CONSONANT ALTERNATION IN FULA

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1. Introduction

The suffixes that are added to nouns in Fula occur in pairs. For example, the noun stem tůmmu 'calabash' takes the suffix pair (de, øe). The singular form of this noun is formed by suffixing de to the noun stem, giving tůmmude. The plural form of this noun, tůmmuøe, is formed by adding the other suffix, øe, to the noun stem. A given noun stem can only occur with a given pair of suffixes, so that tůmmu always occurs with the suffix pair (de, øe) and never with a pair such as (gol, øi). The noun stem tõdor 'belt', on the other hand, occurs with this pair; tõdorgol is the singular form, tõdorõi is the plural form. Of course, tõdor never takes any other suffix pair besides (gol, øi).

Some of the suffixes have semantic content. For example, the suffix pair (øo, øe) always occurs with nouns that refer to human beings, such as joggoøo 'servant', lómm 'king', maccu 'slave', and so on. Another suffix pair (gøl, kõn) has a diminutive sense. Thus, from the stem peõir 'head', we have peõirõgol 'a small head' and peõirõkõn 'small heads'.

With certain nouns the initial consonants of the suffixes vary. This variation is referred to as suffix alternation. Similarly, the initial consonants of stems can vary, depending on the suffix added to the stem. This type of variation is referred to as stem alternation. Traditional analyses of consonant alternation in the Fula noun system have implicitly calimed that suffix alternation is different from stem alternation. Suffix alternation appears to consist of four types or grades: a

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1I would like to thank Herb Stahlke for his helpful comments on this paper.

2The data used in this article is from Klingeneheben [1963]. His work is a description of the Adamawa dialect of Fula. Klingeneheben represents pre-nasalized consonants with the form Ç. This notation is used throughout this paper. Klingeneheben also uses J and C to represent the voiced and voiceless palatal stops in Fula.
continuant grade, a stop grade, a nasal grade, and a zero grade. The initial consonant of the suffix can appear in four different forms, depending on the stem to which the suffix is attached. In the zero grade, the initial consonant of the suffix has been deleted. In stem alternation, the zero grade does not appear; the initial consonant of the stem can take the other three grades, but the initial consonant is never missing as in suffix alternation.

In this paper I will argue that suffix alternation is indeed the same as stem alternation and that the suffixal zero grade is really a form of the continuant grade. Traditional analyses have also postulated that the continuant grade is the basic, underlying grade. I will argue, to the contrary, that the stop grade is the basic grade and that the continuant grade is derived from the stop grade. Finally, having shown that suffix and stem alternation are essentially the same, I will consider how morphemes in Fula should be specified for consonant alternation.

2. **Suffix alternation**

Depending upon the particular stem, the suffix may take a zero grade, a continuant grade, a stop grade, or a nasal grade. Consider the pair of suffixes (de, δe). These suffixes take the following forms for each of the given grades:

(1)  
<table>
<thead>
<tr>
<th>Grade</th>
<th>re</th>
<th>e</th>
<th>re</th>
<th>je</th>
<th>de</th>
<th>δe (~le)</th>
<th>ge</th>
<th>δe (~le)</th>
</tr>
</thead>
<tbody>
<tr>
<td>continuant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>stop</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>nasal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The stems new and yoy take the zero forms of de and δe:

(2a)  
<table>
<thead>
<tr>
<th>Stem</th>
<th>'palm (of the hand)'</th>
<th>newre</th>
<th>newe</th>
<th>yoyre</th>
<th>yoye</th>
</tr>
</thead>
<tbody>
<tr>
<td>new-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>yoy-</td>
<td>'craftiness'</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Examples of stems taking the continuant form of the suffixes are:

(2b)  
<table>
<thead>
<tr>
<th>Stem</th>
<th>'cliff'</th>
<th>tapāre</th>
<th>tapāje</th>
</tr>
</thead>
<tbody>
<tr>
<td>tapā-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>dūjī-</td>
<td>'owl'</td>
<td>dūjīre</td>
<td>dūjīje</td>
</tr>
<tr>
<td>jammō-</td>
<td>'surname'</td>
<td>jammōre</td>
<td>jammōje</td>
</tr>
</tbody>
</table>
With this pair of suffixes we can distinguish between those stems taking the stop form de and those taking the nasal form ɗe. First, some examples of stems taking de:

(2c) tāmmu- 'calabash' tāmmude tāmmuɗe
durdu- 'pasturage' durduɗe durduɗe
jangir- 'school' jangirɗe jangirɗe
nāngar- 'peat for religious washings' nāngarde nāngarɗe
nai- '24-hour day' naiɗe naiɗe
lōtir- 'soap' lōtirɗe lōtirɗe
birdu- 'milking pail' birduɗe birduɗe

