions claiming the raising of the tongue in production of the vowels, but the studies afterwards came up with the notion of ATR not only with raising of the tongue but also advancement and larynx expansion on the basis of phonetic and phonological aspect of describing the vowel sounds in particular language(s). Ladefoged, (1964:39f) addresses the enlargement and expansion of opening between back of the mouth and throat, retraction or raising of the tongue body for distinguishing the vowels on the basis of phonetic characteristics by using the acoustic and articulatory records of cine-radiology film, and the distinction corresponds to [±ATR] feature of the present day.

As a shared feature of some vowels, ATR is a distinctive feature that conveys about three notions, and these are forwardness of the tongue (advancement), raising of the tongue (root state) and enlargement of pharyngeal cavity (expansion) with larynx lowering in the production of vowels (Morton, 2012). A vowel sound that involves the points indicated is considered to be [+ATR] whereas the others are described as [-ATR] ones on the basis of the particular language's phonetic and phonological characteristics because a basically ATR language shows [±ATR] distinction (Mahanta, 2007). However, few languages like Anywa as described in Reh, (1996) may happen to show the distinction as [+ATR] and Neutral/plain or the other way round. Some studies like Turton and Bender (1976), and Triulzi, et. al. (1976) of Mursi and Berta languages respectively use the traditional distinction of vowels as tense and lax contrasts in Ethiopian Nilo-Saharan family. In addition, Tefera, (1989) distinguishes vowels of Shabo language, a nine vowel system, as tense and lax contrast in describing the grammatical sketch of the language. However, the literature puts that the terms tense/lax are somehow different from the [±ATR] distinction of vowel both in phonetics –acoustic and articulatory nature and in phonology –co-

¹ The term has been spelt differently in different languages varying as Anuak, Agnwa, Anyua, Anywa, and this paper uses the spelling Anywa throughout the writing.

occurrence restriction (Ladefoged, 1964; Ladefoged and Maddieson, 1996). Thus, the current studies focus on ATR feature of the languages which is considered inclusive, instead of the traditional feature, tense/lax contrast, provided that the language allows such vowel system.

In the phonetic characterization of ATR distinguishing from tense/lax features, Ladefoged and Maddieson, (1996) illustrates that tense/lax distinction is about muscular tension and voice quality whereas ATR is about tongue root position and some pharyngeal settings so that the phonetic system of [\pm ATR] is different from that of tense/lax contrast of vowels. Therefore, they happen in different characterizations in their acoustic and articulatory properties. As Tiede, (1996) substantiates the point by Magnetic Resonance Image (MRI) method of identifying the phonetic (acoustic and articulatory) correlates of the vowels in their distinctive variation related with ATR feature. It shows that levels of the articulatory characteristics, sagittal form related with tongue position and the axial form related with pharyngeal cavity expansion, pertaining to [\pm ATR] is different from the tense/lax feature as observed in a sample language; what's more, it has been observed that tense/lax distinction differs from [\pm ATR] feature in its acoustic aspect in which the formant variation of tense/lax is larger than the difference in [\pm ATR] contrast. The involvement of voice quality in the ATR feature also has been an issue of argument between linguists.

Some descriptions like Ladefoged and Maddieson, (1996), and Duerksen, (2004) indicate that ATR distinction goes with some particular phonation type as auditory characteristics of vowels. Stewart's (1967) [\pm ATR] distinction connects the [+ATR] vowels with creaky, and the [-ATR] ones with breathy voice qualities (Stewart, 1967 cited in Aralova, 2015). Indicating the attempts so far to connect ATR feature and voice quality in languages, Aralova, (2015) and Casali, (2008) state that auditory distinction (voice quality) is much more complicated than that of [\pm ATR] distinction so that these features are worth said to be parallel features in vowel systems because the [\pm ATR] contrasts do not clearly correspond to particular and separate phonation type in languages.

