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Number in Dholuo

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Abstract

Dholuo is one of the languages with a highly productive overt nominal marking system, particularly in plural formation. Despite this, previous studies have differed sharply on exactly how number is expressed in Dholuo nouns. In addition, the previous studies' approaches posit feature polarity (voice, manner or prosodic) as a feature that solely applies to nouns. Again, none of the attempts has endeavored to fully account for the morphemes **–e**, **-i** and **–ni** occurring at the end of Dholuo plural forms. The analysis in this study shows that the feature "voice," in general or voice polarity in particular, is not an exclusive constraint for defining Dholuo plurals but is a general descriptive constraint for all Dholuo nominal inflectional processes. The study has established that plural formation in Dholuo is regular and that Dholuo has a basic plural marker **–e** which has three allomorphic variations **[-e], [-i],** and **[-ni]** occurring in specific, morphophonologically defined environments. The [-**ni**] allomorph occurs predominantly with V-final noun roots and whose penultimate syllable is preceded by a long vowel; the [-**i**] allomorph occurs with noun roots which have a diphthong in the preceding syllable; and the final [-**e**] allomorph occurs elsewhere, but particularly with noun roots with a short vowel or vowel sequences in the penultimate syllable. This study also established that phonotactic restrictions in Dholuo nominals play a crucial part in yielding the structures in the plural forms, particularly articulatory harmony in consonants and vowel place (rounding, height, backness, ATR) harmony.

Keywords: Number, Dholuo, Nominals, Plurals, Constraints

Introduction

The objective of this study was to determine how number is realized in Dholuo nouns. Number is a very challenging grammatical aspect of a language (Alyilmaz, 2017). In fact, Number might appear to be one of the simplest and straightforward natural categories but on closer inspection

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it presents a great many difficulties, both logical and linguistic (Jespersen, 1924) and therefore its analysis as a category in particular languages may be a very complex matter (Lyons, 1968). Although there are indeed languages with the basic singular↔plural opposition, there are also many languages with richer systems; with a dual, trial, paucal, with the richest systems having five number values as in Sursurunga (Corbett, 2000). Corbett (2000), in addition, notes that number is neither a singular↔plural opposition nor do all items that mark number behave the same way. Still, in some languages such as Bodo and Rabha, number is morphologically marked (Gautam, 2018) while in other languages, like Bonggi, do not mark plural grammatically (Greenberg, 1963). So, how is number realized in Dholuo nouns? The answer to this question has been a long-standing debate among linguists. There have been marginal concessions by previous studies (Alderete, 2001; Bye, 2006; De'Lacy, 2012; Okoth, 1982; Ong'ayo, 2016; Stonham, 1994; Trommer, 2006; Tucker, 1994 & Wolf, 2005), albeit with observable contradictions, that Dholuo nouns express plurality through feature alternation. The studies have, however, not exhaustively accounted for the reason why there is feature alternation only when nouns change from singular to plural form. This "feature alternation" phenomenon is problematic because, certain Dholuo nominal structures exhibit similar voicing or devoicing of root final sounds when, for example, expressing possession. Furthermore, the studies have offered incomplete account of the morphemes **-e, -i, -ni** visibly occurring word-finally in Dholuo plural forms.

This paper provides both an alternative explanation of how plurals are formed in Dholuo nouns and an elaborate account of observable morphophonological alternations, some of which the previous studies have not accounted for exhaustively. Previous research have marginally accounted for the morphemes **–e,-i,-ni** that are found at the end of plural forms in Dholuo. Previous analyses (Alderete, 2001; Bye, 2006; De'Lacy, 2012; Okoth, 1982; Stonham, 1994; Trommer, 2006; Tucker, 1994 & Wolf, 2005) have concentrated largely on feature exchange ignoring these important morphemes that could possibly unlock the problematic plural formation in Dholuo. Moreover, there are certain Dholuo nominal structures which exhibit similar voicing or devoicing of final sounds of noun roots when, for example, expressing possession confirming that feature alternation may not be a preserve of plural formation.

The language of Study

The object language of this study is Dholuo. Dholuo language is spoken by the Luo community of East Africa. Luo are part of the Western Nilotic group of speech communities whose cradle land is believed to be the Southern Sudan and who settled on the lands around Lake Victoria between 1490 and 1600 A.D. (Ogot,1967). Dholuo is mutually intelligible with Alur, Acholi, Shilluk, Bor, Lango and Padhola dialects of Uganda (Greenberg, 1995). In Kenya, Dholuo is used for broadcasts in local print and electronic media. The Luo in Kenya are found in Nyanza region. A number of Dholuo speaking families can also be found in various parts of Kenya as a result of marriage and migration. The Kenya Population and Housing Census (2019) puts the total number of Luo at five million sixty-six thousand, nine hundred and sixty-six (5,066,966). There are two major varieties of Dholuo in Kenya: the Trans-Yala and the Kisumu-South Nyanza (Adhiambo, 1990) which, despite having a high degree of mutual intelligibility, are distinct enough in their phonological and lexical features to an extent that one can tell the region a speaker comes from by the way they speak (Aduda, 2013). Dholuo has ten (10) Vowel Phonemes in its inventory. The [+ATR] (**i u e o ɑ**) with a corresponding

number [–ATR] Vowels [ɪ ʊ ɛ ɔ ə]. It has 26 Consonantal Phonemes: Stops [p ɓ t d k g]; Fricatives [f s h ɵ ð]; Nasals [m n ɲ ŋ], Prenasalized Stops [mb nð nd ɲʤ ŋg] (Okoth-Okombo, 1997; Suleh, 2013). Suleh, 2013 also identifies the lateral [l]; the glides [w j] and the trill [r]. Although Dholuo is a tone language, tone is normally not represented in its orthography (Okoth Okombo, 1997).

Previous Arguments on Number in Dholuo Nouns

To lay bare the fact that the approach used in the previous studies (Alderete, 2001; Bye, 2006; De'Lacy, 2012; Okoth, 1982; Stonham, 1994; Trommer, 2006; Tucker, 1994 & Wolf, 2005) has been problematic, the current paper traces the arguments put forward in support of feature alternation, especially voice polarity. Here, this study grapples with the question of whether there is genuinely a voice polarity in Dholuo data.

