CONSONANT ALTERNATION IN FULA$^1$

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1. Introduction

The suffixes that are added to nouns in Fula occur in pairs. For example, the noun stem tummu 'calabash' takes the suffix pair (de,δe).\(^2\)

The singular form of this noun is formed by suffixing de to the noun stem, giving tummude. The plural form of this noun, tummuδe, is formed by adding the other suffix, δe, to the noun stem. A given noun stem can only occur with a given pair of suffixes, so that tummu always occurs with the suffix pair (de,δe) and never with a pair such as (go!,δi). The noun stem tādor 'belt', on the other hand, occurs with this pair; tādorgo! is the singular form, tādorδi is the plural form. Of course, tādor never takes any other suffix pair besides (go!,δi).

Some of the suffixes have semantic content. For example, the suffix pair (δo,δe) always occurs with nouns that refer to human beings, such as jaggoťō 'servant', lāmt 'king', maccu 'slave', and so on. Another suffix pair (gel,kon) has a diminuative sense. Thus, from the stem peoir 'head', we have peoirgel 'a small head' and peoirkon '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 claimed that suffix alternation is different from stem alternation. Suffix alternation appears to consist of four types or grades: a

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

\(^2\)The data used in this article is from Klingemenheben [1963]. His work is a description of the Adamawa dialect of Fula. Klingemenheben represents pre-nasalized consonants with the form ŋ. This notation is used throughout this paper. Klingemenheben 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, ðe). These suffixes take the following forms for each of the given grades:

(1) | zero | continuant | stop | nasal |
    | re   | je      | de   | ðe |
    | e    | ðe (~le) | ðe (~le) | ðe |

The stems new and ÿoy take the zero forms of de and ðe:

(2a) new- 'palm (of the hand)' newre newe
     ÿoy- 'craftiness' ÿoyre ÿoye

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

(2b) ṭapā- 'cliff' ṭapāre ṭapāje
dūjī- 'owl' dūjīre dūjīje
jammō- 'surname' jammōre jammōje
With this pair of suffixes we can distinguish between those stems taking the stop form de and those taking the nasal form ge. First, some examples of stems taking de:

(2c) tummu- 'calabash' tummude tummuöe
dardu- 'pasturage' darduđe darduöe
jangir- 'school' jangirđe jangiröe
nangar- 'peat for religious washings' nangarde nangaröe
nal- '24-hour day' nalđe nalöe
lōtir- 'soap' lōtirđe lōtiröe
birdu-'milking pail' birdude birduöe

Now some examples taking the nasalized form ge:

(2d) tīT- 'forehead' tīTGöe tīTöe
dar- 'position' darđe daröe
lay- 'forest' layđe layöe
ber- 'heart' berđe beröe
?in- 'name' ?inge ?inöe

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

(3) namā- 'debt' namāđe namāöe
?iyē- 'rain' ?iyēđe ?iyēöe

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

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3For example, with the singular suffix go, "... in älteren Formen nach der öe- und in jüngeren meist nach der öi-Klasse" [Klingenheben 1963:73]. In words taking the singular suffix go, the plural suffix öi is found in continuous speech, the archaic form öe in the pronunciation of the isolated word [Klingenheben 1963:88].
The singular suffix \( \delta \text{ol} \) occurs with the plural suffix \( \delta \text{i} \). We have the following examples of each of the grades:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Singular</th>
<th>Plural</th>
<th>Continuant</th>
<th>Stop</th>
<th>Nasal</th>
</tr>
</thead>
<tbody>
<tr>
<td>(5a)</td>
<td>(4) zero</td>
<td>le6-</td>
<td>le6ol</td>
<td>le6i</td>
<td></td>
</tr>
<tr>
<td></td>
<td>mah-</td>
<td>'wall'</td>
<td>mahol</td>
<td>mahi</td>
<td></td>
</tr>
<tr>
<td></td>
<td>continuant</td>
<td>bilè-</td>
<td>bilèwol</td>
<td>bilèji</td>
<td></td>
</tr>
<tr>
<td></td>
<td>mētalè-</td>
<td>'turban'</td>
<td>mētalèwol</td>
<td>mētalèji</td>
<td></td>
</tr>
<tr>
<td></td>
<td>stop</td>
<td>tādor-</td>
<td>tādorgol</td>
<td>tādorol</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>bindir-</td>
<td>bindirgol</td>
<td>bindiról</td>
<td></td>
</tr>
<tr>
<td></td>
<td>nasal</td>
<td>goŋ-</td>
<td>gongol</td>
<td>goní4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>dāŋ-</td>
<td>dāngol</td>
<td>dānóí</td>
<td></td>
</tr>
</tbody>
</table>