As phonological characteristics of ATR feature, vowels with similar height, backness and roundness can be distinguished by using a binary feature [\pm ATR]; moreover, the [\pm ATR] distinction happens to be the initial units for the occurrence of ATR harmony which rather justifies the ATR feature as its phonological nature (Billington, 214). On the basis of terminological concepts of ATR, the phonological system ATR harmony represents the occurrence of all [+ATR] vowels or all [-ATR] ones in a word as a phonotactic appropriateness and smooth utterances (Ko, 2012; Casali, 2008; Mahanta, 2007). According to Mahanta, (2007), ATR harmony happens on the basis of three major factors: morphological factors (through affixation processes), or phonological factors

(harmonizing as dominant-recessive² system in a word), or positional factors (position of the cause or the triggering vowel in a word as determinant). The study divides the ATR harmony into two types as superclose (left-to-right) harmony and mid (right-to-left) harmony according to direction of the harmony, and languages choose their harmony domain and type as per their individual phonotactics. Mous, (1986) claims the ATR harmony of the morphological factor results from Well Formedness Condition by representing the harmony in notational formula. The phonological feature of East African Nilo-Saharan languages is considered to be [+ATR] dominant in the ATR harmony system so that the [+ATR] vowels happens to influence in most of the languages (Casali, 2008; Noske, 2000; Lojenga, 1986).

The recently developed researches of Ethiopian Nilo-Saharan languages treated their phonology most of which touched upon the ATR feature because the languages exert such feature as their proto-family's system. These languages are mostly nine-vowel and ten-vowel systems with few seven-vowel system languages almost all of which are pertinent for ATR distinction of the vowels (Otero, 2015; Moges, 2007), and the languages have been studied for their ATR features by many researchers so far. However, they need to be comparatively assessed for their standards and levels of description with sufficient data and detailed explanations. Hence, this paper provides typological information of the Nilo-Saharan language in Ethiopia in terms of structural typology and/or genetic category.

1.2 Objectives

The present paper tries to address the following specific objectives in relation to some studies of ATR contrast and harmony in Ethiopian Nilo-Saharan languages:

- a) Assessing the ATR contrast and harmony systems and types described in the languages.
- b) Comparing the coverage level and depth of the studies concerning ATR systems.
- c) Identifying gaps or the overlooked parts of the ATR harmony descriptions.
- d) Forwarding recommendations for the gaps in the descriptions (if any).

1.3 Significance

Even though the paper work seems to deal with a broad issue referring to studies on Nilo-Saharan languages of Ethiopia, the comparative consideration of the studies on these languages puts a precious asset for the future researchers of

² The term *dominant-recessive* is a compound noun that conveys *dominant* (the harmony triggering vowel or the cause) and *recessive* the changed vowel in ATR harmony.

these languages because this paper provides the general picture of the proto-language in terms of their ATR harmony. It also adds knowledge to the language users, students and teachers. In addition, it can be a base for the classificatory and/or structural typological studies that might be conducted on Ethiopian Nilo-Saharan languages in the future. The country's curriculum, especially the local educational institutions may make use of this paper as holistic information of the languages.

2 Methodology

Procedural structure was followed to assess the nationally and internationally available studies conducted on ATR system of Ethiopian Nilo-Saharan languages going through comparative form of analyzing the relevant studies. First, survey of the available works was carried out, and identified for putting them under analysis. The identified works are hierarchically considered under analysis on the basis of their content and breadth so that descriptions of vowels that focused on individual languages were treated before the comparative works that involve more than one language. Based on the compiled inferences, the gaps within and among the studies were then identified for which recommendations were forwarded.

3. Results and Discussion

Most of the Nilo-Saharan languages have the feature vowel harmony in which ATR harmony is a component part (cf. section 1.1). Though most studies pertaining to ATR harmony and the relevant languages were done focusing on individual languages, few of them tried to identify the commonalities and differences some of the Nilo-Saharan languages exert in their typological features in terms of genetic classification and/or diachronic structural category. Among the relevant works many of which are recent ones, the available and easily accessed studies of few Ethiopian Nilo-Saharan languages have been analyzed herewith. Few earlier works were also considered in the analysis.