Now some examples taking the nasalized form ɗe:

(2d) tū- 'forehead' tūɗe tūɗe
dar- 'position' darɗe darɗe
lai- 'forest' laiɗe laiɗe
ber- 'heart' berɗe berɗe
?in- 'name' ?inge ?ingeɗe

For some speakers, there is a variant ɗe of the plural suffix ɗe; for example, stems taking the nasal grade of the suffix sometimes take this variant form:

(3) nāmā- 'debt' nāmāɗe nāmāɗe
?iyē- 'rain' ?iyēɗe ?iyēɗe

There are a large number of singular suffixes which occur with the plural suffix ɗe or with the variant ɗi, which is apparently replacing the older ɗe.³ The plural suffix ɗi alternates just like ɗe:

³For example, with the singular suffix go, "... in älteren Formen nach der ɗe- und in jungeren meist nach der ɗi-Klasse" [Klingennehen 1963:73]. In words taking the singular suffix go!, the plural suffix ɗi is found in continuous speech, the archaic form ɗe in the pronunciation of the isolated word [Klingennehen 1963:88].
(4) zero \(i\)
continuant \(j\)
stop \(\delta i\) (~\(\delta\))
nasal \(\delta i\) (~\(\delta\))

The singular suffix \(\delta o\) occurs with the plural suffix \(\delta i\). We have the following examples of each of the grades:

(5a) zero \(lëb-\) 'butter' \(lëb\delta l\) \(lëb\delta i\)
continuant \(mëh-\) 'wall' \(mëh\delta l\) \(mëh\delta i\)
stop \(bëlë-\) 'large' \(bëlë\delta l\) \(bëlë\delta i\)

\(mëtalë-\) 'turban' \(mëtalë\delta l\) \(mëtalë\delta i\)
stop \(tëdor-\) 'belt' \(tëdor\delta l\) \(tëdor\delta i\)
continuant \(bëngir-\) 'pen' \(bëngir\delta l\) \(bëngir\delta i\)

nasal \(gën-\) 'tears' \(gëngol\) \(gëni\) \(^4\)

\(dën-\) 'tether for calf' \(dëngol\) \(dëni\)

From these examples, we notice that \(\delta o\) alternates as follows:

(6) zero \(\delta o\)
continuant \(\delta o\)
stop \(\delta o\)
nasal \(\delta o\)

A couple examples of where \(\delta i\) replaces \(\delta i\) are:

(7) cëm- 'snout' \(cëmgol\) \(cëmi\)
continuant jëm- 'tax' \(jëmgol\) \(jëm\delta l\)

Now consider the pair of suffixes \((\delta o, \delta e)\), which alternate as follows:

(8) zero \(\delta e\)
continuant \(j\delta \) (~\(\delta -\)wo) \(\delta e\)
stop \(\delta o\) \(\delta e\)
nasal \(\delta o\) \(\delta e\)

\(^4\)The velar nasal is assimilated to the initial implosive of the suffix.
The suffix ɓe is invariable for all of the grades. Consider the stem ɓur 'director'. This stem takes suffixes in the zero grade. Thus, the singular form is ɓurọ and the plural is ɓurɓe. Examples of stems taking the continuant grade of suffixal alternation are as follows:

(9a) ɓalajT- 'pilgrim to Mecca' ɓalajTjo ɓalajTɓe
nayọ- 'old man' nayọjo nayọɓe
sōbā- 'friend' sōbājo sōbāɓe

If a stem that takes the continuant grade of the suffix ɓo ends in ɓ, then wo is added instead of jo:

(9b) defō- 'cook' defōwo defōɓe
janginō- 'teacher' janginōwo janginōɓe
tigō- 'merchant' tigōwo tigōɓe
lōtō- 'washerwoman' lōtōwo lōtōɓe
nōtō- 'tailor' nōtōwo nōtōɓe
barō- 'murderer' barōwo barōɓe

A couple of stems ending in ɓ also take wo instead of jo:

(9c) sōbirā- 'friend' sōbirāwo sōbirāɓe
hammirā- 'older brother' hammirāwo hammirāɓe

Examples of stems taking the stop grade ɓo are as follows:

(10) jaggotō- 'servant' jaggotōɓo jaggotōɓe
lāmT- 'king' lāmTɓo lāmTɓe
maccu- 'slave' maccuɓo maccuɓe

For this particular pair of suffixes the nasalized grade is indistinguishable from the stop grade.