Stonham (1994) provides the earliest documented attempt to explain the phenomenon of voice alternation in Dholuo plural formation. He claims that Dholuo number inflection has only one morphophonological rule which consistently triggers voicing of root-final obstruents, in a rule formulated as:

1. C → [+voiced] /__ (V) # [+marked number]

The analysis offered by the current study, which agrees with the observations made by Bye (2006); De'Lacy (2012) and Trommer (2008) point out to various gaps in the approach taken by Stonham (1994). First, the approach contradicts the morphological number marking in Dholuo nouns which tends to affix the three allomorphs, -e,-i, and –ni.

Another proponent of voice alternation phenomenon, Wolf (2005) argues that Dholuo voicing polarity derives from allomorphy of floating features. In this perspective of explaining plural in Dholuo using the autosegmental approach, Wolf (2005) analysis shares the basic ideology as de'Lacy's (2012). However, the two differ on both process and detail of the approach. Whereas Wolf (2005) proposes three constraints to govern the behaviour of floating autosegments, de'Lacy (2012) argues that feature changes are not implemented by attachment of floating features, but by coalescence of segments. This analysis offered by Wolf (2005) is, however, deficient and would only work in a (hypothetical) language where voicing polarity appears regardless of syllable structure (Trommer, 2008). The analysis implies roughly the same possibilities as the one offered by Stonham (1994), and Alderete (2001) 'Transderivational antifaithfulness' making inference to a language where all roots are consonant-final. This is not the case with Dholuo nouns which provide a picture of asymmetrical plural formation as well as a mixed structure where nouns end in both consonants and vowels.

The other proponents of voicing polarity (Pulleyblank, 2006 & Trommer, 2006) argue that final obstruents in Dholuo noun roots are underlyingly voiced, unvoiced or unspecified for voicing. Voicing polarity in consonant-final roots, they argue, then amounts basically to final devoicing, while vowel-final roots show a three way-contrast of voicing distribution. However, in a subsequent study Trommer (2008) admits that the earlier analysis, Trommer (2006) was problematic since the distribution given was generally marginal. The current study, therefore, intends to offer an alternative description that would clarify or dispute the controversy seen in Trommer (2006, 2008).

Another study, Bye (2006) on the other hand argues that plural in Dholuo, and feature polarity in particular, is a product of prosodically and morphologically conditioned 'stopping' and 'destopping' of Dholuo nouns and verbs which affixes a [stop] feature immediately following the nucleus (V) resulting in insertion of a /C/ as seen in (2):

2. (a) tʃwɛ → tʃwɛ-tʃɛ 'leech'

   (b) duɛ → due-tʃe 'moon, month'

Whereas in the case of CVCV core, [stop] merges with the rightmost consonant as in (3):

3. (a) ɔkwadʒɔ → ɔkwətʃe 'cane'
   (b) lowo → lope 'earth'

The analysis offered by Bye (2006) assumes that all Dholuo noun roots exclusively end in stops and if they were not, they must be made to be one by either insertion or merging. In OT framework which the current study relies on, markedness and faithfulness constraints will obviously block the two processes proposed by Bye (2006). Moreover, even if insertion and merging were to explain plural formation in Dholuo, it would take care of a very marginal section of the nominal structure. Also, there seems to be lack of vowel harmony in the data provided by Bye (2006) in pluralisation in (2-3) contrary to Dholuo morphophonotactic demands.

It is, therefore, evident from the foregoing that the use of feature exchange by the previous studies in explaining plural formation in Dholuo nouns is problematic. In addition, the use of either voice polarity or switch alpha rule in describing plural formation in Dholuo has been argued as incomprehensive by those who feel 'prosodic structure' is crucial in understanding polarity switch phenomenon in Dholuo plural formation yet it has been ignored by previous research. First, De'Lacy (2012) contends as well that morphological polarity does not occur in Dholuo pluralisation. Instead, De'Lacy (2012) proposes four distinct mutations morphemes which result in: devoicing, desonorization, devocoidization, and root-final vowel deletion. According to him, the plural forces devoicing, desonorization, devocoidization and deletion of a root-final vowel. However, the current study will treat these four mutations as "aspects of lenition" borrowing from the argument advanced by Hyman (1975), which expounds on Trask (2000) phonological scale and the proposition by Lass and Anderson (1975) on weakening trajectory. In addition, the proposition by De'Lacy (2012) is deficient because, still, it argues that voicing plays an important part in Dholuo pluralisation but the current study establishes that voicing occurs regardless of pluralisation. Secondly, some of the data used for analysis by De'Lacy (2012) are misleading as some genitive forms have been presented as noun roots or nominative singular. For instance, the genitive forms [koð] "rain of", [tidʒ] "work of", [tʃag] "milk of" have been presented as nominative singular. On the contrary, the current study has established that voiced obstruents do not occur at the noun root final position in bare nouns in Dholuo. As a result, the phonemes [b, g, ð, dʒ] are realised as final segments in a noun root in affixed noun forms but not in bare noun roots.

One of the studies that have disagreed with the voice polarity process and the exchange rule is Ong'ayo (2016). He argues that when nouns in Dholuo change from singular to plural, they do not just alter the voice feature. He proposes that plural formation in Dholuo shows similarity in the areas of articulation in terms of articulators and where areas are not shared; there is switch in the

articulators either from front to back or from back to front. To this end, the present study agrees to a fair extent with this analysis by Ong'ayo (2016) because from the data collected, the researchers are not convinced that voice polarity could be the only feature or process defining pluralization in Dholuo nouns. However, the major weakness of Ong'ayo (2016) is that his analysis is incomplete because, on those nouns that retain their forms in either singular or plural, his explanation is that the nouns instead use vowel changes to reveal plural formation. Similarly, without offering adequate account, Ong'ayo (2016, p.12) opines that there are also cases where the suffix **–ni** is used to reveal the plurals.

The Problem of 'Feature Exchange' Rule

Is there genuinely a voice polarity or exchange rule in Dholuo data as far as plural formation is concerned? This is the question that part of the analysis in this paper strives to clarify. This phenomenon of exchange rule (also referred to as feature alternation/polarity) is some form of morphological reversals which have the format:

4. /α/ → [β] and /β/ → [α],

(Where **α** and **β** represents some feature with the variable '**+**' or '-' value and which keep reversing these values and or these features in certain morphological or phonological environment.)