In the description of Anywa vowel system, Bender, et. al. (1976), Lusted, (1976) and Reh, (1996) identify the vowel system as voice quality distinction between breathy and plain sets instead of ATR contrast, but Reh slightly touches the concept of ATR and its connection with voice quality. Bender, et. al. (1976) identifies the language as seven vowel system /i, e, ε, a, ɔ, o, u/ in which all have long correspondents except /e/ which Lusted omits it out claiming the language as six vowel system. Studies of Bender and Lusted show the plain and breathy vowel distinction for four of the vowels in the language as /i, i̥/ /ε, ε̥/ /a, ä/ /o, ö/ with two diphthongs /ie/ and /i̥i̥/; however, they don't say anything about ATR system of Anywa. On the other hand, Reh, (1996) states that [±BRV] in Anywa embodies breathiness/[BRV] itself and ATR feature

considering that they go hand in hand. According to Reh, [+ATR] vowels which involve breathy voice correspond to neutral (non-breathy) vowels in the ten vowel system identified as [+BRV] – /i, e, ʌ, o, u/ and [-BRV] – /ɪ, ε, a, ɔ, u/. Although, Reh’s description somehow involves the ATR feature in the language as a vowel distinguishing system in the language, connecting ATR feature with voice quality tends to remain controversial as stated in Casali, (2008) and Aralova, (2015). It also conveys the notion of vowel harmony in terms of voice quality harmonization process instead of ATR feature indicating that [+BRV] is extended to the adjacent vowel in the domain of root or stem in Anywa. Both of the descriptions seem to be focusing on voice quality with little acoustic characterization without ATR contrasts of the vowels; perhaps, that may be the reason for their difference in setting the number of vowel phonemes in the vowel systems.

Otero, (2015) described the concept of ATR and its harmony in Ethiopian Komo in a relatively detailed way. It identifies the language as a seven contrastive vowel system /i, ɪ, ε, a, ɔ, ʊ, u/ that separating into two sets as [+ATR] vowels- /i, u/ and [-ATR] vowels- /ɪ, ε, a, ɔ, ʊ/. It also states the existence of phonemic contrast in the language with ATR feature of the seven vowel system as uncommon property which is mostly found in languages of East Africa. Besides the phonemic seven vowels, Otero considers the phonetic surface [+ATR] vowels [e, ə, o] as allophonic correspondents of the [-ATR] vowels /ε, a, ɔ/ so that the language becomes a ten vowel system on phonetic ground.

Table 1: Phonemic and phonetic vowels (Otero, 2015: 214)

	[+ATR]	[-ATR]	
+HIGH	i u	ɪ ʊ	+HIGH
-HIGH	[e] [o] [ə]	ε ɔ a	-HIGH

After identifying the language as phonemic and phonetic variation, Otero’s description indicates ATR harmony systems in terms of directionality and dominance systems in the language. According to this study, Komo’s ATR harmony is typically anticipatory occurring in mono-morphemic words and across morpheme boundaries as well - the [+ATR] vowel imposed to the preceding adjacent [-ATR] vowels. It illustrates that root or stem vowels are often assimilate to the [+ATR] suffix vowels though some [-high, -ATR] and [+high, -ATR] vowels of suffix may happen not triggering the harmony.

Example: yèk-ír [yèkír] ‘He sows’ yèk-úk [yèkúk] ‘sow.PFV’ [+ATR]
harmony

tóg-í [tógí] 'You taste'	tóg-úk[tógúk] 'taste.PFV'	
hám-á [hámá] 'I yawn'	hám-ó [hámó] 'yawn.VEN'	} No harmony
dàd-án [dàdán] 'We refuse'	dàd-ó[dàdó] 'refuse.VEN'	

Otero, (2015: 215)

Therefore, sometimes the [+ATR] and [-ATR] vowels can possibly occur in the same word in Komo without any ATR harmony process in the same environment. It states that the progressive [+ATR] harmony is lacking in the language, but the language exhibits [-ATR] progressive harmony in which the [+high, -ATR] root/stem vowels /ɪ, ʊ/ impose their feature rightwards to the suffix [+high, +ATR] vowels in a productive fashion. In general, Komo shows [+ATR] anticipatory harmony, and [-ATR] progressive harmony in the domain root, stem or word but not beyond word though the word can be either mono-morphemic or multi-morphemic.

