Triangular vowel harmony in EkeGusii:

Intuitive corpus analysis

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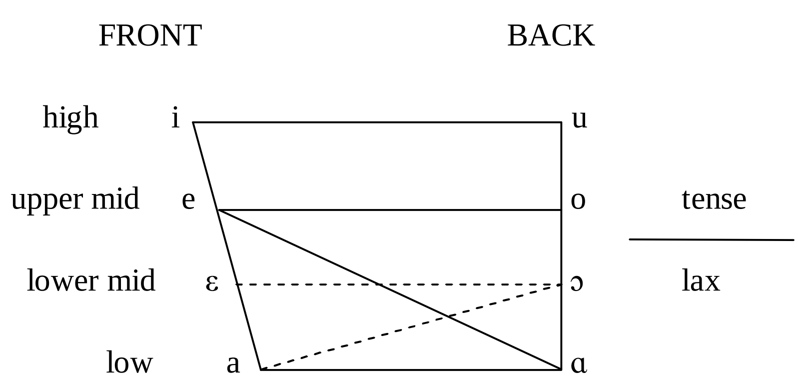
Abstract

The main objective of this paper is to demonstrate that vowel harmony in EkeGusii is a complex triangular process which reveals a hitherto uncovered linguistic fact that EkeGusii is an 8-vowel inventory system, thereby demonstrating that previous research has not embarked on a fact finding mission but relied upon unverified descriptions. It reveals that harmonized vowel height in EkeGusii is co-distinctive alongside features like tone and vowel length. We examine instances of disharmonicity to demonstrate the existence of segment opacity which blocks this form of assimilation. It is demonstrated that the front and back high vowels, [i] and [u], are both harmony neutral and opaque. Reflexive prefixal morphemes are also opaque segments that ultimately hamper harmony by rendering certain vowels invisible to harmonizing features. To-infinitives on the other hand, appear transparent and support the triangular vowel harmony hypothesis. Whether vowel harmony is root or affix-controlled, regressive or progressive, are explained. Names are examined to support arguments around syllabicity and proximity in the study. A few examples of atypical disharmony are examined. Corpus analysis is relied upon with the basic tenets of autosegmental phonology guiding the descriptions and explanations. Conclusively, native speakers of a language have highly reliable intuitions that can by no means be replaced for ultimate description of language nuances.

Key words*: harmony, opacity, transparency, neutrality*

1.0 Introduction

The nature of vowel harmony in *EkeGusii*, a Bantu language of south western Kenya, is yet to be exhaustively described. Whether it applies at the morphological or syllabic level, its behaviour in different classes such nominal or verbal, its exact nature in bi-syllabic, tri-syllabic, quadrisyllabic or even polysyllabic verbal structures are yet to be fully explained. This paper comes up with a theoretical position that vowel harmony is triangular in nature; the front and back lower mid vowels harmonize with a front low vowel /a/, while the front and back upper mid vowels harmonize with a back low vowel /ɑ/, an additional segment. This amounts to the claim that EkeGusii is a balanced 8-vowel inventory system with four back and four front vowels, and not seven as argued in Cammenga (2002) and others (Komenda, 2011; Nash, 2011; Morara, 2017), or five in Ongarora (1996). There is an aim to substantiate that this triangle is obeyed except in certain limited instances of disharmony that may not rebut the hypothesis. Instances of disharmony that adduce evidence against the triangular nature of harmony are objectively assessed and explained. There is endevour also to demonstrate that the front and back high vowels are both harmony neutral and opaque in different environments. The hypothesized lower and upper triangles are shown on the modified cardinal vowel chart in fig.1 below. The dashed lines are used to mark off the lower triangle from the upper. It is demonstrated that though vowel height is a distinctive feature in EkeGusii (Ongarora, 1996), it is better analyzed as a feature in co-articulation besides tone and length, a notion that Cammenga (2002:43) in reviewing Whiteley (1960) only speculates upon: "... it is not clear whether or not the tones are distinctive underlyingly, though supposedly they are." Detail of such simultaneity will be explored in Mariera (forthcoming).



(Fig. 1)

2.0 Literature review

Krämer (2003) describes vowel harmony as a phenomenon where potentially all vowels in adjacent moras or syllables within a domain like the phonological or morphological word (or smaller morphological domain) systematically agree with each other with regard to one or more articulatory features. The presence of a feature triggers a systematic alternation in which vowels are in direct neighbourhood on the syllabic or moraic level of representation so that the involved vowels look alike with respect to the active feature. Nevins (2010) observes that harmony systems tend to avoid "mixing" of features since they divide the vowels along a dichotomy of "odd" and "even." A set of restrictions are applied to determine possible and impossible sequences of vowels so that certain words are permissible and not others. Vowel harmony initiates a consistent long distance relationship. Nevins (2010) observes that vowels select one another not really by relying on proximity but on certain inherent common features, which is confirmed by the triangular nature of harmony in EkeGusii.

Goldsmith, ed. (1996) explores some of the most revealing detail on vowel harmony. In *Finnish* for instance, vowel harmony is based on a front-back opposition. Certain vowels like /i/ and /u/ display neutrality and transparency in *Finnish* but opacity in *Tangale*. Vowel harmony is an anomalous process. Goldsmith, ed. (1996), observes that vowel harmony could be stem-controlled or affix-controlled varyingly across systems. The concepts of neutrality, transparency, opacity, the classification of harmony systems, locality and more are all explored. As Goldsmith, ed. (2001) observes, vowel harmony refers to assimilations among vowels though the syllable head approach distinguishes it from the general assimilation processes which are strictly local. For detail on such and more, these two references are recommended.

This study reviews the EkeGusii vowel system via the analysis of harmony. Cammenga (2002) reviews the EkeGusii vowel system relying on Whiteley (1960) without effort to establish but sanitize available data. This has erroneously maintained that the language is a 7-inventory system, which has been adopted by several studies including Komenda (2011), Morara (2017) among others. We welcome Cammenga's non-committal stance (2002:38), "If it may be supposed that this is the case…," which implies need for verification, as attempted in this paper.

On vowel harmony in EkeGusii, Ongarora (1996) is a ground breaking study that comes up with important findings including that it is an autosegment that relies on height as a contrastive and harmonizing feature, with backness and roundness being only non-contrastive prosodies. Notably, the low back vowel is identified (Ongarora, 1996:65), though review of the vowel system is not the study's core purpose, but the vowels are conclusively reduced to five, a position herein revisited. Effort is made to ascertain the existence of the eighth vowel via revelations the hypothesized triangle. Elsewhere, Ringen (1979) shows ATR to be the harmonizing feature in Igbo and Diola Fogny. In Igbo vowel harmony, all suffixes and prefixes assimilate to the harmonic quality of the root vowels.

