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The Agar variety

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**Abstract:** In Dinka, a predominantly monosyllabic and highly fusional Western Nilotic language, vowel quality alternation in the root plays a major and systematic role in the morphology of verbs, together with alternations in vowel length, voice quality, and tone. Earlier work has shown that in the inflection of simple, i.e., underived, transitive verbs, the vowel quality alternation conforms to a vowel height gradation system with three vowel grades. The present article shows that this vowel gradation system is also operative in the morphology of derived verbs with a transitive root, but with certain modifications. These include a different distribution of the vowel grades and interaction with a shift in voice quality, to breathy voice.

**Keywords:** Dinka, vowel alternation, vowel quality, voice quality, nonlinear morphology, verb derivation

1 **Introduction**

The Western Nilotic language Dinka is largely monosyllabic, but nevertheless it has a fairly rich morphology. Most of its morphology is not expressed by affixes, but by alternations in the phonological material of the monosyllabic root, which makes Dinka a highly fusional language. As described in Andersen (1987), the Agar dialect of Dinka has three contrastive degrees of vowel length, two contrastive voice qualities in vowels (breathy and non-breathy), and three contrastive tones. Together with vowel quality alternation, alternations in these three phonological parameters of the syllable peak constitute most of the nonlinear morphology in both verbs and nouns.

In Andersen (1992–1994) it was demonstrated how voice quality, vowel length and tone are exponents of derivation and/or inflection in verbs with a transitive root in the Agar dialect. In Andersen (1993) it was furthermore shown how vowel quality is an exponent of inflection in simple (i.e., non-derived) verbs with a transitive root, and a system of vowel gradation with three vowel grades

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was uncovered. The purpose of the present article is to demonstrate how, in the Agar dialect, vowel quality alternation also plays a central role in the formation of derived verbs with a transitive root and in the inflection of such verbs. The article thus fills the gap left by Andersen (1992–1994, 1993) in the description of the central parts of the morphology of transitive verbal roots.


The article is organized as follows. As a prerequisite, Section 2 recapitulates some of the findings in Andersen (1992–1994, 1993). Section 3 shows that the vowel gradation system also accounts for vowel quality alternation in derived verbs, but with a partly different distribution of the vowel grades and with a partly different manifestation of one of the grades. Section 4 demonstrates that although vowel quality is basically independent of voice quality, the shift from non-breathy to breathy phonation has some consequences for vowel quality. Moreover, it is discussed how this shift interacts with the vowel gradation system. Section 5 is a conclusion which includes some reflections on the historical development of the vowel alternations.

2 Background

2.1 Verb shapes

A verb in Dinka is generally a monosyllable which conforms to the segmental shape \(C(w)(j)V(V(V))C\) with optional segments in parentheses. Thus, the verb segmentally consists of an onset consonant \((C)\), optionally followed by one or two glides \(/w/\ and/or \(/j/\ in that order), a vowel which is either short \(V)\),
medium (VV) or long (VVV), and a coda consonant (C). The voice quality of the vowel is either breathy (ə) or non-breathy (ø), and the vowel carries a tone which in the Agar dialect is either low (ã), high (ó) or falling (ô). In my transcription, the voice quality and tone diacritics are placed on the first of a sequence of vowel symbols. The monosyllable may be followed by a suffix with the segmental shape -(C)V.

2.2 Derivational and inflectional categories

2.2.1 Derivational categories

A verb with a transitive root is either simple or derived. As accounted for in Andersen 1992–1994), derived verbs with a transitive root include the following five categories: centrifugal, which indicates direction towards a goal which is different from the deictic center (Andersen 2012b: 160); centripetal, which indicates direction towards the deictic center; dative, an applicative which makes the verb ditransitive by including a recipient, goal or beneficiary as an extra object; antipassive, which makes the verb intransitive by excluding the object of the simple verb; and dativized antipassive, an applicative which transitivizes the antipassive by including a recipient, goal or beneficiary as an object. All of these derivations are fairly productive. The sentences in (1) with the transitive root mìt ‘pull’ exemplify the formation and use of the simple verb and the five derived categories listed above.