Without giving any more examples, consider the alternations that the other suffixes can take:

(11) zero ru e o o al i ol um ri
continuant ru ye wo ho wal hi hol jum ri
stop du ge go ko gal ki kol ɗum di
nasal ɗu ɗe ɗo ko ɗal ki kol ɗum ɗi
zero a a u a am el um al on
continuant wa wa wu ha jam yel wum hal hon
stop ga ba5 gu ka δam gel gum kal kon
nasal ɡa ɡa ɡu ka ɡam ɡel ɡum kal kon

We can summarize the alternations of the suffixes in terms of the initial consonant of the suffix:

(12) zero - r - - - b -
continuant w r w y h b j (~w)
stop b d g g k b δ (~l)
nasal ɡ b ɡ ɡ k b δ (~l)

g alternates with w if the vowel of the suffix is a back vowel; g alternates with y if the vowel of the suffix is a front vowel. Thus, the suffixes go and gel have the continuant forms ye and yel. The continuant forms of the suffixes go, gal, gol, ge, gu, and gum all begin with w. In addition, we notice that only voiced stops can be nasalized; the voiceless stop k and the implosives δ and δ cannot be nasalized.

One interesting distributional fact is that if a stem ends in a nasal that is homorganic to the initial stop of the suffix, then the suffix will end up in the nasalized grade instead of the stop grade. For example:

(13) ?en- 'breast' ?engu ?enoi
?in- 'name' ?inge ?inoe
goações 'tears' gongol gonoi
dōg- a type of load dōgal dōge
腾- 'louse' ingleton tonoi
dāng- 'tether for calf' dāngol dānoi
tōng- 'lip' tōngu tōnoi

The stem-final nasal does not necessarily assimilate to the suffix-initial stop. In such cases, the stem can take suffixes in the stop grade. For example:

5An older singular suffix ba is still found in western dialects of Fula. This form is the remnant of an older class of words [Klingenheben 1963:100].
(14) lim- 'number'  limgal  limle
    cūm- 'snout'  cūmgol  cūmli
    jaŋ- 'lesson'  jaŋde  jaŋlo

But of course stems like these can appear in the nasal grade too, just like stems ending in non-nasal segments:

(15) ɗem- 'tongue'  ɗemgal  ɗemle
    dim- a type of load  dimgal  dimle
    +T- 'forehead'  +Tge  +Tle

In other words, there are many stems that take the nasalized form of the suffix without any phonetic condition. But stems ending in a nasal homorganic to the initial consonant of the suffix may take suffixes in the nasal grade because of a phonetic rule of nasalization:

(16) \[
\begin{array}{c}
+\text{cons} \\
-\text{cont} \\
+\text{vcd} \\
\times F
\end{array}
\]  \[\rightarrow [\text{+nasal}] / [\text{+nasal}] \]  + ___

Within morphemes voiced stops following nasals must be nasalized, even if the segments are non-homorganic:

(17) jambɔ́- 'betrayer'
    jaŋjɔ́- 'teacher'
    kəŋdɔ́- 'chain'
    ɗəŋdu- 'food'
    ?inji- 'machine'

Thus the nasal assimilation is more general within morphemes:

(18) \[
\begin{array}{c}
+\text{cons} \\
-\text{cont} \\
+\text{vcd}
\end{array}
\]  \[\rightarrow [\text{+nasal}] / [\text{+nasal}] ___

Finally, let us consider the zero grade. Nearly all those that have investigated Fula have claimed that the zero grade is an independent grade. But if we consider what kinds of stems take the zero grade of the suffix, we note that they all end in a consonant:
Nearly all the stems taking the continuant grade of the suffix end in a vowel:

Except for the alternation of the implosive $\delta$, the only difference between the zero grade and the continuant grade is that a glide ($w$, $y$, or $h$) has been deleted in the zero grade. The sonorant $r$ occurs in both grades. Let us postulate a rule that will delete glides when preceded by a stem-final consonant:

Now we can claim that there are actually only three grades in suffix alternation and that the zero grade arises because of a rule deleting a glide preceded by a stem-final consonant.
There are some exceptions to this generalization. Consider a stem like yakatabo, a type of shoe, which takes the continuant form of the suffix pair (go, doe), or a stem like pampam 'empty peanut shell', which takes the continuant form of the suffix pair (gu, si):

(22) yakatabwo  yakaṭabje
     pampamwu     pampamji

We do not get the expected forms *yakatabo and *yakatabe, or *pampam and *pampami. Perhaps the w fails to delete in this environment because the preceding consonant (b or m) is labial. There are a few examples where j has failed to delete before a consonant, as in:

(23) merlem- a type of frog         merlemru     merlemji

rather than *merlemi. Nonetheless, it is a fact that every stem that does take the zero grade ends in a consonant, while the great majority of stems taking the continuant grade end in a vowel.