Feature exchange, however, has been dismissed by some scholars (De'Lacy, 2012 & Lecarme, 2002). The objections are based on the postulate that 'rules should not be able to arbitrarily switch feature values.' According to Lecarme (2002) a polarity principle should also be rejected on conceptual grounds irrespective of the empirical question of whether polarity systems are found in natural language. Feature exchange would imply that language functions in a binary system in which what happens to a given feature on the left is the mirror image of what is expected to happen on the same or alternate feature on the right in a linguistic operation. Even though this may be true for some features in some languages, it may not apply in others.

For that reason, feature exchange in Dholuo plural formation runs into empirical problem. The examples below in Tables 1 and 2 give a picture where this rule only applies to a marginal section of Dholuo nouns and therefore should not be the general descriptive rule for number in Dholuo nouns. In particular, the voice polarity does not explain the behaviour of the alveolar lateral **[l]**, the alveolar trill **[r],** the labial glide **[w]** and the palatal glide **[j]** as seen in Table 1 which provides data on plural formation in nouns ending in approximants.

Table 1

Plurals of Noun Roots Ending in Approximants

Singular	Plural	Glossary
liel	**liet-e**	graveyard
bur	**butʃ-e**	hole
lowo	**lop-e**	land
ɲojo	**ɲotʃ-e**	maize, beans mixture

From the foregoing, the alternation of the alveolar lateral **[l]** with the unvoiced alveolar stop **[t];** and that of the alveolar trill **[r]** and the palatal glide **[j]** with the unvoiced palatal fricative **[ʧ]**; the labial glide **[w]** with the unvoiced labial stop **[p]** would certainly be beyond voice polarity phenomenon. Similarly, the defiance of some stop-final roots to obey the phenomenon of voice polarity as seen in some noun roots in Table 2 would be enough attestation to its failure to effectively explain pluralisation in Dholuo nouns.

Table 2

Voice Polarity Problem in Some Stop Final Roots

Singular	Plural	Gloss
osiki	**osik-e**	stump
ndi:ga	**ndi:g-ni**	bicycle
koŋga	**koŋg-e**	sisal tree
lek	**lek-e**	herd (of cattle)
ʧupa	**ʧup-e**	bottle
latʃ	**letʃ-e**	urine

Consequently, if voice polarity were to be used, the unvoiced velar **[k]** in **osiki** would be expected to alternate with the voiced counterpart **[g]** in the plural to yield the ungrammatical **osige*** as seen with **guɔk- guɔgi.** The same procedure would also be advanced in the case of **ndi:ga** so that the expected plural be ***ndi:k-e/ ndi:k-i** or **ndi:k-ni*.** Even still, voice polarity fails to explain the **-ni** morpheme in **ndi:g-ni,** the **-i** in **guɔgi,** and the **-e** in **ʧok-e** neither does it explain what happens to the vowels **[a, i]** in the V-final noun roots in Table 5 above.

Therefore, the present study has established that the alteration in the voice feature of the final phoneme of the noun root occurs in pluralization, genitive forms and other inflected forms such as adjectival construction. To put this into a better perspective, consider the morphophonological behaviour of the root-final phoneme of the word **otit** "firefly" in various inflected forms illustrated in Table 3.

Table 3

Morphophonological Behaviour of Root Final Phoneme in Inflections

Inflection Process	Inflected Form	Gloss
Nominative (Sg.)	**otit**	firefly
Nominative (Pl.)	**otid-e**	fireflies
Genitive (Sg.)	**otid-a**	my firefly
Genitive (Pl.)	**otid-wa**	our firefly
Nominative (Pl.) + Genitive (Sg.)	**otid-e-na**	my fireflies
Nominative (Pl.) + Genitive (Pl.)	**otid-e-wa**	our fireflies
NounR + interrogative	**otid-ŋa**	whose firefly

NounR + Pl. + interrogative	**otid**-e-**ŋa**	whose fireflies
NounR + determiner	**otid-ni**	this firefly
NounR+ Pl. + Det.	**otid-e-gi**	these fireflies
NounR+ Pl. + Genitive (Sg.) + Det.	**otid-e-na-gi**	these my fireflies
NounR+ Pl. + Genitive (Pl.) + Det.	**otid-e-wa-gi**	these our fireflies

Evidently, the voicing of the final phoneme of the noun root occurs in all the inflected cases in Table 3. This is a clear indication that plural formation in Dholuo nouns is not a result of voice polarity. The voice feature is therefore just one of the many constraints defining inflection processes in Dholuo nominals including affixation of plural, genitive, determiner, interrogative and pronominal morphemes to the noun root. Other constraints such as Dholuo noun syllable structure, phonotactic restrictions and articulatory harmony (consonant, vowel and consonant-vowel) similarly play a crucial factor in describing inflection processes in Dholuo nominals. This study demonstrates that consonant hardening and weakening define the morphophonological variations seen in the noun root final consonant but does not define pluralisation. The researchers argue that Dholuo nouns form plurals by affixation of the three allomorphs, **-e**,**-i**, and **-ni** to the noun root in certain morphophonologically defined environments.

Methodology

Data for analysis was collected through the targeted elicitation approach using various test frames administered to a study sample of 30 respondents chosen through a systematic random sampling technique from the accessible population of the 31,573 native speakers of Dholuo in Bondo Town, Kenya. This study being an analytic descriptive design, the data collected was analysed through interpretive and descriptive process using the Optimality Theory (OT) framework. The test frames contained a list of words drawn from Dholuo-English dictionary (compiled by Capen Bob, 1998), which the respondents were expected to generate corresponding and appropriate structures of Dholuo nominals and plural forms that were used as data for the study.

Results

The Plural Marker in Dholuo Nouns

The current study is of the view that any model of morphology must make provisions for deviations from the principle that language description follows a straightforward pattern. The approach taken here, consequently, deviates from the feature polarity phenomenon employed by earlier studies in describing plural formation in Dholuo nouns. Furthermore, the behaviour of Dholuo nouns in forming plurals has been observed to follow a similar pattern to other nominal structures when inflected. The current study, therefore, takes the view that Dholuo has a basic plural marker **-e** which has three allomorphic variations **–e, -i, -ni** occurring in specific, morphophonologically defined environments.