Nash (2011), attempts to address vowel harmony in EkeGusii. The study observes that mid vowels undergo height assimilation with respect to a mid-vowel within the root. Notably, harmony operates in a leftward direction in nouns (since they receive prefixes only), and both leftwards and rightwards in verbs as they receive prefixes and suffixes, which position is also confirmed herein. It also observes that laxing operates within the word domain but herein, it is vowel harmony in general that is word-bound (§ 6.11 below). Nash avoids Cammenga's (2002) unverified [±ATR] features which are made redundant by the feature [MID], preferring the lax-tense distinction. The analysis, however, faces a number of challenges. First, the neutrality and/or opacity of /i/ is overlooked making it appear harmonized in examples like *e-ri-iso* (eye). The word ɛ-kɛ-bwɛ (fox) is wrongly harmonized instead of expected disharmony with explanation as in *e-ke-bwɛ* (2011:56). The word *o-go-sek-er-a* meaning "to laugh at" (2011:58) has tense vowels (upper mid) instead of the lax (lower mid) as in *ɔ-gɔ-sɛk-ɛr-a*. The mistranscription shows the inability of this study to reveal the eighth vowel in EkeGusii, having relied on Cammenga's (2002) 7-vowel inventory. The study also, gives the word *ɛ-bi-mɔgɔɔra* to mean "fierce person" (2011:57) instead of *e-bi-mɔgɔra* (fierce people). This pejorative diminutive is a misanalysis with a wrong pre-prefix that appears to harmonize assuming the opacity of /i/ which blocks the process (§ 6.9 below). The prefix is a plural morpheme that cannot, whatsoever, give singular meaning in EkeGusii, and with the meaning-distorting long vowel in the root, this may be an anomalous word in the language. With limited data analysis and unawareness of Ongarora (1996), the study is bound to be insufficient for wider generalizations. The challenges raised with regard to Nash (2011) have been explained in this paper.

Making reference to Odden & Chacha (1988), Odden (2015) reveals in Kuria, the closest Kenyan Bantu language to EkeGusii, unique and interesting harmony patterns which are quite rare in EkeGusii. These include progressive stem-internal lowering from degree 2-3 as in *oko-rɔg-ɛr-a* (to bewitch for) cf. *ugu-súraraaŋgera* (to praise for). Except in cases of disharmony (see §6.12 &6.13), EkeGusii does not allow such patterns. Others include regressive raising in all domains from degree 2-1 as in *umu-rim-i* (farmer) cf. *oko-rem-a* (to farm), regressive stem-internal lowering from degeree 1-2 as in *ogo-s**ee**k-er-a* (to close for) and *ugu-s**ii**k-a* (to close), and regressive stem-internal raising from degree 3-2 as in *omo-r**o**g-i* (witch) cf. *oko-rɔg-a* (to bewitch) (Odden 2015:9). Most Bantu languages are 7-vowel systems but evidence is raised here for an 8-vowel system as opposed to an allophonic relationship between **/a/** and **/ɑ/** in EkeGusii.

3.0 Data Sources

Data involves corpus generated on the basis of native speaker intuition and a little more from secondary sources (Ongarora, 1996; Bosire, 2013). Interviews, recording, questionnaires or such other conventional tools of data collection would not yield such data to the level and perspective of such linguistic interest. It is part of the argument herein that research based on L1 corpus analysis is likely to yield results of much linguistic interest especially for purposes of igniting debate in directions of particular interest. This enables advancement of views as language is analyzed away from traditional theoretical frameworks, to strike new ground, description and insight. It is upon the educated native speakers of a language to accord justice to their own languages and move away from rigid data collection approaches that have for years limited fair linguistic descriptions. Language investigations cannot avoid native speaker intuitions.

4.0 Theoretical framework

The study is guided by Autosegmental phonology (Goldsmith, 1976; 1990), that harmony like tone, vowel length, nasality and such other elements of prosody are autonomous or independent, and operate on tiers different from the segmental. Harmony is therefore mainly treated as a feature of spread that can in some instances be blocked. That it is a distinctive and harmonizing feature associated with the vowels has been demonstrated by Ongarora (1996). This is not our major concern. Rather we endevour to establish that harmony is triangular among other objectives. AP has been widely applied as a theory that explains tone in African languages. It has been applied to unravel initially unexplained puzzles like floating tones, contour tones, tone spread, down step and up step, tone terracing and more. Theoretical exploration and detail can be found in Ongarora (1996) as it is not the major focus here.

5.0 Data analysis

Data is analyzed on a featural basis; vowels are considered bundles of independent autonomous features. Where necessary, tones born by the vowels are shown by diacritics. Where diagrammatic representations are important for exemplification, diagrams in line with the tenets of Autosegmental Phonology are used. For long vowels, sequential representation is used for convenient exemplification and clarification, though Odden (2001) observes that doubling of long vowels is not a tenable position.

6.0 Findings

This section elicits evidence relying on data existing in the language to table argument around the triangular nature of vowel harmony in EkeGusii with a revelation of an extra vowel, the co-distinctive nature of the feature [high] and its root-controlled behaviour. Two harmony neutral and opaque vowels are identified and explained among other interesting findings.

6.1 The Nominal basis of vowel harmony

The data below involves lexical items that have the usual augment or pre-prefix at the initial word position preceding class marker morphemes which generally appear transparent to harmonizing features. Such examples appear in (a-j). In (k) and (l), the nominal forms have pre-prefixes preceding nominal roots.

	column 1	*column 2*
a.	ε-kε-mɔnyɔ (aphids)	e-ke-noro (fatness)
b.	ε-γε-sεrɔ (animal hide mat)	e-γe-songo (English language)
c.	ε-γε-sɔnɔ (vagina or clitoris)	e-γe-sobono (nakedness)
d.	ɔ-mɔ-kɔny-i (helper)	o-mo-sɑɑndo (bird flu)
e.	ε-kε-nyɔru (mountain grass)	o-mo-chɑro (uncontrollable animal)
f.	ɔ-mɔ-kεnyε (sand)	o-mo-cheng-o (jubilation)
g.	ɔ-mɔ-nyεny-i (butcher)	o-mo-rend-i (guard)
h.	ɔ-kɔ-βɔkɔ (hand)	o-ko-goro (leg)
i.	ɔ-bɔ-rɔ:rɔ (hen lice)	o-bo-roro (pain)
j.	ε-ndɔ-r-εr-ɔ (apple of eye)	o-mo-rero (fire)
k.	ε-nkɔrɔ (heart)	e-ndobe (field fire furnace)
l.	ε-mbɔrɔ (penis)	e-mboro (pimple)