The alternation of the implosive δ is highly irregular. Although the other implosive, ɓ, never alternates, δ does. In addition, δ alternates in the continuant grade with a palatal stop, j, rather than with a continuant. We did notice, however, that with stems taking the singular suffix δo and ending in a back vowel (ɔ and sometimes ɔ), the back glide w showed up instead of j. This peculiar behavior of δ suggests that the dental implosive actually alternates with a front glide, and that this front glide can be changed to the back glide w in the environment of two back vowels, as in the examples:

(24) defɔ + δo  ==>  defɔwo
     sɔbirɔ + δo  ==>  sɔbirɔwo

If the continuant form of δ actually is a glide, we can also explain why the zero grade of δ is null. According to our rule of glide deletion, a glide produced from δ could be deleted before a stem-final consonant. The glide would remain if the stem taking the continuant form of δ ended in a vowel. In this case, the glide would be realized as the palatal stop j unless it occurred between two back vowels. Note that
this glide would be voiced and palatal. The crucial change then would be to simply make a stop out of the glide y.

In summary, every stem takes a certain pair of suffixes. A stem will be marked for taking the continuant, the stop, or the nasal form of the suffix. If a stem ends in a consonant and takes the continuant form of the suffix, the initial continuant of the suffix will be deleted if it is a glide. There are only three grades of suffix alternation, not four.

3. **Stem alternation**

Not only does the initial consonant of the suffix alternate, but in a similar way, the initial consonant of the stem itself can alternate, depending on the suffix that is added to the stem. Just as there are stems that always take the continuant (or zero) grade of the suffix, there are suffixes that take stems beginning with a continuant. Similarly, there are suffixes that occur with stems having stops in initial position. For example, consider the pair of suffixes (de, ðe). The singular suffix de takes stems in the continuant grade. The other suffix, ðe, takes stems in the stop form. Consider the following alternations of stems that take this pair of suffixes:

<table>
<thead>
<tr>
<th>Stem</th>
<th>Continuant</th>
<th>Stop</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>f ~ p</td>
<td>fijirde</td>
<td>pirjirðe</td>
<td>'playground; game'</td>
</tr>
<tr>
<td>w ~ b</td>
<td>wawai de</td>
<td>bawaiðe</td>
<td>'shield'</td>
</tr>
<tr>
<td>r ~ d</td>
<td>rami de</td>
<td>damìðe</td>
<td>'billy goat'</td>
</tr>
<tr>
<td>s ~ c</td>
<td>sāgorde</td>
<td>cāgorðe</td>
<td>'forearm'</td>
</tr>
<tr>
<td>y ~ j</td>
<td>yardude</td>
<td>jarduðe</td>
<td>'drinking place'</td>
</tr>
<tr>
<td>h ~ k</td>
<td>harbāde</td>
<td>karbāðe</td>
<td>'hip joint'</td>
</tr>
<tr>
<td>y ~ g</td>
<td>yettōre</td>
<td>gettōjāe</td>
<td>'gratitude'</td>
</tr>
<tr>
<td></td>
<td>yimre</td>
<td>gime</td>
<td>'song'</td>
</tr>
<tr>
<td></td>
<td>yelemre</td>
<td>geleme</td>
<td>'calf (of the leg)'</td>
</tr>
<tr>
<td>w ~ g</td>
<td>wāyre</td>
<td>gāye</td>
<td>'itch'</td>
</tr>
<tr>
<td></td>
<td>wonorade</td>
<td>gonorðe</td>
<td>'home'</td>
</tr>
<tr>
<td></td>
<td>wamru de</td>
<td>gamruðe</td>
<td>'dancing place'</td>
</tr>
<tr>
<td></td>
<td>wasar de</td>
<td>gasarðe</td>
<td>'mine'</td>
</tr>
</tbody>
</table>
Like the suffix alternation of $g$, the stem-initial $g$ alternates with the front glide $y$ if the following vowel is a front vowel; $g$ alternates with the back glide $w$ if the following vowel is a back vowel.