Majang, the northern surmic language, is identified as ten-vowel system (Moges, 2007) - /i, ɪ, e, ε, a, ʌ, ɔ, o, ʊ, u/ unlike the considerably untenable six-vowel system /i, e, ε, a, o u/ set by Bender, (1983). Moges' study came up with the generalization that ATR distinction of the ten or nine vowels can work for South-western surmic and northern surmic (Majang) languages of Nilo-Saharan family most of which are spoken in Ethiopia. It divides the vowels into two sets as [±ATR] distinction with no restriction of their co-occurrence (members of different sets) in one root or stem or word so that the process of ATR harmony doesn't need to take place. According to this study, absence of ATR harmony in Majang might have resulted from diachronic language phenomena as cognate systems of the proto-surmic evidence indicates. The nine-vowel system, Majang, is considered to have -ATR harmony process as described in Pearce, (2008), but it claims subtlety of the harmony system because the expected reduction resistance of [-ATR] vowels and the phonetic quality change (reduction) of the [+ATR] vowels as in other languages are unnoticeable so that the generalization for Majang to have a vowel harmony is less reasonable on the current synchronic description status.

Nuer is better considered for the significant distinction of voice quality rather than ATR systems as described in Duerksen, (2004) and Moges, (1995). They identify the language as seven vowel system /i, e, ε, a, ɔ, o, u/-plain/non-breathy vowels with their corresponding breathy vowels, but the latter description contains three more centralized breathy vowels having no corresponding plain vowels with the absence of breathy-high-back vowel which makes the number of breathy vowels exceed that of the plain ones.

As stated in Turton and Bender, (1976), Mursi is a language with five vowel system with the lax counterpart for each plain vowel in allophonic distinction as /i, e, a, o, u/ and [ɪ, ɛ, ə, ɔ, ʊ]. The so called allophonic variations are equivalent with the present days [-ATR] vowels in the genetically related languages. On the other hand, Triulzi, et al. (1976) considers Berta as a language with basically five vowel system; however, there exists the tense and lax contrast for each vowel which is considered as allophonic variation just in the same way with Mursi's as described in Turton and Bender. In connection with the up-to-date dominance of ATR feature in contrast with those two works of the year 1976, their description can be construed to be controversial because of the unpopular ATR feature in time and scantiness of the studies.

In contrasting descriptions, Gumuz is considered for the general vowel harmony rather than ATR system because it is claimed to be a six-vowel system (Ahland, 2012; Pearce, 2008). The contrast is that Pearce states the vowel harmony in Gumuz on its starting point claiming that there is no vowel harmony attested so far, but Ahland describes the vowel harmony of Gumuz in two ways as total and partial degrees on regressive basis with exception of [ə] which undergoes total assimilation regressively or progressively, but it doesn't say anything about the particular ATR system of the language.

	Example: NoG (North Gumuz)		
	PHONEMIC	PHONETIC	Ahland, 2012: (Anticipatory)
60)	/d-é-bit-á/ → [d-í-bit-á]		
	AFF-FUT-descend-3SG.INTR		
	'he will descend'		

The change of vowel /é/ of phonemic word into /í/ in the phonetic word is the partial regressive or anticipatory assimilation of vowels. The focus is on the vowel harmony without describing the ATR system in few languages like Gumuz as described in the above studies maybe due to sketchiness of the works or the real language structure. Tefera, (1989) provides a simple and sketchy description of vowel systems in Shabo identifying its [eight] vowels /i, e, ɪ, ʌ, a, ɔ, o, u/ five of which occur with the long correspondents. The five vowels /i, e, a, o, u/ having the long forms are considered "tense" in the study. This is all about vowels as conveyed herewith, but any in depth investigation may find it exhibiting ATR system because the so called "tense" in this study is perhaps empirically [+ATR] type that somehow is a gap just like most earlier literature distinguishing tense/lax sets instead of [±ATR] in the relevant languages.

In Murle, Arensen (1982) identifies only seven vowels /i, e, ε, a, ɔ, o, u/ considering [ɪ] and [ʊ] as allophonic variations, but Moges, (2005) asserts that Murle is a nine-vowel system /i, ɪ, e, ε, a, ɔ, o, ʊ, u/ with phonemic relevance providing empirical illustrations, and these are described in [±ATR] distinction.

Murle vowel phonemes (Moges, 2005: 122)

i	u	ɪ	ʊ
e	o	ε	ɔ
a			
[+ATR]		[-ATR]	

The study indicates that the phonemic vowel length is also attested in Murle. Regarding vowel harmony, the study explains that the vowels are harmonized comprising the [+ATR] and [-ATR] sets in which [a] happens with both sets. The dominant vowel type [+ATR] triggers the harmony in both directions (progressive and regressive) changing the [-ATR] vowels in root, stem and word. In addition, the [+ATR] vowel suffixes are dominant over the [-ATR] vowel roots and stems in harmonizing them.