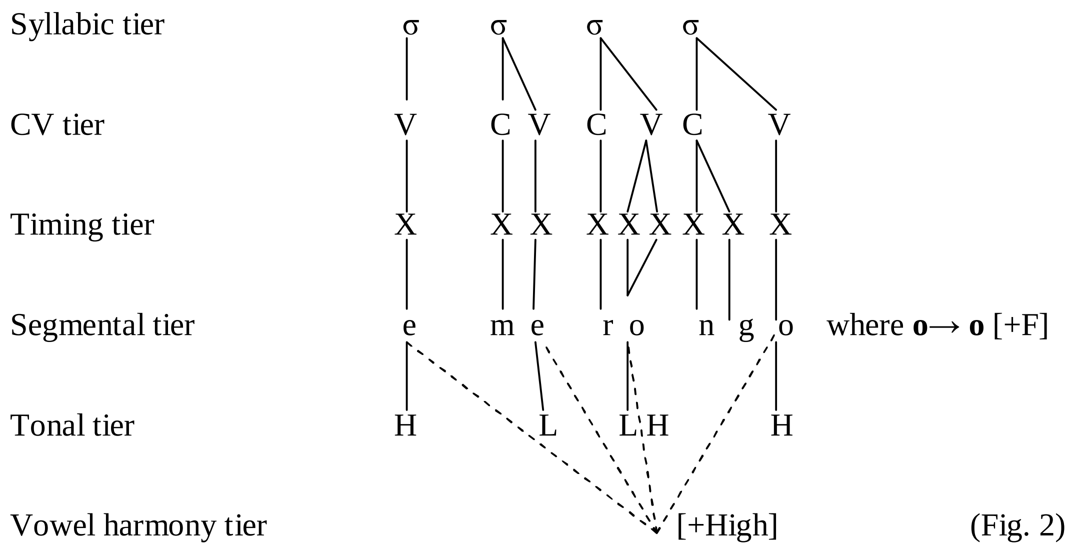
It can generally be observed that the class marker vowels are harmonized such that the front and back lower mid vowels in column 1 agree in the feature [-high], while the front and back upper mid vowels in column 2 agree in the feature [+high]. This means the class marker morphemes are transparent to harmony. No intervening segment blocks harmony. In this earliest opportunity, it can be argued that all the nominal roots in both columns retain the shown vowel height before prefixation. The prefixes and pre-prefixes therefore get harmonized with the roots. So harmony in this case spreads autonomously leftwards (regressively) as a root-controlled feature. Nash (2011) has come up with a similar position. This forms the basis of vowel harmony in EkeGusii with the realization that it is the upper mid vowels that are most saliently harmonized, the frequency of which makes us treat them as the underlying vowels that realize the lower mid vowels, which are equally harmonized. However, the situation of harmony in EkeGusii cannot be assumed to be as simple as it appears in these examples. The complexities are explored further below.

6.2 Harmonized vowel height as a co-distinctive feature

That vowel height is a distinctive feature in EkeGusii is not in dispute. Certain words such as *ɔ´mɔ`kɔ´* (relative in-law) versus *o´mo`ko´* (sycamore tree), are distinguished by differences in vowel height, since tone is suspended with a HLH pattern in both cases. Ongarora (1996) explores evidence of such distinctive vowels as harmonized autosegments. Beyond Ongarora's position, we demonstrate that height harmony is not a solely distinctive but achieves this function contemporaneously with other features of prosody, save for non-contrastive rounding and backness. This concept is to be explored in greater detail in *Suprasegmental multiplicity and iconicity in EkeGusii*, (Mariera, forthcoming). Consider the following examples, five of which are actually from Ongarora (1996), though the glosses may vary coupled with high tone diacritics so that toneless vowels are assumed to bear low tones.

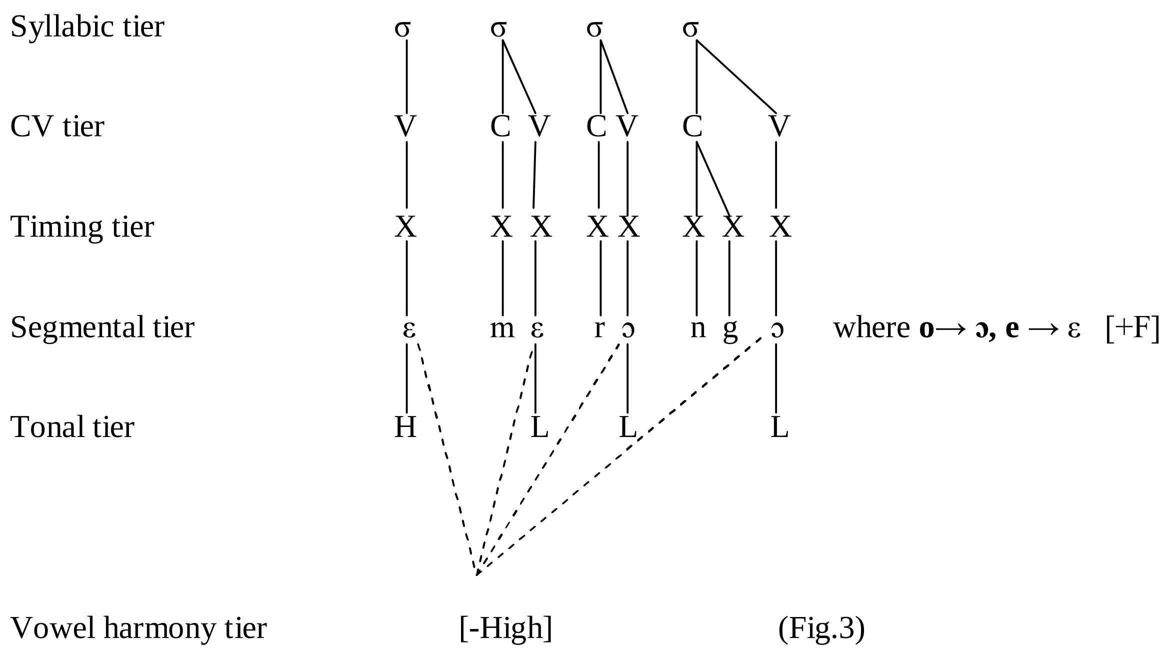
	Column 1	*Column 2*
a.	έ -mbɛrɛ (vagina)	é-mberé (problem)
b.	έ -mbɔ´rɔ´ (penis)	é-mboró (pimple)
c.	έ-ngɔrɔ´ (God)	é-ngoro (hole)
d.	έ-sɛsɛ (whooping cough)	é-sese´ (dog)
e.	έ-mɔndɔ (ill fate)	é-mondó (crop or gizzard of a bird)
f.	έ-kɛɛnɛ (truth)	é-keené (remnant part of a body or cut tail)
g.	ɔ´-βɔ-rɔ:rɔ (hen fleas)	ó-βo-roró (pain)
h.	é-βi-tɛɛga (bow legs)	é-βi-tegɑ´ (cooking pots)
i.	έkɛ-rɛɛr-ɔ (modern style)	é-ke-rer-o´ (a cry)
j.	é-mi-ɔrɔ (pangas)	é-miooro´ (nose)
k.	έ-mɛ-rɔngɔ (tens)	é-me-roo´ngo´ (spines/stingers)