Similarly, there are suffixes that take stems with nasalized initial consonants. For example, consider some stems that occur with the pair of suffixes ($gu, ꞌi$); the singular suffix $gu$ takes stems in the nasalized grade and ꞌi takes stems in the stop grade:

\[(26) \ b \sim b \quad bəɾtu \quad bəɾtjə \quad \text{'peanut'}
\]
\[(27) \ d \sim d \quad dʒu \quad dʒu \quad \text{'year'}
\]
\[(28) \ j \sim j \quad jəɾtu \quad jəɾtjə \quad \text{'lion'}
\]
\[(29) \ g \sim g \quad ḡilgu \quad ḡil̃i \quad \text{'worm'}
\]

Voiceless stops, on the other hand, cannot be nasalized:

\[(27) \ p \sim p \quad puccu \quad pucci \quad \text{'horse'}
\]
\[(28) \ t \sim t \quad təɾgu \quad təɾ̃i \quad \text{'louse'}
\]
\[(29) \ c \sim c \quad cəɾgu \quad cəɾ̃i \quad \text{'leopard'}
\]
\[(30) \ k \sim k \quad kəɾwawu \quad kəɾwaw̃ji \quad \text{'leather sack'}
\]

We also noticed that the suffixes beginning with a voiceless stop were never nasalized by suffix alternation.

Suffix alternation never applied to the implosive consonant in the suffix $ɓə$. Likewise, stem alternation never affects words beginning with $ɓ$. The continuant form of $ɓ$ is also $ɓ$:

\[(28) \ bəɾdu- \quad \text{'milking pail'} \quad bəɾduđe \quad bəɾdûe
\]
\[(29) \ bəɾ- \quad \text{'heart'} \quad bəɾə̂ge \quad bəɾêe
\]

Likewise, the nasalized grade of $ɓ$ remains unchanged:

\[(30) \ bəɾ̃- \quad \text{'mosquito'} \quad bəɾ̃u \quad bəɾ̃i
\]

There are, in fact, other consonants that do not alternate. For example, the voiceless dental stop, $t$, does not alternate with a continuant form:

\[(30) \ t \sim t \quad tıng̃- \quad \text{'onion'} \quad tıng̃êre \quad tıng̃êje
\]
\[(30) \ tμμu- \quad \text{'calabash'} \quad tμμuđe \quad tμμuđêe
\]
\[(30) \ t̄τ- \quad \text{'forehead'} \quad t̄τ̂e \quad t̄τêe
\]
Glottal stops, nasals, liquids, nasalized stops, and implosives are also not affected by stem alternation:

<table>
<thead>
<tr>
<th>(31) continuant</th>
<th>stop</th>
</tr>
</thead>
<tbody>
<tr>
<td>?</td>
<td>?</td>
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<td>?</td>
<td>?</td>
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<tr>
<td>p</td>
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<td>l</td>
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<tr>
<td>b</td>
<td>b</td>
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<tr>
<td>d</td>
<td>d</td>
</tr>
<tr>
<td>v</td>
<td>v</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(32) nasal</th>
<th>stop</th>
</tr>
</thead>
<tbody>
<tr>
<td>?</td>
<td>?</td>
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<tr>
<td>?</td>
<td>?</td>
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<tr>
<td>m</td>
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<td>n</td>
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<tr>
<td>p</td>
<td>p</td>
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<tr>
<td>l</td>
<td>l</td>
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</tbody>
</table>

Thus the only segments that alternate are the simple stops p, b, d, k, and g. All of the simple stops except + may alternate with a corresponding continuant, and only voiced simple stops may alternate with a nasalized stop.

In those stems in which stem alternation takes place, what is the underlying initial consonant? Klingeneben [1963:12,25], Arnott [1970:48], and Sapir [1970:69] have noted that the alternation can in general be accounted for if underlying continuants rather than underlying stops are postulated for those stems that alternate. The basis for this claim is that Fula contains a large number of stems whose initial stops, like +, do not alternate. For example:

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6The singular suffixes di and ga take stems in the nasalized grade.
(33) bathā- 'leather box' bathāru bathāji
defō- 'cook' defōwo defōbe
dūjī- 'owl' dūjīre dūjīje
jammō- 'surname' jammōre jammōje
jūlīr- 'mosque' jūlīrde jūlīrōe
kurfu- 'boot' kurfuwo kurfuji

Suppose that the continuants are underlying in stems that are affected by stem alternation, and that we postulate a rule that will change continuants to stops depending on the type of suffix added to the stem. Then we could claim that in such words as tinje, bathā, defō, jammō, and kurfu the stops were all underlyingly present. In this case, the rule of stem alternation would not affect underlying stops, only underlying continuants; and thus stems with underlying stops would never alternate.