From these examples, we notice that \( \delta \text{ol} \) alternates as follows:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Singular</th>
<th>Continuant</th>
<th>Stop</th>
<th>Nasal</th>
</tr>
</thead>
<tbody>
<tr>
<td>(6)</td>
<td>(4) zero</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td></td>
<td>continuant</td>
<td>wøl</td>
<td>wøl</td>
<td>wøl</td>
</tr>
<tr>
<td></td>
<td>stop</td>
<td>goø</td>
<td>goø</td>
<td>goø</td>
</tr>
<tr>
<td></td>
<td>nasal</td>
<td>goø</td>
<td>goø</td>
<td>goø</td>
</tr>
</tbody>
</table>

A couple examples of where \( \delta \text{i} \) replaces \( \delta \text{ol} \) are:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Singular</th>
<th>Plural</th>
<th>Continuant</th>
<th>Stop</th>
<th>Nasal</th>
</tr>
</thead>
<tbody>
<tr>
<td>(7)</td>
<td>cūm-</td>
<td>'snout'</td>
<td>cūmgol</td>
<td>cūmli</td>
<td></td>
</tr>
<tr>
<td></td>
<td>jomor-</td>
<td>'tax'</td>
<td>jomorgol</td>
<td>gomorli</td>
<td></td>
</tr>
</tbody>
</table>

Now consider the pair of suffixes \((\delta \text{ø}, \delta \text{e})\), which alternate as follows:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Singular</th>
<th>Continuant</th>
<th>Stop</th>
<th>Nasal</th>
</tr>
</thead>
<tbody>
<tr>
<td>(8)</td>
<td>(4) zero</td>
<td>o</td>
<td>( \delta \text{ø} )</td>
<td>( \delta \text{ø} )</td>
</tr>
<tr>
<td></td>
<td>continuant</td>
<td>jo ( \sim \text{wo} )</td>
<td>( \delta \text{ø} )</td>
<td>( \delta \text{ø} )</td>
</tr>
<tr>
<td></td>
<td>stop</td>
<td>( \delta \text{ø} )</td>
<td>( \delta \text{ø} )</td>
<td>( \delta \text{ø} )</td>
</tr>
<tr>
<td></td>
<td>nasal</td>
<td>( \delta \text{ø} )</td>
<td>( \delta \text{ø} )</td>
<td>( \delta \text{ø} )</td>
</tr>
</tbody>
</table>

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4The 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 ɓuro and the plural is ɓurɓe. Examples of stems taking the continuant grade of suffixal alternation are as follows:

(9a) ?alajT- 'pilgrim to Mecca' ?alajTjo ?alajTɓe
    nayè- 'old man' nayèjo nayèɓe
    sobà- 'friend' sobàjo sobàɓe

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

(9b) defò- 'cook' defòwo defòɓe
    janginò- 'teacher' janginòwo janginòɓe
    tigò- 'merchant' tigòwo tigòɓe
    lòtò- 'washervwoman' lòtòwo lòtòɓe
    nòtò- 'tailor' nòtòwo nòtòɓe
    barò- 'murderer' baròwo baròɓe

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

(9c) sobirà- 'friend' sobiràwo sobiràɓe
    hammirà- 'older brother' hammiràwo hammiràɓe