It is evident that all the words in columns 1 and 2 are contrasted by vowel height but something else happens. Tone variation is an extra contrastive feature to all lexemes in (a-f), while in (g-k) three features are simultaneously distinctive: harmonized vowel height, varied tones and root vowel lengths. This demonstrates multiple contrasting displaying EkeGusii as a suprasegmentally multi-layered language. The words in (k) also appearing in Ongarora (1996) are hereby represented as multiply contrasted as shown below in line with the tenets of Autosegmental phonology. What happens here is a multiple linking of three prosodic layers to the morae in the segmental tier while maintaining EkeGusii as a strict CV language as argued in Morara (2017). The CV strictness posits the argument that homorganic sounds are not clusters or sequences of consonants but single phonemes, as also noted in Mutua (2007).



(Fig. 2)

Contrasted to:



(Fig.3)

[**Adopted from Mariera, forthcoming**]

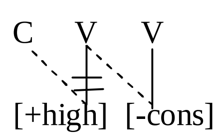
The long vowel in figure (2) is linked to two timing positions to avoid sequencing vowels in line with Odden (2001). Length is a contrastive feature since the root has a short vowel in figure (3). The consonant cluster is equally linked to two timing positions to reflect a consistent CV sequence instead of VCC or so. Harmony spreads leftwards in this case (nous receive prefixes only) but in verbs (see §6.4), iteratively from the root in both directions (leftwards and rightwards). Nash (2011) has also adduced evidence of bidirectional spread. This follows change in vowel height as a contrastive feature. The tones are varied so that in fig. 2 the pattern in HLLHH with a contour in the long vowel while in fig. 3 the pattern is HLLL. Cammenga (2002) takes vowel length to be the main contrastive feature assuming that tones could be underlyingly distinctive. This position is unjustifiable since three features are concurrently contrastive; harmonized vowel height, vowel length and tone. This is the concept behind suprasegmental multiplicity (Mariera, forthcoming).

6.3 Insights from glide and Plural formation

Komenda (2011; 2015) and Nash (2011) explore excellent detail on glide formation in EkeGusii. To this process, being not our major focus, we make reference for the purpose of describing the high front and back vowels, /u/ and /i/, as being both harmony-neutral and opaque. Glide formation occurs when a high vowel is followed by a non-high vowel. Consider the two examples below.

a. om**u**-arɛ → omw-aarɛ (strands of soot) cf. emi-arɛ (strands of soot –rare plural)
b. om**u**-ɑre → omw-ɑɑre (secluded initiate) cf. ɑbɑ-ɑre (secluded initiates)

The resultant bilabial /w/ from /u/ as shown by the arrow can be summarized as follows:



The high /u/ is dissociated from the V slot and is re-associated to the preceding consonant /m/ so that it acquires consonantal features (consonantal features spread rightwards). The words above entail long vowels, one being a result of compensatory lengthening that takes care of an empty V slot; the V slot is attached to the next mora which doubles. Clear detail on glide formation including mora assignment, vowel raising (where necessary), rightward spread of consonantal features and attachment of the last mora to the next is explored in Nash (2011). Glide formation and compensatory lengthening is not further pursued though alluded to in findings as necessary.

It is clear from (a) that glide formation is preceded by sound /u/ which is considered neutral but opaque in this medial position since it blocks harmony. The rare plural form of the noun shows that the intervening segment between the root and the prefixal form is /i/, which is also considered harmony neutral but opaque in this position since like /u/, it blocks harmony. The plural form of (b) appears harmonized to the prefixal vowels due to lack of the intervening opaque segment unlike it singular form. The prefixal /o/ in (a) is therefore affixed by default in the event that the anticipated /ɔ/ cannot be fitted. However, the root vowels appear harmonized in both cases so that in (a), the front lower mid agrees with the front low /a/ whereas in (b), the front upper mid agrees with the back low /ɑ/. This position is meant to argue for an additional hitherto undiscovered eighth vowel in EkeGusii, a debatable position that shall further be evidenced below, which though, shall be found tenable. Intuitively, the vowels used in the roots of the two nominal forms cannot be the same. The two are simply back and front alternants that cannot be collapsed into some medial /a/, of which they should be variants as portrayed by Cammenga (2002). This goes against the findings of Cammenga (2002) and followers of the same view. The implications of this argument will extend towards the position that vowel harmony in EkeGusii is root-controlled and spreads autonomously both regressively and progressively. This is further exemplified by affixation in § 6.4 below.