However, there are also a number of exceptions with continuants as well. Non-alternating continuants do show up where stops should occur; for example:

(34) sóbā- 'friend' sóbājo sóbābe
sōbirā- 'friend' sóbirāwo sóbirābe
hammirā- 'older brother' hammerāwo hammerābe
hamilā- 'sword belt' hammerāol hammerāji
yakatāb- a type of shoe yakatābwo yakatābje
sōro- a type of house sōrowol sōróji
suka 'small young man' sukayel sukahon

In addition, there are loan words that have initial continuants that do not alternate:

(35) suley- 'shilling' suleyre suleyje
sōje- 'soldier' sōjījo sōjīje
hayru- 'luck' hayru hayrūji
hakīka- 'truth' hakīka hakīkāji
fōto- 'photograph' fōto fōtōji

\[7 \overline{v} \rightarrow \overline{v} / \_j\]
Such words generally do not add any singular suffix, but do have the
continuant form occurring with the plural suffix  ꠯i, which is supposed
to occur with stems in the stop grade. There are a large number of
re-analyzed nouns in the language which fit into this pattern. For
example, consider the noun sabbix 'nest' which originally had the plural
form  ꠭æbe. Re-analysis has taken place, and a new plural sabbixji has
replaced the older form  ꠭æbe. Other examples show that such nouns can
begin with continuants as well as stops:

(36) 'palace'  ꠭da    ꠭da ꠯i
'game'    waŋno    waŋno ꠯i
'end'  ragare    ragarë i
'hour'  sãʔa    sãʔi
'hope'  yela    yelă i
'wonder'  hayőgām    hayőgāmji
'word'  kalma    kalma ꠯i
'farm in suburbs'  ciraka    ciraka ꠯i
'luck'  barka    barka ꠯i
'trick'  dabare    dabare ꠯i
'ability'  gikku    gikku ꠯i
'wrong'  jamba    jamba ꠯i
'pencil'  pensur    pensur ꠯i
'plague'  torra    torra ꠯i

There is another pattern of suffixes that admits underlying continuants
as well as stops. This is exemplified by sōje 'soldier', a loan word
from English. The singular form is sōjëjo, the plural is sōje?en.
Again, both unalternating continuants and stops can fit into this pattern:

(37) ꠭dawa- 'courtier'  ꠭dawājo    ꠭dawa?en
wajTri- 'minister'  wajTri ꠯ i ꠭dawa?en
sarāki- 'official'  sarākëjo    sarāki?en
yatMē- 'orphan'  yatMējo    yatMë?en
hawsa- 'Hausa'  hawsājo    hawsa?en

\(^8\)Sometimes the ꠯o suffix is deleted.
All of these examples indicate that the tendency in Fula is to eliminate stem alternations. There are a large number of stems beginning with both stops and continuants that do not alternate. Recent loan words do not alternate. The rule that is responsible for stem alternation must be an exceptional rule in the sense that a stem must be marked as [+ STEM ALTERNATION] in order for alternation to occur, and that the unmarked or expected case in Fula is that stems are [- STEM ALTERNATION]. In any event, we cannot use the lack of consonant alternation in certain words to account for the type of underlying consonants in words that do show alternation.

One especially striking fact is that if a stem does alternate for a given pair of suffixes, then one of the forms must be in the stop grade. Thus, we can find the following types of alternation:

(38) **singular** | **plural** | **example pair of suffixes**
---|---|---
stop | continuant | (šo,še)
continuant | stop | (de,še)
nasal | stop | (gu,ši)
stop | nasal | (gel,kon)

But we never find in noun stems an alternation between the continuant and the nasal form. In other words, if a stem alternates, the stop form always shows up. With some suffix pairs, the other form of the stem will be in the continuant grade. With other suffixes, it will be a nasalized stem. But the stop form will always manifest itself in a surface form.

Let us postulate then two simple rules, one to change stem-initial stops to continuants when they occur with certain suffixes (continuant-producing suffixes), and the other to nasalize voiced stops when they
occur with certain other suffixes (nasal-producing suffixes):

\[ (+\text{cons}) -\text{cont} \] --> [+nasal] / \( \_X \) stem + N-suffix

\[ (+\text{cons}) -\text{cont} \] --> [+cont] / \( \_X \) stem + C-suffix

The rule of stem alternation that produces continuants can explain the alternation of /g/. As we have seen, /g --> w/ occurs before back vowels and /g --> y/ before front vowels. We also have the unconditioned alternations /b --> w/ and /j --> y/ irrespective of the following vowel. If the stops /b/, /g/, and /j/ are postulated as the underlying segments, we can easily predict which glide will alternate with which stop. But if the glides are the underlying segments, one cannot wholly predict which stops alternate with a given glide. For example, /w/ can alternate with /g or b/ if /w/ is followed by a back vowel:

\[ '\text{shield}' \quad \text{wawarde} \quad \text{bawar\-\oe} \]
\[ '\text{mine}' \quad \text{wasarde} \quad \text{gasar\-\oe} \]