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

(10) jaggotò- 'servant' jaggotòɗo jaggotòɓe
    lamT- 'king' lamTɗo lamTɓe
    maccu- 'slave' maccuɗo 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 a l i o l um ri
    continuant ru ye wo ho wa l hi ho l jum ri
    stop du ge go ko gal ki ko l ɗum di
    nasal ɗu ge go ko gal ki ko l ɗum di
zero  a  a  u  a  am  el  um  al  on
continuant  wa  wa  wu  ha  jam  yel  wum  hal  hon
stop  ga  ba 5  gu  ka  ðam  gel  gum  kal  kon
nasal  ga  ba  gu  ka  ðam  gel  gum  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  ð  (-l)
nasal  b  d  g  g  k  b  ð  (-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 ge and gel have the continuant forms ye and yel. The continuant forms of the suffixes go, gal, gol, ga, 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 b and ð 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) ñen-  'breast'  ñengu  ñenõi
in-  'name'  ñinde  ñinõe
goñ-  'tears'  goñol  goñõi
dõñ-  a type of load  dõñol  dõñle
tññ-  'louse'  tñgu  tñõi
daññ-  'tether for calf'  daññol  dañõi
tonñ-  'lip'  tongu  tonõi

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:

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5An older singular suffix ba is still found in western dialects of Fula. This form is the remnant of an older class of words [Klingenhebben 1963:100].
But of course stems like these can appear in the nasal grade too, just like stems ending in non-nasal segments:

(14) lim- 'number' limgal limle
cūm- 'snout' cūmgol cūmli
jaŋ- 'lesson' jaŋde jaŋle

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) \[
\begin{array}{c}
{[+\text{cons}]} \\
{-\text{cont}} \\
{[+\text{vcd}]} \\
\{\text{vcd}\}_F
\end{array} \rightarrow \left[ [+\text{nasal}] / \left[ [+\text{nasal}] \right] \right] + \_ \]

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

(17) jambō- 'betrayer'
jaŋginō- 'teacher'
kangōng- 'chain'
pāmdu- 'food'
ʔinjine- 'machine'

Thus the nasal assimilation is more general within morphemes:

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

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:

(20)  `alajT-  'pilgrim to Mecca'
    nayē-  'old man'
    sōbā-  'friend'
    defō-  'cook'
    jangīnō-  'teacher'
    tiγō-  'merchant'
    lōtō-  'washerwoman'
    noŋō-  'tailor'
    barō-  'murderer'
    sōbirā-  'friend'
    hammirā-  'older brother'
    tapā-  'cliff'
    dūjT-  'owl'
    jammō-  'surname'
    bilē-  'large feather'
    mētalē-  ' turban'

Except for the alternation of the implosive ś, 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:

(21) \[ [-\text{cons}] \quad \rightarrow \quad \emptyset / [-\text{syl}] + \quad \] 

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 yakatab, a type of shoe, which takes the continuant form of the suffix pair (go, øe), or a stem like pampam 'empty peanut shell', which takes the continuant form of the suffix pair (gu, øi):

(22) yakatabwo
    yakaṭabje
pampamwu
    pampamji

We do not get the expected forms *yakatabo and *yakatabe, or *pampamu 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 ø is highly irregular. Although the other implosive, ê, never alternates, ø does. In addition, ø 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 øo and ending in a back vowel (ø and sometimes æ), the back glide w showed up instead of j. This peculiar behavior of ø 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) defō + øo ==> defōwo
    sōbirā + øo ==> sōbirāwo

If the continuant form of ø actually is a glide, we can also explain why the zero grade of ø is null. According to our rule of glide deletion, a glide produced from ø could be deleted before a stem-final consonant. The glide would remain if the stem taking the continuant form of ø 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:

(25) f ~ p fijirde pirjirőe 'playground; game'
w ~ b wawarde bawarőe 'shield'
r ~ d ramde damőe 'billy goat'
s ~ c sāgorde cāgorőe 'forearm'
y ~ j yardude jarduőe 'drinking place'
h ~ k harbāde karbāőe 'hip joint'
y ~ g yețtőre gettője 'gratitude'
yimre gime 'song'
yelemre gleme 'calf (of the leg)'
w ~ g wāyre gāye 'itch'
wonorde gonorőe 'home'
wamruđe gamruőe 'dancing place'
wasarude gasarőe 'mine'
Like the suffix alternation of ɡ, the stem-initial ɡ alternates with the front glide ɣ if the following vowel is a front vowel; ɡ 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,ð̃i); the singular suffix gu takes stems in the nasalized grade and ð̃i takes stems in the stop grade:

(26) b ~ b  birtwu  birti  'peanut'
d ~ d  dũbu  dũbi  'year'
j ~ j  jagawu  jagaji  'lion'
g ~ g  gilgu  gilõi  'worm'

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

(27) p ~ p  puuccu  pucci  'horse'
t ~ t  tengu  tenõi  'louse'
c ~ c  cirgu  cirõi  'leopard'
k ~ k  kaywawu  kaywæji  '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 ð̃e. Likewise, stem alternation never affects words beginning with ð̃. The continuant form of ð̃ is also ð̃:

(28) birdu-  'milking pail'  birkude  birdude
ber-  'heart'  bẽrẽ  bẽrõe

Likewise, the nasalized grade of ð̃ remains unchanged:

(29) bog-  'mosquito'  bogu  bogī

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 ~ t  tingõ-  'onion'  tingõre  tingõje
tummu-  'calabash'  tummuõe  tummuõe
tẽ-  'forehead'  tẽõe  tẽõe
Glottal stops, nasals, liquids, nasalized stops, and implosives are also not affected by stem alternation:

(31) continuant stop

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>continuant</th>
<th>stop</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>m</td>
<td>m</td>
<td>maccu-</td>
<td>'slave'</td>
<td>maccuço</td>
</tr>
<tr>
<td>n</td>
<td>n</td>
<td>nangar-</td>
<td>'peat for religious washings'</td>
<td>nangarde nangarée</td>
</tr>
<tr>
<td>n</td>
<td>n</td>
<td>naal-</td>
<td>'24-hour day'</td>
<td>naalde naalée</td>
</tr>
<tr>
<td>l</td>
<td>l</td>
<td>lōtir-</td>
<td>'soap'</td>
<td>lōtirde lōtirée</td>
</tr>
<tr>
<td>b</td>
<td>b</td>
<td>bărō-</td>
<td>'murderer'</td>
<td>bărōwo bărōné</td>
</tr>
<tr>
<td>ḍ</td>
<td>̱</td>
<td>ḍowtār-</td>
<td>'obedience'</td>
<td>ḍowtāre</td>
</tr>
<tr>
<td>ŋ</td>
<td>ŋ</td>
<td>ŋoy-</td>
<td>'craftiness'</td>
<td>ŋoyre ŋoye</td>
</tr>
</tbody>
</table>

(32) nasal stop

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>nasal stop</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>m</td>
<td>m</td>
<td>mōʔ-</td>
<td>'termite'</td>
<td>mōʔu mōʔi</td>
</tr>
<tr>
<td>n</td>
<td>n</td>
<td>nor-</td>
<td>'crocodile'</td>
<td>norwa6 norji</td>
</tr>
<tr>
<td>n</td>
<td>n</td>
<td>nākurē-</td>
<td>'small horse-fly'</td>
<td>nākurēwu nākurēji</td>
</tr>
<tr>
<td>l</td>
<td>l</td>
<td>lēl-</td>
<td>'gazelle'</td>
<td>lēlwa lēlji</td>
</tr>
</tbody>
</table>

Thus the only segments that alternate are the simple stops p, b, d, k, and g. All of the simple stops except t 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? Klinghenheben [1963:22,25], 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 t, do not alternate. For example:

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The singular suffixes di and ga take stems in the nasalized grade.
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 tīnge, bāttā, 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) sōbā- 'friend' sōbājo sōbābe
sōbirā- 'friend' sōbirāwo sōbirābe
hammirā- 'older brother' hammirāwo hammirābe
hamilā- 'sword belt' hamilāwo hamilāji
yakatab- a type of shoe yakatabwo yakatabje
sōro- a type of house sōrowol sōroji
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' sōjejo sōje?en
hayru- 'luck' hayru hayruji
hakTkā- 'truth' hakTkā hakTkāji
fōto- 'photograph' fōto fōtoji

\[ \text{7 } \text{v} \rightarrow \text{v} / \text{__j} \]
Such words generally do not add any singular suffix, but do have the continuant form occurring with the plural suffix öi, 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 sabbo 'nest' which originally had the plural form cabbe. Re-analysis has taken place, and a new plural sabboji has replaced the older form cabbe. Other examples show that such nouns can begin with continuants as well as stops:

(36) 'palace' fāda fādāji
    'game' waŋno waŋnōji
    'end' ragare ragārēji
    'hour' sāʔa sāʔāji
    'hope' yela yelāji
    'wonder' hayōōgam hayōōgmāji
    'word' kalma kalmāji
    'farm in suburbs' ciraka cirakāji
    'luck' barka barkāji
    'trick' dabare dabarēji
    'ability' gikkū gikkūji
    'wrong' jamba jambāji
    'pencil' pensur pensurji
    'plague' torra torrāji

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

(37) fādawa- 'courtier' fādawājo fādawa?en
    wajTri- 'minister' wajTri8 wajTri?en
    sarāki- 'official' sarākTjo sarāki?en
    yatTme- 'orphan' yatTmējo yatTme?en
    hawsa- 'Hausa' hawsājo hawsa?en

8Sometimes the jo 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:

<table>
<thead>
<tr>
<th>Example</th>
<th>Pair of suffixes</th>
</tr>
</thead>
<tbody>
<tr>
<td>singular</td>
<td>plural</td>
</tr>
<tr>
<td>stop</td>
<td>continuant</td>
</tr>
<tr>
<td>continuant</td>
<td>stop</td>
</tr>
<tr>
<td>nasal</td>
<td>stop</td>
</tr>
<tr>
<td>stop</td>
<td>nasal</td>
</tr>
</tbody>
</table>

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):

\[
(39) \quad \begin{array}{c}
\text{+cons} \\
\text{-cont} \\
[+vcd]
\end{array} \rightarrow \begin{array}{c}
[+\text{nasal}] \\
\text{stem}
\end{array} + \text{N-suffix}
\]

\[
(40) \quad \begin{array}{c}
\text{+cons} \\
\text{-cont}
\end{array} \rightarrow \begin{array}{c}
[+\text{cont}] \\
\text{stem}
\end{array} + \text{C-suffix}
\]

The rule of stem alternation that produces continuants can explain the alternation of \( g \). As we have seen, \( g \rightarrow w \) occurs before back vowels and \( g \rightarrow y \) before front vowels. We also have the unconditioned alternations \( b \rightarrow w \) and \( j \rightarrow y \) 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:

\[
(41) \quad \begin{array}{c}
\text{'shield'} \\
\text{'mine'}
\end{array} \quad \begin{array}{c}
wawarde \\
wasarde
\end{array} \quad \begin{array}{c}
bawarde \\
gasar\text{"e}
\end{array}
\]

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

\[
(42) \quad \begin{array}{c}
b\ddot{o}\ddot{d}- \\
\text{gar-} \\
\text{jeh-} \\
\text{gett-} \\
\text{dem-} \\
\text{pi\ddot{o}-} \\
\text{com-} \\
\text{ke\ddot{e}-}
\end{array} \quad \begin{array}{c}
\text{'to be pretty'} \\
\text{'to come'} \\
\text{'to go'} \\
\text{'to thank'} \\
\text{'to plough'} \\
\text{'to shoot'} \\
\text{'to receive'}
\end{array} \quad \begin{array}{c}
\text{mi w\ddot{o}\ddot{d}i} \\
\text{mi wari} \\
\text{mi yehi} \\
\text{mi yet\ddot{t}i} \\
\text{mi remi} \\
\text{mi fi\ddot{o}i} \\
\text{mi somi}
\end{array} \quad \begin{array}{c}
mim b\ddot{o}\ddot{d}i \\
mim gari \\
mim je\ddot{h}i \\
mim getti \\
mim demi \\
mim pi\ddot{o}i \\
mim comi \\
mim ke\ddot{e}\ddot{i}
\end{array}
\]