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2 A few intransitive verbs deviate from this shape by lacking a coda consonant.
3 In some other dialects of Dinka, there are four tones (Remijsen and Ladd 2008; Remijsen 2010).
4 The consonant symbols used in my transcription basically conform to IPA. Thus, /ʃ/ is a palatal glide, and /ʃ/ is a voiced palatal stop. However, the point of articulation of /t, d, n/ is interdental rather than dental.
5 The dative is called “benefactive” in Andersen (1992–1994).
6 The dativized antipassive is called “benefactive-antipassive” in Andersen (1992–1994). There is morphological evidence that it is indeed based on the antipassive; but for reasons of space, this evidence is not given here.
7 There are more derivational categories with a transitive root, at least the following: Antipassive centrifugal, antipassive centripetal, reciprocal, causative, anticausative or middle, multiplicative (or pluralactional or plural), and antipassive multiplicative. But they are less productive, and they are not considered here.
8 It might be convenient to use the term “stem” when dealing with the derivational status of a verb, and thus to talk about, for instance, a “simple stem” or a “centripetal stem” as in Andersen 1992–1994), thereby referring to an abstract entity without any inflectional information. Here, however, I only use the terms “root” and “verb (form)”.


2.2.2 Inflectional categories

As for inflection, verbs are either finite or non-finite (Andersen 1992–1994, 1993), as exemplified with the simple transitive verb mòc ‘shoot’ in declarative clauses in (2). All the verb forms in (2) are finite, except for the last one in (2k).

9 The following abbreviations are used in interlinear translations and elsewhere: 1PL = first person plural; 1SG = first person singular; 2PL = second person plural; 2SG = second person singular; 3PL = third person plural; 3SG = third person singular; ALL = allative; AP = antipassive; CF = centrifugal; CP = centripetal; CS1 = first construct state; CS2 = second construct state; D = declarative; DAT = dative; DEM1 = first person demonstrative; DEM2 = second person demonstrative; ESS/ABL = essive/ablative; FOC = focus; LOC = locative; NF = non-finite; NTS = having a non-topical subject; PASS = passive; PASS.CT = passive with a circumstantial topic; PF = perfect; PL = plural; PRO = proform; SG = singular.

10 A “declarative” clause is here defined as a clause which includes a declarative proclitic particle, cf. Andersen (1991).
(2)  a. bol ̀= móc  láj.  
    Bol  D = shoot  animal  
    'Bol is shooting an animal.'

b. láj ̀= móc  bol.  
    animal  D = shoot.NTS  Bol  
    'Bol is shooting the animal.'

c. láj ̀= mwòc.  
    animal  D = shoot.1SG  
    'I am shooting the animal.'

d. láj ̀= móc.  
    animal  D = shoot.2SG  
    'You are shooting the animal.'

e. láj ̀= móc.  
    animal  D = shoot.3SG  
    'He is shooting the animal.'

f. láj ̀= móc-kù.  
    animal  D = shoot-1PL  
    'We are shooting the animal.'

g. láj ̀= mwòc-kà.  
    animal  D = shoot-2PL  
    'You are shooting the animal.'

h. láj ̀= móc-kè.  
    animal  D = shoot-3PL  
    'They are shooting the animal.'

i. láj ̀= móc.  
    animal  D = shoot.PASS  
    'The animal is being shot.'

j. tén = è ̀= móc-è  láj  tin.  
    place.CS1 = DEM2  D = shoot-PASS.CT  animal  PRO.ESS/ABL  
    'An animal is being shot in that place.'

k. bol ̀= cè  láj  móc.  
    Bol  D = PF  animal  shoot.NF  
    'Bol has shot an animal.'

There are ten finite forms. As exemplified in (2a), one of them is inflectionally unmarked and left unglossed. It is used when the verb is preceded by the subject, whereas the form in (2b), glossed as NTS, indicates that the verb is followed by a non-topical subject.11 Six other finite forms express a pronominal

11 On the notion of “topic” used here, see Andersen (1991, 2015a).
subject, with a distinction between 1SG, 2SG, 3SG, 1PL, 2PL and 3PL, as exemplified in (2c-h). Two finite forms express an impersonal passive, with a distinction between having an object-topic, as in (2i) and glossed as PASS, and having a circumstantial topic, as in (2j) and glossed as PASS.CT. In addition, there is a non-finite form (NF), which is used when the finite verb is an auxiliary, as in (2k), where the finite verb is the perfect auxiliary cê (PF). Thus, a transitive verb, whether simple or derived, has 11 inflectionally different forms. The inflection may involve one of five suffixes: 2SG -é, PASS(.CT) -è, 1PL -ku, 2PL -ka and 3PL -ke (or -ki). The clauses in (2) differ with respect to the syntactic role of the preverbal noun phrase, the “topic”. In (2a) and (2k) the topic is subject, in (2b-i) it is object, and in (2j) it is an adverbial.