The [-i] Allomorph

The **[-i]** allomorph occurs in a specific environment. Largely, the **[-i]** allomorph occurs with noun roots whose final segment is preceded by a diphthong. The words in this category were all native noun roots without a single loan. Moreover, the entire group of noun roots taking the **[-i]** allomorph are C-final.

Table 4

Plural Nouns with the [-i] Allomorph

Singular	Plural	Gloss
guɔk	**guɔg-i**	dog
ʤuɔk	**ʤuɔg-i**	witchcraft
ɲuɔk	**ɲuɔg-i**	billy-goat
ruɔɵ	**ruɔð-i**	king
ruaɵ	**rueð-i**	bull
kuɔt	**kuɔd-i**	shield
muɔk	**muɔg-i**	ant bear
ɵuɔn	**ɵuɔnd-i**	cockerel

It should be notable, however, that there are some noun roots with vowel sequences and which do not form their plurals in the manner described in Table 4. They are: **ɵuol**, **ʧiew, ɲatieŋ** and **kuon** whose plural forms are **ɵuond-e**, **ʧiep-e, ɲitieŋg-e** and **kuond-e.** This is so because vowels in the root form a sequence and not a diphthong

The [-ni] Allomorph

As noted earlier, the three allomorphic variations are defined in certain phonological and morphological environments. The **[-ni]** allomorph also occurs in a specific environment. The **[-ni]** allomorph occurs with V-final noun roots only. It occurs with noun roots that have a long vowel preceding the penultimate syllable of the V-final noun root. The data in Table 5 exemplifies plural formation in vowel final native noun roots while Table 6 illustrates loan roots.

Table 5

Vowel Final Native Roots Occurring with the [-ni] Allomorph

Singular	Plural	Gloss
hi:ga	**hi:g-ni**	cup
ago:la	**ago:l-ni**	veranda
ago:ko	**ago:k-ni**	chest
apa:ka	**ape:k-ni**	wave
bu:nde	**bu:nd-ni**	gun
so:ko	**so:k-ni**	a well

aba:ʤa	abe:ʤ-ni	large spear
osi:ki	osi:k-ni	stump
aba:ga	abe:g-ni	thorny rambler
mo:di	mo:d-ni	reed
agu:lu	agu:l-ni	pot
ndi:ga	ndi:g-ni	bicycle
oga:nda	oge:nd-ni	community

Table 6

Vowel Final Loan Roots Taking the [-ni] Allomorph

Singular	Plural	Gloss
ku:be	ku:b-ni	cube-shaped jerri can (English “cube”)
pa:ka	pe:k-ni	cat (Kiswahili “paka”)
mito:ka	mito:k-ni	car (English “motor car”)
ratʃu:ŋgi	ratʃu:ŋg-ni	sieve (Kiswahili “kichungi”)
ota:nda	ote:nd-ni	bed (kiswahili “kitanda”)
api:ko	api:k-ni	motorcycle (kiswahili “pikipiki”)

The final vowel is deleted when forming plurals. It should be notable also that these noun roots taking **[-ni]** allomorph do not submit to voice alteration of the final segment in the noun root.

The [-e] Allomorph

This allomorph occurs elsewhere in a variety of environments not encompassed by the other two. Specifically, the **[-e]** allomorph occurs with noun roots whose final segment is preceded by a short vowel or vowel sequences. The **[-e]** allomorph, therefore, productively inflects with noun roots whose final sound segments are: obstruents, nasals, approximants, and vowels whether the roots are native or loans. Table 7 exemplifies obstruent final native roots taking the **[-e]** allomorph in forming plurals. These native noun roots have the final consonant preceded by a short vowel.

Table 7

Obstruent Final Native Roots Taking the [-e] Allomorph

Singular	Plural	Gloss
pap	pew-e	field
gɔt	gɔd-e	hill
okot	okod-e	bell
atʃuɵ	atʃuð-e	vulture
piɵ	pið-e	mole hill

ʧak	**ʧeg-e**	milk
kiʧ	**kij-e**	orphan
iʧ	**ij-e**	stomach

Of the five obstruents [**p, t, k, ɵ**, and **s**], only **[s]** does not naturally occur in the Dholuo native noun root final position. However, when it does occur, for example in loan roots, it takes the the **[-e]** allomorph like is the case with the rest of the four obstruents. The **[-e]** allomorph also occurs with obstruent final loan roots in forming plurals as exemplified in Table 8. The final obstruents in these loan roots are preceded by short vowels.

Table 8

Obstruent Final Loan Roots Taking the [-e] Allomorph

Singular	Plural	Gloss
dis	**dis-e**	plate
otas	**otes-e**	paper
mandas	**mandes-e**	baked bread
kabiʧ	**kabij-e**	cabbage
oŋget	**oŋged-e**	blanket
buk	**bug-e**	book

The final consonants in the noun roots (both native and loans) occurring with the **[-e]** allomorph can also be nasals. Table 9 exemplifies nasal final native roots taking the **[-e]** allomorph in forming plurals while Table 10 illustrates loan roots taking the **[-e]** allomorph. It should be notable that a number of noun roots in Table 9 have vowel sequences preceding the final consonants as opposed to diphthongs illustrated in Table 4 which on the contrary admit the –**i** allomorph.

Table 9

Nasal Final Native Roots Taking the [-e] Allomorph

Singular	Plural	Gloss
arum	**arumb-e**	an owl
lum	**lumb-e**	grass
rabuon	**rabuond-e**	potato
kuon	**kuond-e**	ugali
ajaɲ	**ajeɲʤ-e**	verbal assault
ʧuɲ	**ʧuɲʤ-e**	liver
ɲatieŋ	**ɲitieŋg-e**	boulder
tɔŋ	**toŋg-e**	spear

Table 10 illustrates nasal final noun loan roots taking the **[-e]** allomorph in forming plurals. The nasals in these loan roots are preceded by short vowels.