(1)	<u>Singular</u>	<u>Plural</u>	<u>Gloss</u>	Moges, (2005: 124)
	út:ok	ut:ug:e - t:i	'mouth'	
	lóló	lólój - ok	'rainy season'	
	gɔɔl	góól - ók	'road'	
	kéεɲ	kééɲ - ti	'belly'	

(2)	<u>Singular imperative</u>	<u>Plural imperative</u>	<u>Gloss</u>
	míɲ	í - miɲ - it	'play'
	ɲóok	ú - ɲúug - it	'pull'
	kéεp	e - k:ééɓ - ìt	'count'
	téεt	é - t:éed - it	'cut'

The [+ATR] suffix vowel is the dominating set over the [-ATR] vowels in the roots, and the root vowels are harmonized with the vowels of the suffixes as shown in example set (1) above. Moges indicates the second set of examples as the plural structure through the prefix and suffix in the discontinuous morpheme V...VC in which the suffix containing [+ATR] vowel triggers the

harmony by changing the [-ATR] vowels in the roots; the vowel prefixes are just formed through duplicating the first vowel in the roots.

Moges, (2001) asserts the predominance of ATR distinction and ATR harmony in almost all Nilo-Saharan languages extending to the wider range of East African vowel systems as a common linguistic feature. For instance, it recognizes the commonest nine-vowel system /i, ɪ, e, ε, a, ɔ, o, ʊ, u/ for Baale and Murle in southwest Surmic languages dividing into [±ATR] sets with mutual exclusion in one morpheme. The vowel /a/, in Baale, has the surface form [a] because it doesn't have a [+ATR] counterpart so that it is not restricted from free co-occurrence with the [+ATR] vowels in the same root. For the rest of the vowels in the language, ATR harmony takes place with dominance of [+ATR] feature in the domain of root, stem or words with dominant suffix [+ATR] spreading to a preceding root with [-ATR] vowel. The study identifies the southeast Surmic languages like Chai, Mursi and Me'en as seven vowel system languages with absence of the vowels /ɪ/ and /ʊ/ from the nine vowels indicated for the southwestern Surmic. As stated in Moges, (2001), the Ethiopian Nilo-Saharan languages, with some exceptions whose vowel systems are not synchronically and diachronically well treated in the descriptions, involve the ATR contrast and ATR harmony in their phonological systems of vowels.

Within the general grammatical description of the Surmic languages, Bender, (1977) states that the vowel system of the languages is easier than that of the Nilotic types claiming that the Surmic languages follow basic five vowel systems with the additional lax vowels like /ε/ and /ɔ/ with consideration of ə in few others. On top of this, the Surmic languages are considered for having very less features of tense/lax and voice quality phenomena unlike the Nilotic types in the family. Most of the earlier descriptions, like this one, are under broader topics that their way of analyzing and characterizing is too sketchy to come-up with convincing statements especially on the very specific, but inclusive, issues like ATR systems.

4. Gaps and Controversies

The recently research attracting areas, Ethiopian Nilo-Saharan languages, have been described predominantly in terms of their grammatical and lexical properties in which some of the descriptions treated phonological patterns even with little works of phonetic outputs in the languages. The proto-linguistic typology of these languages in phonetic and phonological patterns particularly on ATR features of the languages has been comparatively stated by Moges (2001) that tremendously contributes in such scanty and few relevant works; apart from this one, there is no any comprehensive and comparative study of the Nilo-Saharan languages, especially in Ethiopia, that conveys ATR systems so that typological distinction of the languages as their group and sub-group is

lacking. Casali, (2008) calls on the study on ATR system of Nilo-Saharan languages asserting its urgency because most of the languages are yet to be studied for identifying their typological categories and for assessing their commonalities and differences among the languages.