6.4 Insights from affixation

The following examples examine pre-fixation and suffixation to help us further argue for the feature controlling vowel harmony, the direction of harmony spread and support the hypothesized triangular nature of harmony. The verbal root [-*sɛk*-] for laugh has been used for this analysis.

a. sɛk-a (laugh)
b. sɛk-w-a (be laughed)
c. kɔ-γɔ-sɛk-a (if you laugh)
d. γɔ-sɛk-ɛ-r-a (laughing at)
e. nɔ-sɛk-a (even if you laugh)
f. na-mɔ-mɔ-sɛk-rɛ-r-a (even if you laugh at him/her)
g. ɔ-γɔ-sɛk-ɛr-a (to laugh at)

h. ɔ-γɔ-sɛk-ɛ-r-a-n-a (to laugh at the same time)

i. ɔ-γɔ-sɛk-ɛ-r ɛ-ra-n-a (to laugh at one another)

j. tɔ-sɛk-a (do not laugh- singular, covert 2nd person subject marker -ɔ-)

k. tɔ-tɔ-sɛk-ɛ-r-a (do not laugh to us)

l. tɔ-γɛ-sɛk-ɛ-rɛ-r-a (do not laugh at it)

m. ti-mo-r**i**- sɛk-ɛ-r-a (do not laugh at it –Augmentative class marker -ri-)

n. ti- mɔ-sɛk-a (do not laugh-plural, 2nd person subject marker -mɔ-)

Example (a) shows the verbal root has a front lower mid. All forms of affixation as they develop from (a) to (l) indicate that only the back lower mid /ɔ/ and the front low /a/ can agree with the root vowel in both directions, rightwards and leftwards. Example (b) shows that glide formation is the source of /w/ (as explained above). What happens in (m) can therefore be conveniently explained as a default supply of /o/ in the event that the pre-root /i/ has caused opacity hence the invisibility of other prefixal forms. This is evidenced in (n) which has eliminated the said opaque /i/ and allowed the same vowel to be visible to the stem vowel which has automatically harmonized with the feature [high]. The segment /i/ only appears to block segments preceding it. It can therefore be concluded as follows. Firstly, vowel harmony appears to be a root-controlled process. Secondly, it is an independent feature that spreads in either direction, leftwards or rightwards. Thirdly, the feature is independent of segmental structure, and finally, only the front low /a/ agrees with the front and back lower mid vowels, though it occurs word finally in all cases except in (f). The manner in which vowels select one another is here dictated not by proximity, but inherent common properties as argued by Nevis (2010).

6.5 Evidence from phrasal and clausal lexemes

This section may be viewed as a prelude to § 6.6 below since it explores data that expressly evidences the harmony sensitive nature of the front and back low vowels so that the triangle hypothesis can suffice.

	Column1	*Column 2*
a.	β**a**-ɛr-i-re (they are finished)	β**ɑ**-enen-i-r-e (they have refused)
b.	β**a**-ɛnɛki-e (they confirm)	β**ɑ**-tenenk-i-r-e (they have gotten rich)
c.	β**a**-rɛr-ɛ (they nurture)	β**ɑ**-rer-e (they cry)

d.	**a**-rɛr-ɛ	(s/he nurtures)	**ɑ**-rer-e	(s/he cries)
e.	**a**-mɛn-ɛ	(s/he licks)	**ɑ**-mer-e	(s/he swallows)
f.	tɔ-rɔr-ɛk**a**-n-ɛ (we appear)		to-inyor-**ɑ**-n-i-e (we remind one another)	

Firstly, all the lexemes display no harmony neutral or opaque segments (the high vowels) which are deliberately avoided for purposes of clarity. Secondly, the two columns involve lexemes in which the front and back low vowels occur word initially as or within subject marker morphemes or in medial positions, yet display their harmony sensitive nature. Column 1 therefore shows that /a/ is harmonized with ɛ-ɔ (lower triangle) while /ɑ/ is harmonized with e-o (within the upper triangle). This pattern can be observed throughout. As witnessed, harmony is actually intervening-segment insensitive save for opaque segments (§ 6.8 & 6.9 below). These observations confirm the existence of an eight vowel in EkeGusii and the soundness of hypothesized triangular behaviour of harmony. This position finds backing in the rejection of the wrong vowel in § 6.6 below.

6.6 Rejection of [a] or [ɑ] in wrong environments

The following data serves to demonstrate the existence of two distinct front and back low vowels, so that the [+BACK] and [-BACK] can be correctly used ruling out any perceptions of anticipatory assimilation while the feature [lax] remains shared. It should be noted that the [ATR] features are avoided for being made redundant by [mid] (Nash, 2011). The data is supplied in two columns where the natural column reflects native speaker articulation while the unnatural column attempts use of the low back vowel in (a-e) and the low front vowel in (f-l). The use of the bilabial fricatives and velar plosives creates room to assess the function of any assimilatory processes.

	Natural	*Unnatural*	*gloss*
a.	β**a**-ɛnɛki-e	β**ɑ***-ɛnɛki-e	(they confirm)
b.	**a**-rɛr-ɛ	**ɑ*-**rɛr-ɛ	(s/he nurtures)
c.	**a**-sɔrɔr-ɛ	**ɑ*** -sɔrɔr-ɛ	(she requests)
d.	γ**a**-sɔm-ɛ	γ**ɑ***-sɔm-ɛ	(it reads- diminutive subject marker)
e.	k**a**-rɔr-ɛ	k**ɑ***-rɔr-ɛ	(it sees- diminutive subject marker)
f.	k**ɑ**-ror-e	k**a*-**ror-e	(it gets bitter- diminutive subject marker)

g. β**ɑ**-orok-e β**a*-**orok-e (they appear)
h. **ɑ**-umer-e **a***umer-e (s/he meets)
i. **ɑ**-kurur-e **a***kurur-e (s/he pulls)
j. **ɑ-**eneen-e **a***-eneen-e (s/he refuses)
k. **ɑ-**tenen-e **a***-tenen-e (s/he stands)
l. **ɑ-**rer-e **a***-rer-e (s/he cries)

The first observation made is that in (a-e), the attempted low front vowel in the unnatural column is rejected in all the examples while in (f-l), the low back vowel is equally rejected in all the examples. The vowels are actually displacive of one another. The bilabial fricative in (a) and (g) does not influence the vowels. Each case selects the specific vowel as shown and an attempted swap is rejected. The same scenario appears in (d), (e) and (f) where the plosives do not influence vowel quality. Instead, the positional qualities of plosives are influenced by the vowels. In (h) and (i), there are opaque elements which dictate that the initial /ɑ/ is supplied by default while in (j-l) the vowel is a dictate of the harmony condition. Conclusively, the unnatural column is the informative one, which reveals that the front and back low vowels are distinct and the wrong candidate is rejected (starred as shown above). Examples (b) and (l) with **a**-*rɛr-ɛ* (s/he nurtures) and ***a****-rer-e* (s/he cries) in that order will clearly demonstrate this position when pronounced together for contrast. The only contrastive feature is vowel height as tone and length are neutralized. Any attempt to interchange the vowels is absolutely rejected, allowing only the legitimate vowel to function. What the analysis of vowel harmony has done is reveal the eighth candidate of the EkeGusii vowel system and further, find the triangle hypothesis tenable.