Table 10

Nasal Final Loan Roots Taking the [-e] Allomorph

Noun root	Plural Form	Gloss
sim	simb-e	sim card
kalam	kalemb-e	pen
lɔŋ	loŋg-e	pair of long trousers
sabun	sabund-e	soap
san	send-e	plate
daram	daremb-e	drum

The final consonants in the noun roots occurring with the **[-e]** allomorph can also be approximants. The noun roots with approximant final noun roots may be native noun roots as illustrated in Table 11 or loans as illustrated in Table 12. The approximant in these roots may be preceded by a short vowel or vowel sequences.

Table 11

Approximant Final Native Roots Taking the [-e] Allomorph

Singular	Plural	Gloss
bul	bund-e	drum
ɵuol	ɵuond-e	snake
bur	butʃ-e	hole
laktar	laktetʃ-e	doctor
ŋgaw	ŋgep-e	antelope
tʃiew	tʃiep-e	porcupine
raw	rep-e	hippo

Table 12

Approximant Final Loan Roots Taking the [-e] Allomorph

Noun root	Plural Form	Gloss
situl	sitund-e	stool
bɔl	bɔnd-e	ball
gɔl	gɔnd-e	goal
kar	ketʃ-e	car

The **[-e]** allomorph also occurs with vowel final roots in forming plurals. The V-final roots may be native or loan roots as illustrated in Tables 13 and 14 respectively. The vowel preceding the final segment in these V-final roots is a short vowel.

Table 13

Vowel Final Native Roots Taking the [-e] Allomorph

Singular	Plural	Gloss
dani	**dej-e**	grandmother
buŋgu	**buŋg-e**	forest
ʧogo	**ʧok-e**	bone
kidi	**kit-e**	stone
dwɛ	**dwetʃ-e**	month
olele	**oletʃ-e**	lizard
rombo	**romb-e**	sheep
ɲojo	**ɲotʃ-e**	githeri
aluru	**alutʃ-e**	quail
akuru	**akutʃ-e**	dove
dipo	**dip-e**	veranda
tipo	**tip-e**	shadow
bura	**butʃ-e**	meeting

Table 14

Vowel Final Loan Roots Taking the [-e] Allomorph

Singular	Plural	Gloss
punda	**pund-e**	donkey
ndege	**ndek-e**	aircraft
okombe	**okomb-e**	cup
boma	**bomb-e**	town
misa	**mis-e**	mass
koti	**kod-e**	coat

Nouns Forming Plurals in Multiple Ways

There is another group of Dholuo noun roots which form plurals in multiple ways by taking both the [**-ni**] and [**-e**] allomorphs. Table 15 provides data on noun roots that predominantly end in approximants except the loan root **okebe** (tin) and which take both the [**-ni**] and [**-e**] allomorphs.

Table 15

Nouns Forming Plurals in Multiple Ways

Singular	Plural	Gloss
raw	rew-e/ rep-e/rew-ni	hippopotamus
ragwɛl	rogwɛnd-e/ rogwɛnd-ni	bow-legged
ogwal	ogwɛnd-e ogwɛnd-ni	frog
osiki	osik-e/ osik-ni	stump
agulu	agutʃ-e/ agul-ni	pot
okebe	okep-e/okep-ni	tin

There is a thin but clear-cut distinction in the root vowels in those nouns taking each of the three allomorphs **[e, i, ni]**. While it is distinct that those taking **–i** allomorph have a diphthong in the preceding syllable and those taking the -**e** allomoph have a short vowel or a sequence of vowels in the penultimate syllable, a further distinction exists between those roots that take the **–ni** allomorph and those taking the **–e** allomorph. The **–ni** allomorph group have a long vowel in the preceding syllable but the **–e** allomorph group have a sequence of vowels in the preceding syllable. This, for instance, justifies the plural formation in the word **ogwal→ogwend-e/ ogwe:nd-ni.** The noun can be underlying [**ogual**] but which during suffixation, the plural morpheme initiates an articulary harmony process in which then the [**u**] glides to [**w**] and the following vowel [**a**] lengthens to compensate for [**u**] that changed to [**w**]. In this case, then, we have [**ogwa:l]** which then takes the [**-ni**] allomorph. However, when gliding does not take place we have [**ogual**] which then takes the [**-e**] allomorph or gliding takes place but it is not compensated for which then results to [**ogwal**]; proving the fact that the vowel in the preceding syllable is a sequence and that is why it is able to glide. This is the procedure that makes us end with multiple ways of plural formation in Table 15.

Irregular Plural Formation in Dholuo

Dholuo, just like in other languages, there are nouns that form their plurals in an irregular way as the data in Table 16 illustrates.

Table 16

Nouns Forming Plurals in Irregular Ways

Singular	Plural	Gloss
ɲako	ɲiri	girl
ðako	mon	woman
ðiaŋ	ðok	cattle
ðano	ʤi	person
ot	udi	pot
diel	diek	goat

ɲaɐi	ɲiɐindo	child
pesa	pes	money
dani	deje	grandmother
dala	mier	home
jaɐ	jien	drug

The nouns in the category in Table 16 form their plurals in different, irregular ways. They generally do not admit the plural morphemes [**-e, -ni, -i**]. Instead, there is internal morphological adjustment of the singular form when changing to the plural form. Others do admit the plural morphemes but the root final segments fail to fortify or lenite as is regular of pluralisation of Dholuo nouns.

Nouns Remaining Unchanged in the Plural Forms

In Dholuo, as in other languages, there are those nouns whose structures remain the same both in singular and plural forms. The data in Table 17 illustrates nouns that remain unchanged both morphologically and phonologically in the plural forms. A majority of nouns in this group are abstract nouns. These nouns end in both consonants and vowels and there were no loan roots in this category.

Table 17

Nouns Remaining Unchanged in Plural Forms

Singular	Plural	Gloss
lep	lep	tongue
diep	diep	diarrhoea
lit	lit	pain
gek	gek	hiccups
ran	ran	stupidity
bweɲ	bweɲ	great grandchild
lotʃ	lotʃ	power
mitʃ	mitʃ	gift
ler	ler	light
mor	mor	joy

Phonological Opacity in Dholuo Plural Formation

There are, however, a number of cases in which articulatory harmony (in consonants and vowels) and other constraints in Dholuo describing number do not yield the expected structures and as such the interaction is opaque and is blocked in a number of instances. A small number of nouns do not neatly fall into the structural confines described above. There are instances where certain nouns do not follow the dominant pattern shown by the rest of other nouns in the group. As such, phonological opacity occurs in plural formation in certain Dholuo nouns. For instance, the

constraint **ObsHrd[_#C]~Wk[#C_#]** which requires that noun root final obstruents except **[s]** which are always phonologically strong, weaken word internally but remain hard word finally in the output; and the constraint **SonWk[_#C]~Hrd[#C_#]** which demands that if the noun root final sound is weak, it hardens word internally but remains weak word finally run into phonological opacity. Table `18 exemplifies nouns whose final obstruents fail to fortify or lenite as is expected in pluralisation of nouns in Dholuo despite that fact that they admit the regular plural morpheme **–e**.