As far as the accessible pertinent studies indicate, many Nilo-Saharan languages in Ethiopia are less described in terms of exhibiting ATR contrast and ATR harmony. The languages like Dinka, Mebaan, Shilluk, Suri, Bodi, Kwegu, Shita, Nera, Tishema are not well identified in their detailed phonetic and phonological properties and the particular ATR systems; it seems there is a wider gap in this linguistic area attracting many more researchers. The need for more studies is not only for the absence or insufficiency of phonetic and phonological description but also for rationalizing and/or changing the described ones. For instance, Kunama is considered as five-vowel system which needs to be justified for why it deviates from the majority in the same family. What's more, in the languages like Gumuz as in Ahland (2012), the phonological patterns of the vowels are described from which the particular ATR feature (as a specific part of vowel system) is missing. Perhaps, such studies lack detailed description. In connection with this, co-occurrence of the vowels in terms of ATR features in notational explanations is necessary for more effective and detailed understanding of their phonological systems. This is needed especially for the low vowel /a/ because it lacks its +ATR correspondent in many nine-vowel system languages. In addition, in some languages, environment restrictions are relevant for the ATR harmony processes and their phonological patterns.

Universality of the ATR distinction of vowels and ATR harmony across the Nilo-Saharan languages in Ethiopia is under question because of some non-exhibiting languages in the same family. Perhaps, such irregularity arises from diachronic background of the language in sociolinguistic (contact) phenomena. A case in point, the presence of ATR contrast in Majang with the absence of vowel harmony process as stated in Moges, (2001) can, perhaps, be considered as a token for some missing features overtime. Another point of concern to have remained subtle is the connection between ATR contrast and voice quality distinction in Nilo-Saharan languages realizing if they are the co-occurring features or autonomous properties in a given language. As stated in Reh, (1996) for Anywa, the two features occur together which is partly supported by Moges, (2001) saying that the voice quality follows the ATR distinguished vowels (eg. +ATR vowel is followed by breathy voice) with the claim of less commonality in all languages. Thus, it is worth considered under the controversy until sufficient studies provide justifications on this regard.

5 Conclusions

In the vowel systems of Nilo-Saharan languages in Ethiopia, ATR distinction and its harmony systems are less studied on the basis of phonetic (acoustic, articulatory and somehow auditory) properties; even the phonological studies are scanty and seeming incomplete in most cases so that the available resources do not suffice for trustworthy generalizations. However, it is proto-linguistically intuitive that ATR feature is compatible in the Nilo-Saharan languages from the existing descriptive indications. ATR harmony can occur within a morpheme or in the form of cross-morphemic process; affixal dominant ATR sets trigger harmonizing the recessive vowels in the root or stem. The binary vowel feature \pm ATR distinguishes the two sets in terms of tongue advancement, and it usually is an indication that the languages also exhibit ATR harmony in which vowels of different ATR sets never co-occur in a word. The [+ATR] vowel sets usually happen to be the dominant ones in the ATR harmony processes whether the harmony is within a morpheme or across morphemes. The overwhelming majority of the languages are nine-vowel systems with few ten-vowel and seven-vowel system languages all of which are phonologically compatible for ATR contrast and hence ATR harmony processes. There are still few other languages described to be deviating from such vowel system commonalities like Gumuz and Kunama whose grounds need to be explored.

6 Recommendations

A comprehensive research needs to be conducted particularly on ATR systems of the Nilo-Saharan languages in Ethiopia because there is no separate and detailed description on this specific issue; the existing ones all just treat the ATR system in the other broader topics like phonology of a language or even the broader topic, Grammar. On the same concept, the feature ATR system, the general languages of Nilo-Saharan family need to be comparatively studied and typologically well identified by characterizing the common and different ways of behaving among the languages.

Another interesting issue that attracts more research is the historical and sociolinguistic phenomena for justifying the few languages that deviate from the regular forms of ATR systems in the family. Identifying and classifying the occurrence patterns on the basis of synchronic and diachronic studies equips the researchers and other concerned bodies with the overall picture of the family and its sub-groups as well. Hence, effective and efficient educational syllabuses as well as books can be prepared accordingly for the benefit of native speakers of the languages and the country, Ethiopia.

Since the languages are spoken in the remote areas of Ethiopia around the border of the country, it needs researchers to sacrifice much effort and money so

that the national and international research funds should be mobilized towards studying these languages and bringing them to their standard level, at least, in relational concept. In addition, I suggest establishment of a research center in the language areas (if there is no any) so that the interested individuals can get to work on studying and characterizing the languages and contributing to the growth and structural well-being (like maintaining the structure – protecting from change overtime).

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