6.7 Evidence from transparent to-infinitives

Infinitival forms are considered transparent, not capacitated with the ability to block harmony, therefore able to reveal the triangular nature of the vowels. Let's examine the following infinitival forms.

	Column 1	*column 2*
a.	ɔ-γɔ-tɛ:b-a (to say)	o-γo-teb-ɑ (to be sterile)
b.	ɔ-kɔ-γɔn-a (to snore)	o-ko-γor-a (to buy)
c.	ɔ-kɔ-rɛr-a (to nurture)	o-ko-rer-ɑ (to cry)

d. ɔ-kɔ- ɔ:ndɔk-a (to fear) o-ko-endok-a (to slant over)
e. ɔ-γɔ-sɔ:k-a (to be married) o-γo-so:k-ɑ (to be ashamed)
f. ɔ- kɔ-bɔ´:r-a (to swell) o-ko-bo:r-ɑ (to say)
g. ɔ- kɔ-bɔ:r-a (to cry loudly) o-ko-bor-ɑ (to miss)

Columns 1 and 2 above serve to demonstrate clearly that only the front low /a/ can agree with the front and back lower mid pair of vowels. On the other hand, only the back low /ɑ/ can agree with the front and back upper mid pair. In fact, the two are different and neither can replace the other in either environment. The two vowels are sensitive to harmony and are the basis of the harmony triangle which is as a result of ease of articulation. This can be exemplified as follows where the starred forms are unnatural, difficult and wrong to articulate.

h. o-kw-eumi**a*** o-kw-eumi**ɑ** (to mourn)
i. o-kw-ɛngɛnt**ɑ*** o-kw-ɛngɛnt**a** (to hang oneself)

As exemplified above, any attempt to interchange the vowel makes the articulation quite unnatural, nearly impossible. It could therefore be erroneous to imagine of any variants of [a] instead of two distinct vowels. Once the tongue has taken the [-BACK] position at the upper mid level as in the acceptable form in (h), it is natural to retract (revert) to [+BACK] to articulate /ɑ/ than travel downwards to acquire another [-BACK] to articulate /a/. On the other hand, once the tongue has attained the [-BACK] position, it feels easier to articulate the proximal front /a/ than the further back /ɑ/ before retraction to assume it rest position. The existence of two distinct vowels is therefore further evidenced against previous views.

6.8 Opaque reflexive morphemes

The reflexive morphemes in all the lexical items below have an underlying /u/ which has led to glide formation as displayed in bold.

	Column 1	**column 2**
a.	o-γ**w**-ɛkɔr-a (to make pretend)	o-γ**w**-eko:r-ɑ (to finish oneself)
b.	o-γ**w**-ɛkɔn-a (to masquerade)	o-γ**w**-ekon- ɑ (to scratch oneself)
c.	o-k**w**-ɛbɔr-i- ɑ (to redeem oneself)	o-k**w**-ebor-i-ɑ (to ask oneself)
d.	o-k**w**-ɛnyɛgɛr-i- ɑ (to shake oneself)	o-k**w**-engerer-i-ɑ (to cry non-stop)

The stems in the first column display instances of lower mid harmony while those in column 2 display upper mid vowel harmony. The pre-prefixal forms do not appear to agree with the stem vowels on this height feature. It can be noted that all of them precede a reflexive morpheme which is realized in two variant forms, shown in bold in each item, having undergone glide formation as explained above. If harmony were spreading from the prefixal forms then the picture would be different in the pre-prefix vowels. However, the final vowels not preceded by a penultimate /i/ are all affected by root harmony making the whole stem harmonized. Those preceded by /i/ have missed out from being harmonized and since the intervening segment is not in word final position, we posit an argument that finds it opaque in medial position thereby blocking harmony. The ultimate conclusion therefore logically follows that prefixal reflexive morphemes are opaque and are the consequences of disharmony. They have successfully made the augment vowels invisible from the root vowels which would otherwise have harmonized them. Following this position, it is logical consequentially to argue that harmony in EkeGusii is root controlled and spreads both progressively and regressively from the root. This position adduces evidence to negate the earlier view by Osinde (1988) that harmony is dependent on affixation. As a final observation, it is clear from examples (a) and (b) in both columns that the final vowel positions attract selected FVs in support of the hypothesized vowel harmony triangle. In other words, the vowels /a/ and /ɑ/ are available in EkeGusii and are active candidates of the harmony triangle. The latter is a revealed member of the 8-inventory system since replacing the correct vowel interferes with articulatory naturalness of a native speaker of EkeGusii.

6.9 Opacity in intervening segments: [i], [u].

The following examples are meant to demonstrate that these two segments are not only harmony-neutral but contemporaneously opaque. Further, they demonstrate the functionality of the hypothesized harmony triangle.

a. o-mo-s**i**nyɔntɔ (an edible sour herb with a juicy stem)
b. o-γo-s**u**ngɛr-a (to wither)
c. o-γo-s**u**mbɛra (to stay with somebody naggingly)
d. ɔ-kɔ-rɛr-**i**-ɑ (to pamper)
e. o-ko-rer-**i**-ɑ (to make cry)
f. e-γe-t**u**rɛr**i** (trumpet)

g. ɑ-β**i**-sɛr-**i**-e (he chases them away - non-animates)

h. e-ke-**u**mbɛr**i** (a fire furnace)

i. e-γe-s**uː**rɛ (maize top or crest)

j. ch**i**-ndɔrɛrɔ (eye pupils)

k. e-γe-s**i**nkɔmɛ (pejorative - insult)

l. e-s**i**mbore (a chant)

m. ɑ-γe-**i**tek-e-r-e (it spills on it)

n. ɑ-γe-**u**ti-e (s/he nearly hits it/ or s/he narrowly misses it)

o. e-k**i**-ɔngɔt**i**r-ɑ (neck)

The first argument to posit here is that the front and back high vowels are neutral and opaque to harmony at the same time. The first observation is made on their stemal behaviour in examples such as (a-c), (f), (k), and (l). Both /u/ and /i/ stand insensitively to the rest of the harmony structure. Indeed, they appear quite neutral as in other languages like *Finnish* (Goldsmith, 1996). However, they equally appear opaque. Without desire to ascertain the direction of harmony spread, it is clear that in all the prefixal forms preceding these candidates, disharmony is displayed with regard to the harmonized stem or root. This is clear evidence that the segments are actually opaque that they make the vowels sandwiching them invisible to each other. Examples (d) and (e) confirm this position since the vowels are harmonized across the word until (d) meets the opaque /i/ which takes over and allows its back low countepart /**ɑ**/ to take over instead of /**a**/, confirmed by the harmony triangle. The same appears in (g). This is because the ultimate position becomes invisible to the harmonizing feature as a result of the opaque penultimate segment. Otherwise all vowels on either of these segments are actually separately harmonized.