Table 18

Phonological Opacity in Plural Formation in Dholuo Nouns

Root	Plural	Gloss
ip	**ip-e**	tail
arip	**arip-e**	milky way
baɵ	**beɵ-e**	side
latʃ	**latʃ**	urine
lak	**lek-e**	tooth
lek	**lek-e**	herd (of cattle)
tʃupa	**tʃup-e**	bottle
osiki	**osik-e**	stump
kuom	**kuom-e**	hump

OT Analyses of the Plural Forms

It is notable, however, that the alternations observable in the final phonemes in the noun root is not specific to suffixation of the plural morpheme. The alternation is a phenomenon which occurs in all inflected forms in Dholuo nominals. In general, Dholuo nominals adhere strictly to articulatory harmony in all suffixation processes. There is, therefore, a constraint in Dholuo which enforces morphophonological alternations in the final phonemes in all Dholuo nominal structures in inflections.

Consequently, the morphophonological alternation in the final segment of the noun root (e.g., from **[k]→[g], [t]→[d], [n]→[nd], [ɵ]→[ð]** etc) seen in the discussion in the sections above is an obligatory process in Dholuo inflections with regard to consonants. A change is triggered in the final segment of the root word in certain morphophonological environments in a process known as consonant weakening/hardening, (see the constraints below). Again, it should be noted that this is a necessary but not obligatory process in plural formation as it is a phenomenon uniformly applicable in all suffixation processes in Dholuo nominals.

5. **ObsHrd[_#C]~Wk[#C_#]** –this constraint requires that word final consonants except [s] in the input are realized as hardened or weakened segments in the output. That is, word final obstruents which are always phonologically strong, weaken word internally but remain hard word finally in the output.

The case in (5) only captures strong segments. Sonorants and vocalic segments (nasals, liquids and approximants) which are generally weak segments are captured by the constraint in (6).

6. $SonWk_{[\_\#C]}$~$Hrd_{[\#C\_\#]}$ -demands that if the word final sound is weak, it hardens word internally but remains weak word finally.

The above constraints, however, must play alongside other universal linguistic constraints, for instance, which require some identity between the input and output.

7. Ident~Hrd/Wk- requires that the hardened or weakened segment in the output must be identical to the segment in the input.

To get the optimal candidate admitting the -ni allomorph in forming plurals, however, the defining constraint will have to do with the penultimate syllable of the noun root as summarised in Constraint (8). The –ni allomorph occurs with roots whose penultimate syllable has a long vowel.

8. $V{:}\_\#C_{Root}$-ni -this constraint demands that we only get the –ni allomorph when the final consonant of the root is preceded by a long vowel

To yield a well-formed structure, however, the above constraint (8) plays alongside other linguistic constraints including in Dholuo plural formation. Consequently, for the nouns which take the [-i] allomorph, the constraint which will determine the plural allomorph that is admitted by the noun root will have to define the vowel in the root. As earlier explained, the [-i] allomorph occurs with roots that have a diphthong preceding the final consonant of the noun root, the constraint in (9) below is highly ranked in pluralisation of nouns which take the [-i] allomorph and therefore defines which candidates are admitted.

9. $V_{[DIPH]}\_\#C_{Root}$[-i]- this constraint demands that the –i allomorph only occurs with roots whose final consonant is preceded by a diphthong.

The [-e] allomorph on the other hand occurs in all other environments not defined by the other two allomorphs. It occurs with nouns with C-final phonemes as well as those with V-final noun roots. The [-e] allomorph is the morpheme which occurs with noun roots across the spectrum irrespective of whether the roots are native or loan. Specifically, the [-e] allomorph occurs with noun roots whose final segment is preceded by a short vowel or vowel sequence as illustrated in the constraint in (10).

10. $V_{[V\leftrightarrow VV]}\_\#C_{Root}$[-e]- this constraint demands that the –e allomorph only occurs with roots whose final segment is preceded by a short vowel or vowel sequence.

In addition, articulatory harmony as regards to vowels in the input and output segments is an obligatory requirement in the pluralisation of nouns as well as in all other inflectional processes in Dholuo. This requirement is defined by the constraint in (11).

11. **ArtHam(v-v) -**requires that vowel features in the output must be harmonious with the vowel segment features in the input in terms of articulatory parameters defining vowel place (backness, rounding, height, ATR).

Here, it is the vowel in the suffix that triggers harmony. Therefore, when suffixation occurs the vowel in the root has to change in order to harmonise with the vowel in the suffix. It is for that reason, for example, that the open central vowel **[a]** in the C-final noun root **pap** "field" and V-final loan root **paka** "cat" whose plural forms are **pew-e** and **pek-ni** and not ***paw-e** or ***pak-ni** have to satisfy this articulatory coherence. The vowel in the input has to agree with the mid front vowel [**e**] in **pew-e** or close front vowel [**i**] in **pek-ni** in the suffixes in terms of vowel place. This is not seen, for example, in the **osiki→osik-ni** in which vowel harmony is already achieved. Faithfulness to vowel-place features is therefore a necessary but not obligatory condition to be met in plural formation. In addition, this vowel place harmony also requires that vowels in V-final roots are deleted in the output before admitting a suffix as summed in constraint (12).

12. **ArtHam(_v#$_{[Del]}$) -** this constraint requires that final vowels in V-final roots are deleted in the output when admitting a suffix to satisfy this articulatory coherence requirement regarding vowel place.

Therefore, using the example of **guɔk-guɔg-i,** we can use the constraint tableaux (13) to illustrate how the above and other articulatory constraints come into play to yield the well-formed plural forms that admit the [-**i]** allomorph.