The verb is also affected by stem alternation. For example, after the first person plural pronoun /m\text{\textsc{n}}/ 'we', a verb in the past tense will begin with a nasalized stop, but after the first person singular pronoun /m\text{\textsc{i}}/ 'I', the verb will be in the continuant grade:

\[ \text{b\text{\textsc{d}}\-} \quad '\text{to be pretty}' \quad \text{mi w\text{\textsc{d}}\-i} \quad \text{m\text{\textsc{m}} b\text{\textsc{d}}\-i} \]
\[ \text{gar\-} \quad '\text{to come}' \quad \text{mi war\-i} \quad \text{m\text{\textsc{n}} g\text{\textsc{a}}\-i} \]
\[ \text{jeh\-} \quad '\text{to go}' \quad \text{mi y\text{\textsc{h}}\-i} \quad \text{m\text{\textsc{n}} j\text{\textsc{e}}\-i} \]
\[ \text{gett\-} \quad '\text{to thank}' \quad \text{mi yetti} \quad \text{m\text{\textsc{n}} gett\-i} \]
\[ \text{dem\-} \quad '\text{to plough}' \quad \text{mi remi} \quad \text{m\text{\textsc{n}} dem\-i} \]
\[ \text{pi\text{\textsc{d}}\-} \quad '\text{to shoot}' \quad \text{mi f\text{\textsc{i}}\-i} \quad \text{m\text{\textsc{m}} pi\text{\textsc{d}}\-i} \]
\[ \text{com\-} \quad '\text{to be tired}' \quad \text{mi somi} \quad \text{m\text{\textsc{n}} com\-i} \]
\[ \text{ke\text{\textsc{b}}\-} \quad '\text{to receive}' \quad \text{mi he\text{\textsc{b}}\-i} \quad \text{m\text{\textsc{n}} ke\text{\textsc{b}}\-i} \]

According to Klingeneheben [1963:12], there is a nasal assimilation rule in Fula that will change a continuant to either a voiced nasal stop or a voiceless non-nasal stop. Klingeneheben postulates that the continuous
segments are underlying and that his nasal assimilation rule will convert, for example, \( y \rightarrow j \) in the stem \( yeh 'to go' \), but with the stem \( ye'\text{ü} 'to thank' \), \( y \rightarrow g \). Since in both stems the vowel following the front glide is a front vowel, there is no way to predict which rule, \( y \rightarrow j \) or \( y \rightarrow g \), should apply to these given stems. Thus Klingeneheben is forced to indicate which stop alternates with the glide for some stems with an initial glide.\(^9\) But if we postulate underlying stops, the glides are completely determined by our rule of stem alternation. We simply say that the rule of stem alternation that produces continuants applies to the verb stem in the first person singular past tense. The fact that in the first person plural the verb stem takes initial stops in the nasalized grade can be explained by our more general nasalization rule. The final nasal in \( miN 'we' \) is first made homorganic to the initial consonant of the verb stem:

\[
(43) \quad [+\text{nasal}] \rightarrow [\alpha F] / \quad + \quad \left[ \begin{array}{c}
+\text{cons} \\
\alpha F 
\end{array} \right]
\]

and then voiced stops are nasalized across the morpheme boundary:

\[
(44) \quad \left[ \begin{array}{c}
+\text{cons} \\
-\text{cont} \\
+\text{vcd} \\
\alpha F 
\end{array} \right] \rightarrow [+\text{nasal}] / \quad \left[ \begin{array}{c}
+\text{nasal} \\
\alpha F 
\end{array} \right] \quad + \quad ___
\]

This rule is the same rule that accounts for the suffix alternation of stems ending in a nasal homorganic to the suffix-initial consonant (cf. rule (16)). The fact that the stem-initial stop of the verb stem in \( m\text{i}m \text{ bo}\text{ð}i \) is nasalized can be accounted for by a very general nasalization rule.