In *Ife Yoruba*, these vowels appear irrelevant so that they are skipped; vowels on either side still harmonize as in *ɛúrɛ* (goat), while the picture is different in standard *Yoruba* which treats the second vowel as the next (Nevins, 2010:9). As demonstrated by example (o) above, they block harmony in EkeGusii as often as they occur so that the root vowels are harmonized except the ones on either sides of /i/. The opacity of the front and back high vowels can further be confirmed from the following trisyllabic or quadrisyllabic names (names have no glosses), where initial capitals for proper nouns are deliberately avoided for uniformity.

oy**i**έkɔ	ot**u**kε	ok**i**bɔ
os**i**emo	ob**u**rε	omb**i**rɔ
mo**u**kɔ	or**u**chɔ	o**i**rεrε

The names above display disharmonicity so that the harmonizing feature may not be identified. However, the consistent picture is that the intervening high vowels cannot be termed neutral or irrelevant, for the vowels on either side are actually harmonized. They must be opaque. Then, Comparison can be made to other trisyllabic or quadrisyllabic words as a final step, suggesting that harmony may not be a syllabic feature since the high vowels are not harmony-sensitive but opaque. Consider:

p. eng'**u**kɔ (mole)
q. eb**i**rɔ (seasons)
r. eny**i**gɔ (kidney)
s. eβ**i**εβɔ (gullet)
t. ɑmɑ**i**sɔ (eyes)
u. em**i**ɔrɔ (machetes)
v. em**i**ɔyɔ (throats)

Whenever there are two vowels on either side of /i/ as in (s, u, v), they display clear height harmony. However, regardless of proximity, the segments do not allow the vowels to harmonize in (p, q, r). The opacity of /u/ and /i/ cannot be emphasized.

6.10 Counter-triangle evidence in nominal final vowels

Perhaps the following examples may display evidence that the triangular hypothesis of vowel harmony may not stand its ground but explanation is attempted to account for the fact that all the prefixal morphemes appear to negate harmony processes. To sustain an objective linguistic argument, we have to examine the following nominal examples.

a. o-βo-rar**ɔ** (bridge)
b. o-βo-ra:r**ɔ** (sleeping place)
c. o-βo-kan**ɔ** (Gusii guitar)

d. o-βo-sar**ɔ** (medicinal ash)
e. o-mo-βar**ɔ** (population)
f. o-mo-ɣaːng**ɔ** (cooking stick)
g. o-ro-saː**ɔ** (diarrhea)
h. o-mo-chaːnd**ɔ** (problem)
i. o-mo-chaːng**ɔ** (funds drive)
j. o-βo-**i**tɔngɔ (contentment)
k. ɔ-mɔ-ɛri**ɔ** (end)

The first challenge posed by such data is to explain whether, vowel harmony is a morphemic or moraic feature. This is because disharmony is displayed where /o/ is preceded by a bilabial fricative or bilabial nasal except in (g). Example (k) shows [-mo-] to be transparent while it looks opaque in (e), (f), (h) and (i). This really compounds a challenge in drawing a conclusion. One plausible explanation will have to hover around the pause between the prefixal morphemes and the nominal stems above. Slow articulation reveals a fairly longer and considerable pause here that may seem to cause insensitivity to harmony. Such pauses seem to occasion opacity the same way harmony is blocked in post-lexical compounds in § 6.12 below. Therefore, being lexically bound, harmony senses these two parts as different lexical territories so that vowels on either side of the pause are separately harmonized. Why evidence from such data may not be successfully used to refute the hypothesized triangle is from within the very data. In fact, all the vowels within the stems are correctly harmonized so that the front low /a/ agrees with back lower mid /ɔ/ as expected in that /ɑ/ cannot be presented as a candidate. Some insight may lie within the phonetically long vowels following the pre-prefix and prefix [o-mo-] but how it contributes to harmony is yet to be deciphered. Otherwise, examples (c, d, e) counter this assumption. Going back to the more promising pause theory, (k) can be explained as a simple transition from vowel to another as in gliding, which naturally shortens the pause hence the transparency. In fact all the stems are consonant-initial after the prefixal morphemes unlike (k) and (j) which display a neutral and opaque segment as explained in § 6.9 above. A final and more plausible option would be to suggest an argument around ease of harmony selection between /ɛ/ and /ɔ/ than between /o/ and /a/. Assuming that /o/ is the underlying form of /ɔ/, then the members of the first pair will easily see each other in words such as *ɔ-mɔ-chɛr-ɛ* (rice) and *ɔ-mɔ-rɛmbɛ* (peace) including *ɔ-mɔ-εriɔ* (end) in (k) above as opposed to all examples in (a-l). Combined with the pause argument, then perhaps, it hampers visibility in such cases.

6.11 Invisibility in compounds and post-lexical structures

The compound forms here are to help draw a non-committal conclusion on the post-lexical nature of vowel harmony in EkeGusii. (a-d) can be termed phrasal compounds while (e-f) can be considered nominal compounds which though, convey derived senses. The morphological parsing is for descriptive convenience but not morphological purposes. However, compound nouns such as those in (e-g) can be analyzed as [AUG- class-V-N], where a verbal root and a noun form a compound noun.

a. omont'/ɔmɔtɔn**u** (a covetous person)
b. omont'/ɔmɔchεn**u** (a hygienic person)
c. ε-gε-sɔn'/ekebe (a bad clitoris)
d. moker'/ɔng'ɔnd**i** (sheep's tail)
e. e-γe-tɑndɑ'/bɔya (pubic louse)
f. ε-kε-ngεnta'/mbor**i** (a local herb)
g. e-γe-s**i**ra'/mbεεrε (brazier)
h. mo-sɑmb-ɑ-/mwa-yε ('the one that has burnt his house' - metaphorical for newborn)

The slash demarcates where the first part of the compound phrase or noun ends (for convenience), otherwise, the string reads as one word in rapid speech. The point of interest is the consistent pattern that shows that each part is separately harmonized. For instance, (f) has three front lower mid vowels in the first part while the second part has a back high mid vowel which obviously cannot be harmonized with the front lower mid. In (c), the first part shows clear height harmony which does not appear in the adjectival part. The territorially limited presence of both /e/ and /ε/ in compound forms like (g), or /o/ and /ɔ/ in example (a), is a clear indication that vowel harmony is a cyclic process in EkeGusii and only lexical rules should be applied in its description. Post-cyclic applications may be ruled out though such a position cannot be conclusive but suggestive. As it appears, all the vowels in one part of the compound word are invisible to all the vowels in the other part. If such happens at the compound level, then it defeats logic for one to entertain a possibility of harmonized vowels at any other post-lexical level. The retained position is that /i/ and /u/ are considered neutral in this case, considering their peripheral positions except the stem initial position in (g). Nash (2011) shares a related view.