13. input: **guɔk + -i** "dog + Pl"

OUTPUT **guɔk-guɔg-i**	$V_{[DIPH]}$_#C_{Root}[-i]	$ObsHrd_{[\#C]}$~ $Wk_{[\#C-\#]}$	$SonWk_{[\#C}$~ $Hrd_{[\#C-\#]}$	Ident~ Hrd/Wk	ArtHam(v-v)	ArtHam (_v#$_{[Del]}$)
(a)☞**guɔg-i**			*			
(b) **guɔk-i**		*				
(c) **guɔk-ni**	*!	*				
(d) **guɔg-ni**	*!		*			
(e) **guɔg-e**	*!		*			
(f) **gɔg-i**	*		*	*!		
(g) **guk-i**	*	*		*!		

The first two candidates (a) and (b) both satisfy the highly ranked constraint $V_{[DIPH]}$_#C_{Root}[-i] which dictates the environment in which the [-**i**] allomorph occur. Thus, all the candidates (c, d, e) with different plural allomorphs from the [-**i**] have a fatal confrontation with the highest ranked constraint, $V_{[DIPH]}$_#C_{Root}[-i] and are straight away knocked out. For that reason, the last two candidates (f) and (g) similarly have a fatal confrontation with the most highly ranked constraint because they have a short vowel instead of a diphthong in the preceding syllable. Further, the two are ruled out because they fatally violate the constraint, **Ident~Hrd/Wk** which enforces identity between the segment in the input and output and which prevents deletion and or insertion. The fact that one of the vowels in the noun roots surfaces as deleted segment also renders the outputs

semantically inadmissible in the language. However, candidate (b) **guɔk-i** has a fair competition with the optimal candidate (a)☛**guɔg-i** until it is knocked out by the constraint, **ObsHrd$_{[\#C]}$~Wk$_{[\#C-\#]}$** which demands that the noun root final obstruents in the input are realized as weakened segments word internally in the output. It is this constraint that also leads to candidates (c) and (g) losing ultimately to the optimal candidate. The final two constraints, **ArtHam(v-v)** and **ArtHam(_v#$_{[Del]}$)** play no decisive role in this. Similarly, the constraint **SonWk[_#C]~Hrd[#C_#]** plays no major decisive role as it only concerns sonorants.

The phonotactic restrictions defining Dholuo nominal structure play a crucial part in yielding the structure in the plural form. In particular, articulatory harmony seen in consonant hardening/weakening and vowel place (backness, rounding, height, ATR) harmony is responsible for the morphophonological variations in the noun root final sounds.

Using the example of **paka-pekni,** we can use the constraint tableaux (14) to illustrate how articulatory constraints come into play to yield the well-formed plural forms that admit the [-**ni**] allomorph.

14. Input: **pa:ka + ni** "cats"

OUTPUT **pa:ka-pe:k-ni**	**V:_# C$_{Root}$[-ni]**	**ObsHrd$_{[\#C]}$~Wk$_{[\#C-\#]}$**	**SonWk$_{[\#C]}$~Hrd$_{[\#C-\#]}$**	**Ident~ Hrd/Wk**	**ArtHam (v-v)**	**ArtHam(_v#$_{[Del]}$)**
(a)☛**pe:k-ni**		*	*	*		
(b)**pak-ni**	*!	*	*	*	*!	
(c)**paka-ni**	*!	*	*		*!	*!
(d)**pe:k-i**	*!	*	*	*		
(e)**pek-e**	*!	*	*	*		

The outputs (b), (c), (d) and (e) suffer fatal violation of the highly ranked constraint, **V:_#C$_{Root}$[-ni]** which demands that the winning candidate only admits the **–ni** morpheme when the final consonant of the root is preceded by a long vowel. Thus, all the candidates whose penultimate syllables are not preceded by a long vowel are ruled out. Candidates (b) and (c) further suffer fatal confrontation with the last two constraints because they fail to adhere to articulatory coherence on vowel place, where **ArtHam(v-v)** demands coherence between vowels in the noun root and that in the suffix, and **ArtHam(_v#$_{[Del]}$)** demanding deletion of the final vowel in all V-final roots.

The **[-e]** allomorph is the morpheme which occurs with noun roots across the spectrum (i.e., after roots with final obstruents, nasals, approximants and vowels) irrespective of whether the roots are native or loan. Constraint Tableau (15), (16) and (17) illustrate plural formation with the **[-e]** allomorph.

15. input: **atʃuɵ + -e** "vultures"

OUTPUT **atʃuɵ- atʃuð-e**	**V$_{[V\leftrightarrow VV]}$_#C$_{Root}$ [-e]**	**ObsHrd$_{[\#C]}$~Wk$_{[\#C-\#]}$**	**SonWk$_{[\#C]}$~Hrd$_{[\#C-\#]}$**	**Ident~ Hrd/Wk**	**ArtHam (v-v)**	**ArtHam(_v#$_{[Del]}$)**
(a)☛**atʃuð-e**			*			
(b)**atʃuð-ni**	*!		*			

(c) **atʃuɵ-ni**	*!	***!**				
(d)**atʃuð-i**	*!		*			
(e) **atʃuɵ-e**		***!**				

The constraints which define the appropriate environment, by default, knocks out non-optimal outputs and qualify the output with the **-e** morpheme only. Consequently, two candidates (a) and (e) compete favourably until (e) **atʃuɵ-e** suffer fatal confrontation with the constraint, **ObsHrd$_{[\#C]}$~Wk$_{[\#C-\#]}$** which requires that root final obstruents which are phonologically strong surface as weak segments word internally but remain hard word finally. The optimal candidate (a)☞**atʃuð-e**, therefore, triumphs because of "Harmonic Ordering," a principal of OT which entails that in the desirable result, any single constraint will only be violated minimally in an optimal form. The rest of the constraints play no further decisive role in the choice of the well-formed output. Consequently, it should be notable that stops and fricatives occurring at the root final position must surface as weakened segments in the plural form as seen in (15). On the other hand, nasals, liquids and approximants occurring at the root final position must surface as hardened segments in the plural form as seen in (16) because they rank low. The constraints that come into play to yield the form in **ajaɲ→ajeɲʤ-e**, and in all sonorant final roots are elaborated by the constraint tableaux (16).