Our rules of stem alternation are, in fact, the same rules that we need to account for suffix alternation. We have seen that suffix alternation consists of three basic grades instead of four, that the zero grade is really derived from the continuant grade by a glide-deletion

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\(^9\)"Angesichts dieser Verschiedenheiten empfiehlt es sich, bei der Anführung von mit \( w \) und \( y \) anlautenden Wurzeln durch hinzugesetztes \( b, g \), oder \( j \) anzudeuten, zu welcher Permutationsreihe sie gehören...." [Klingeneheben 1963:25]. For a similar solution, cf. Arnott [1970:48].
rule (rule (21)). In fact, the same three grades are found in stem alteration. Except for the dental implosive, ꞏ, all the suffix alter-
nations are exactly the same as the corresponding stem alternations:

\[(45) \quad \text{continuant} \quad w \ r \ w \ y \ h \ \tilde{\delta} \\
\text{stop} \quad b \ d \ g \ g \ k \ \tilde{\delta} \\
\text{nasal} \quad b \ d \ g \ g \ k \ \tilde{\delta}\]

But ꞏ is invariable in stem alteration, but not in suffix alteration:

\[(46) \quad \text{continuant} \quad \tilde{\delta} \quad j \\
\text{stop} \quad \tilde{\delta} \quad \tilde{\delta} \\
\text{nasal} \quad \tilde{\delta} \quad \tilde{\delta}\]

Except for this anomaly, we can postulate a single set of alternation rules that will account for the consonant alternation of both suffixes and stems.

4. Lexical specification in Fula

We have noticed that each given suffix always occurs with stems in a certain grade. For example, the suffixes ꞏe and ꞏe always take stems in the continuant grade. The suffixes ꞏi and kon take stems in the nasalized grade. On the other hand, the suffixes ꞏo, ꞏe, ꞏi, and gel always take stems in the stop grade. Let us say that suffixes such as ꞏo, ꞏe, ꞏi, and gel are unmarked for an alternation rule; that is, they do not cause alternation in the stem. Suffixes like ꞏe and ꞏe will be marked as [+AC] since only stems in the continuant grade can occur with these suffixes. This means that the alternation rule that changes stops to continuants will apply to a stem attached to such a suffix. Suffixes like ꞏi and kon will be marked as [+AN] since only stems in the nasalized grade can occur with these suffixes.

In addition, each given stem always occurs with suffixes in a certain grade. For example, stems like new 'palm (of the hand)' and ꞏapē 'cliff' always take suffixes in the continuant grade. So these stems will be marked as [+AC]. Stems like ꞏē 'forehead' and dar 'position' always take nasalized suffixes. Hence, these stems will be marked as [+AN]. Stems that take suffixes in the stop grade will be left unmarked.
for an alteration rule. Thus we note that every morpheme, whether a suffix or a stem, may be marked as either [+AC] or [+AN]. It's also possible that a morpheme can be left unmarked. But more importantly, the rule marking does not mean that the rule will apply to the morpheme itself, but rather to the other morpheme that co-occurs with that morpheme. As an example, consider the morpheme birT 'peanut' which occurs with the suffix pair (gu, δi). Now birT is marked [+AC] and gu is marked [+AN], but δi is unmarked. Thus, we have the following derivations:

\[(47) \quad \text{birT} + \text{gu} \quad \text{birT} + \delta i\]
\[\quad [+AC] \quad [+AN] \quad [+AC]\]
\[\text{birTwu} \quad \text{birTji}\]

The order of rule application is not important. birT can only co-occur with suffixes in the continuant grade and so gu is converted to wu and δi is converted to ji. And gu itself can only occur with stems in the nasalized grade and so birT is changed to birT. But δi does not affect the underlying initial stop in the stem and so the underlying stem birT remains in the plural.

Of course, there are numerous stems with underlying stops that will not alternate even though they may occur with a suffix that is marked as occurring with an alternating stem. For example:

\[(48) \quad \text{ba††a} + \text{du} \quad \text{ba††a} + \delta i\]
\[\quad [+AC] \quad [+AC] \quad [+AC]\]
\[\text{ba††awu} \quad \text{ba††aji}\]

Although the suffixes are altered, the stem is not, even though the suffix du requires a stem to be in the continuant grade. We do not get *wa††awu. We noticed that there are a large number of stems, especially borrowed and re-analyzed words that the alternation rules never apply to. Stem alternation will therefore be considered exceptional and the natural case is for stems to be minus alternation (or [-A]). If a stem does alternate, then it must be marked so. Hence, ba††a is not only [+AC] (that is, it occurs only with suffixes in the continuant grade), but it is [-A]. Even though the suffix du is marked as [+AC], the fact that ba††a is [-A] means that consonant alternation will be blocked from
applying to baṭṭā. The stem birṭ will be marked as [+A]. In other words, the speaker must memorize that birṭ alternates. Hence, an alternation rule can apply to a stem only if the stem is marked as [+A]. If it is not, then the stem is never affected by alternation.

REFERENCES