6.12 Instances of disharmony

There is sufficient data to display anomalous vowel behaviour so that they pose several puzzles that ignite debate on whether harmony can be fairly accounted for. Let us consider the following examples.

a. to-itaβ-**ɛ** (we respond)
b. to-itɑβ-e-r-e (we respond for/to)
c. to-itɑβ-e-r-ɑ-**nɛ** (we agree to the call)
d. to-itɑβ-e-rwe (we be responded for)
e. to-itɑβ-i-gwe (we be made to respond)
f. to-saβ-**ɛ** (we pray)
g. to-sɑβ-e-r-e (we pray for)
h. to-sɑβ-e-r-a-**nɛ** (we pray for one another)
i. to-siβor-e (we untie)
j. to-siβor-ɑ-**nɛ** (we untie one another)
k. to-onchor-e (we change)
l. to-ochor- ɑ-**nɛ** (we interchange)

The examples above pose various challenges. It appears that certain roots are weak so much that they are not in control of harmony, assuming vowel harmony is root-controlled as posited above. In fact, the same root in (a) and (b) has two vowels, the low front and back forms. The same situation is witnessed in (f) and (g). However, what these examples display is, the suffixal morpheme -r-e could be a strong root changing suffix as it occasions stem-internal raising of vowels (cf. Odden, 2015:9). This could be evidenced in (c) and (f) where the applicative morpheme **–nɛ** does not appear to affect it, neither is the latter affected. The question of the disharmonized **–nɛ** equally arises. It looks plausible to argue that it is the default applicative morpheme but why it refuses to be harmonized is an unresolved puzzle. While the strength of the vowel /e/ in this morpheme –re- appears to spread leftwards, it fails to work rightwards to harmonize the vowel in **–nɛ.** Equally, while **-nɛ** appears stable, it does not seem ambitious enough to harmonize any other vowel. It looks blind and invisible at the same time, making it weak. Now that these observations are challengeable as the debate continues, the only conclusion to stick to is that such are examples of disharmonicity in EkeGusii, though such insights may shed important light on the problem. Perhaps, vowel harmony could be mainly root-controlled and minimally suffix-controlled.

6.13 Atypical disharmony

Whereas words like *o-mo-swaagɔ* (pestle/pounder) and *e-ke-ngwaansɔ* (animal offering) can easily be explained by glide formation and the opacity of the underlying /u/ as discussed above (§6.3, 6.8, 6.9), words such as *ɛ-gɛ-kɔndɔ* (monkey) and *ɛ-kɛ-ngɔɔrɔ* (siren) display expected transparency and harmony. The variant prefixal morpheme [-ge-] or [-ke-] appears transparent to harmony. The following similar examples flout, blatantly, the expected rules making attempt at any explanation look quite impossible. The vowels in bold are separately harmonized from the rest.

a. **e**-k**e**-baagɔ (thug)
b. **e**-k**e**-aɔ (adj-different)
c. **e**-b**ɑ**ndɔ (corn seed/cob/plant)
d. **e**-b**ɑ**kɔra (Cyprus)
e. **e**-b**ɑ**rɔɔngɔ (twin)
f. **e**-g**e**-saambɔ (scar/ injury mark)
g. **e**-g**e**-sambɛba (mouse)
h. **e**-g**e**-taabɔ (clay bowl)

These examples threaten to dismantle the triangle hypothesis but the position is disregarded on the basis of the limited nature of such data in the language. Adduced evidence has already overtaken it. One possible explanation is that /ɔ/ in word final position disregards harmony or is unable to sanction harmony. Why the root vowels do not take control either is hard to explain. In examples (c), (d) and (e), disharmony is within the root. This makes the root-initial syllable sound like a prefixal form related and harmonized to the pre-prefix. In (a, b) and (f, g, h), the class marker morphemes that have elsewhere been displayed as transparent, now seem to orchestrate partial harmony. The roots in these nouns do not influence harmony as expected. Generally speaking, these are instances of extremely raucous disharmonicity whose explanations only seem to lie within disharmony.

7.0 Conclusion

On the basis of the foregoing discussion, the following conclusions can be drawn. Vowel harmony in EkeGusii is a triangular affair. The harmony triangle has revealed that the vowel inventory system of the language has been misconstrued in the past as to have seven instead of eight balanced vowels; four front and four back vowels. Vowel height is a distinctive feature but it achieves this function concurrently with other features including tone and vowel length in considerable instances. Vowel harmony is a root-controlled process that spreads iteratively leftwards and rightwards from the root, though a few instances allude to suffix-controlled harmony. The front and back high vowels in EkeGusii are both harmony-neutral and opaque. Glide formation involving the vowel /u/ in clusters such as -kw- and -γw- makes them equally opaque as a result of the underlying /u/. Vowel harmony appears post-lexically hampered but research into the process is necessary. The upper mid vowels appear the default vowels in instances of disharmony or blocking. Once the position that EkeGusii is a 8-vowel inventory system has been adopted, it dictates that a new feature matrix has to be drawn for EkeGusii vowels as shown below, which is different from the one in Cammenga (2002:39) which includes the unverified [±ATR] redunded by the feature [mid], and that in Nash (2011:35), which excludes [tense] but reflects both [±high] and [±low] thereby making one redundant. Both matrices do not have the eighth vowel and lack the two features, [±round] and [±tense].

	i	**e**	**ɛ**	**a**	**ɑ**	**ɔ**	**o**	**u**
HIGH	+	+	-	-	-	-	+	+
MID	-	+	+	-	-	+	+	-
BACK	-	-	-	-	+	+	+	+
ROUND	-	-	-	-	-	+	+	+
TENSE	+	+	-	-	-	-	+	+

Future researches have no lighter task with the revelations articulated in this paper as native speaker intuitions must play a central role in research. Traditional research methods have hampered exploration into many African languages.

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