16. Input: **ajaɲ + -e** "abuse"

OUTPUT **ajaɲ-ajeɲʤ-e**	**V$_{[V\leftrightarrow VV]}$_#C$_{Root}$ [-e]**	**ObsHrd$_{[\#C]}$~ Wk$_{[\#C-\#]}$**	**SonWk$_{[\#C]}$~ Hrd$_{[\#C-\#]}$**	**Ident~ Hrd/Wk**	**ArtHam(v-v)**	**ArtHam(_v#$_{[Del]}$)**
(a)☞**ajeɲʤ-e**		*				
(b)**ajaɲ-ni**	*!		*		*!	
(c)**ajeɲʤi-ni**	*!	*				
(d)**ajeɲʤ-i***!	*!	*				
(e)**aja:ɲ-e**	*!		*		*!	

The optimal candidate, ☞**ajeɲʤ-e** is the well-formed structure. The constraints which define the environment that admit only the **[-e]** allomorphs, by default, knocks out non-optimal outputs and strictly qualify the output with the **-e** morpheme only. The optimal candidate satisfies all the constraints in the table except the second thus harmonically bounds all other possible candidates. The other candidate (e) **ajaɲ-e** which admits the **-e** morpheme competes favourably with the optimal candidate but is eventually knocked out. First, it violates the constraint **SonWk$_{[\#C]}$~Hrd$_{[\#C-\#]}$** which demands that when noun root final sound is weak, it must surface as hardened segment word internally but remains weak word finally in the output. The sound [ɲ] is therefore expected to surface as [ɲʤ] on admitting the plural morpheme. Second, it fails the constraint, **ArtHam(v-v)** which enforces articulatory harmony between the vowel(s) in the root and that in the suffix.

Candidate (b) also fails the vowel place harmony test imposed by this constraint. The last constraint, ArtHam(_v#$_{[Del]}$) which is only relevant with V-final roots plays no decisive role here.

It should notable, however, that vowel final noun roots either take the **-e** or **-ni** allomorph in forming plurals. This notwithstanding, it is important to note as well that the prosodic domain on which the hardening/weakening rules apply is within the prosodic word and not at the end of the phonological word. Therefore, the vowel is treated as invisible in suffixation. As a result, the root to which the suffix attaches is first considered consonant final before the regular process of hardening and weakening apply or before the whole process of pluralisation is initiated. Nonetheless, if the prevocalic segment in the noun roots is an obstruent, approximant, liquid or nasal it will then take **-e** allomorph in forming plurals provided that it does not satisfy all the demands defining the other allomorph **[–ni].** Consider the constraint tableaux (17) below.

17. Input: **akuru + -e** "dove"

OUTPUT **akuru-akutʃ-e**	**V$_{[V\leftrightarrow VV]}$_#C$_{Root}$[-e]**	**ObsHrd$_{[\#C]}$~ Wk$_{[\#C-\#]}$**	**SonWk$_{[\#C}$ ~Hrd$_{[\#C-\#]}$**	**Ident~ Hrd/ Wk**	**ArtHam (v-v)**	**ArtHam(_ v#$_{[Del]}$)**
(a)☞**akutʃ-e**		*				
(b) **aku:r-e**	*!		*			
(c) **akuru-ni**	*!		*			*
(d) **akutʃu-ni**	*!	*				*
(e) **akuru-i**	*!		*			*

The well-formed candidate, (a)☞akutʃ-e fails the constraint, ObsHrd$_{[\#C]}$~Wk$_{[\#C-\#]}$ but satisfies all constraints thus harmonically bounds the rest of the candidates. Candidate (b) **akur-e** satisfies the second highest ranked constraint but fatally violates the highest ranked. The rest of the candidates are knocked out because of fatal violation of the highest ranked constraint, V$_{[V\leftrightarrow VV]}$_#C$_{Root}$[-e] which strictly admits only the [-e] allomorphs. In particular, constraint SonWk[_#C]~Hrd[#C_#] knocks out candidates (b) **akur-e;** (c) **akuru-ni** and (e) **akur-i** because the noun root final liquid [r] fails to harden word internally in the output. The constraint ArtHam(v-v) eliminates (c), (d) and (e) because they surface as incongruent segments to the input. Constraint ArtHam(v-v) requires that final vowels in V-final roots are deleted before admitting the plural.

Conclusion

The current study disagrees with "feature polarity" phenomenon because it is problematic, runs into empirical problem and does not explain why certain Dholuo nominal structures exhibit similar voicing or devoicing of noun root final sounds. The study has established that alternation in the voice feature of the final phoneme of the root word occurs in pluralization, genitive forms, possessive pronouns and other inflected forms such as adjectival construction. Voice is therefore one of the many constraints defining number in Dholuo nouns. Inflection processes in Dholuo nominals, such as plural formation trigger a change in the consonant and vowel segment features of root words in certain morphophonological environments. Therefore, the plural morpheme **[-e]** is realized as any of the

three allomorphs **[–e,-i,-ni]** to satisfy a number of morphophonological demands in the whole process of pluralization of nouns. Cardinal among these morphophonological demands is the articulatory harmony which is an invaluable but not exclusive component in defining number in Dholuo nouns. Noun root final consonants surface as hardened or weakened segments in the plural form. In addition, vowel features in the output are required to be identical to, and harmonious with the vowel segment features in the input in terms of articulatory parameters defining vowel place. However, hardening or weakening of noun root final segments is a general feature of all affixation processes in Dholuo nominals and does not exclusively define plural formation. This study argues that Dholuo has a basic plural marker **-e** which has three surface realisations as [**-e], [-i],** and **[-ni]**. The three allomorphic variations are defined in certain, specific phonological and morphological environments which dictate which of the three allomorphs **[–e,-i, -ni]** is admitted. This study recommends that future studies on number in Dholuo nouns should dig deep onto the morphophonology of derived nouns in Dholuo. Alongside this, number in Dholuo loanwords remains an area worth further study. This study has also demonstrated that plural formation in Dholuo nouns is a highly productive inflectional process in Dholuo nominals. Therefore, further research effort needs to explore phonological processes in other Dholuo grammatical categories such as the verb and how number is expressed in them.

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