According to Klinghenheben [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. Klinghenheben postulates that the continuous
segments are underlying and that his nasal assimilation rule will convert, for example, y → j in the stem yeh 'to go', but with the stem yet 'to thank', y → g. Since in both stems the vowel following the front glide is a front vowel, there is no way to predict which rule, y → j or y → 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. 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:

\[ (43) \quad [+\text{nasal}] \rightarrow [\alpha F] / \quad + \quad [+\text{cons}] \]

and then voiced stops are nasalized across the morpheme boundary:

\[ (44) \quad [+\text{cons} \quad -\text{cont} \quad +\text{vcd}] \rightarrow [+\text{nasal}] / \quad [\alpha F] \quad + \quad + \]

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 mĩm boši 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

\[ ^{9} "\text{Angesichts dieser Verschiedenheiten empfiehlt es sich, bei der Anführung von mit } w \text{ und } y \text{ anlautenden Wurzeln durch hinzugesetztes } b, \ g, \text{ oder } j \text{ anzudeuten, zu welcher Permutationsreihe sie gehören...}" \]

rule (rule (21)). In fact, the same three grades are found in stem alternation. Except for the dental implosive, ieties, all the suffix alternations are exactly the same as the corresponding stem alternations:

(45) continuant  
    stop 
    nasal  

(46) continuant  
    stop  
    nasal  

But ieties is invariable in stem alternation, but not in suffix alternation:

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 ieties and ieties always take stems in the continuant grade. The suffixes di and kon take stems in the nasalized grade. On the other hand, the suffixes ieties, ieties, ieties, and gel always take stems in the stop grade. Let us say that suffixes such as ieties, ieties, ieties, and gel are unmarked for an alternation rule; that is, they do not cause alternation in the stem. Suffixes like ieties and ieties 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 di 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 tapa 'cliff' always take suffixes in the continuant grade. So these stems will be marked as [+AC]. Stems like ıt '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 alternation 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 $\text{birT} \ '\text{peanut}'$ which occurs with the suffix pair $(\text{gu}, \delta i)$. Now $\text{birT}$ is marked [+AC] and $\text{gu}$ is marked [+AN], but $\delta i$ is unmarked. Thus, we have the following derivations:

\[
\begin{align*}
\text{(47)} & \quad \text{birT} + \text{gu} & \quad \text{birT} + \delta i \\
& \quad [+AC] \quad [+AN] & \quad [+AC] \\
& \quad \text{birTwu} & \quad \text{birTji}
\end{align*}
\]

The order of rule application is not important. $\text{birT}$ can only co-occur with suffixes in the continuant grade and so $\text{gu}$ is converted to $\text{wu}$ and $\delta i$ is converted to $\text{ji}$. And $\text{gu}$ itself can only occur with stems in the nasalized grade and so $\text{birT}$ is changed to $\text{birT}$. But $\delta i$ does not affect the underlying initial stop in the stem and so the underlying stem $\text{birT}$ 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:

\[
\begin{align*}
\text{(48)} & \quad \text{baTTa} + \text{du} & \quad \text{baTTa} + \delta i \\
& \quad [+AC] \quad [+AC] & \quad [+AC] \\
& \quad \text{baTTawu} & \quad \text{baTTa}ji
\end{align*}
\]

Although the suffixes are altered, the stem is not, even though the suffix $\text{du}$ requires a stem to be in the continuant grade. We do not get *waTTawu. 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, $\text{baTTa}$ is not only [+AC] (that is, it occurs only with suffixes in the continuant grade), but it is [-A]. Even though the suffix $\text{du}$ is marked as [+AC], the fact that $\text{baTTa}$ is [-A] means that consonant alternation will be blocked from
applying to ba†ba. The stem birT will be marked as [+A]. In other words, the speaker must memorize that birT 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