Intransitive verbs cannot be inflected for subject in declarative clauses, but in some other clause types they can, for instance in kù-clauses, as illustrated in (3).

(3) a. kù mwòoc.
    and shoot.AP.1SG
    ‘and I shoot.’

b. kù múuc-kù.
    and shoot.AP-1PL
    ‘and we shoot.’

For intransitive verbs there are only 10 inflectionally different forms, since such verbs can only be passive if they have a circumstantial topic.

2.3 Classes of transitive verbal roots

Transitive verbal roots in the Agar dialect fall into four inflectional classes in terms of (i) the vowel length of the inflectionally unmarked (infl. unm.) form of the simple verb and (ii) the tone of the non-finite form of the simple verb (Andersen 1992–1994: 22–25). Thus, as exemplified in Table 1, a root has either

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12 On auxiliary verbs in Dinka, see Andersen (2007a).
13 Root-final plosives, which are underlyingly unspecified for voice, get voiced phonetically in intervocalic position, i.e., before the suffixes -é and -è. Thus, for instance, mwòoc-è in (2) is phonetically [mʊˈjɛ].
14 A kù-clause begins with the conjunction kù ‘and’ and does not include a declarative particle. It normally has no or few markers of tense-aspect-mood (TAM), but is construable as having the same TAM as the preceding clause with which it is conjoined.
Table 1: Classes of transitive verbal roots in Agar Dinka, with examples.

<table>
<thead>
<tr>
<th>Class</th>
<th>Non-breathy</th>
<th>Breathy</th>
<th>Non-breathy</th>
<th>Breathy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Infl. unm.</td>
<td>Non-finite</td>
<td>Infl. unm.</td>
<td>Non-finite</td>
</tr>
<tr>
<td>1F</td>
<td>dɔm</td>
<td>‘catch’</td>
<td>tɔt</td>
<td>‘pierce’</td>
</tr>
<tr>
<td>1L</td>
<td>bìl</td>
<td>‘taste’</td>
<td>mɛr</td>
<td>‘decorate’</td>
</tr>
<tr>
<td>2F</td>
<td>dɪɪm</td>
<td>‘filter’</td>
<td>mʊʊt</td>
<td>‘greet’</td>
</tr>
<tr>
<td>2H</td>
<td>təaŋ</td>
<td>‘cook’</td>
<td>pɪɪc</td>
<td>‘twirl’</td>
</tr>
</tbody>
</table>

a short vowel and a falling tone (Class 1F), a short vowel and a low tone (Class 1L), a medium-length vowel and a falling tone (Class 2F), or a medium-length vowel and a high tone (Class 2H). The class names given here consist of a number, which indicates the number of morae (1 or 2) in the inflectionally unmarked form, and a letter, which indicates the tone (F for falling, L for low, and H for high) in the non-finite form. As also illustrated in Table 1, all of the four classes contain both non-breathy roots and breathy roots. These classes also determine the way in which derived verbs are formed.

Table 2 gives information about the empirical basis of the description. Thus, this table shows for each of the four root classes how many roots have been examined for each of the six derivational categories. Not all the verbs have been examined exhaustively, i.e. with elicitation of all inflected forms, apart from the inflectionally unmarked form and the non-finite form.

Table 2: Empirical basis of the analysis: Number of verbs examined for each of six derivational categories for each of the four root classes.

<table>
<thead>
<tr>
<th></th>
<th>Simple</th>
<th>CF</th>
<th>CP</th>
<th>DAT</th>
<th>AP.DAT</th>
<th>AP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1F</td>
<td>224</td>
<td>76</td>
<td>54</td>
<td>51</td>
<td>30</td>
<td>145</td>
</tr>
<tr>
<td>1L</td>
<td>80</td>
<td>26</td>
<td>13</td>
<td>12</td>
<td>7</td>
<td>62</td>
</tr>
<tr>
<td>2F</td>
<td>197</td>
<td>45</td>
<td>24</td>
<td>36</td>
<td>25</td>
<td>100</td>
</tr>
<tr>
<td>2H</td>
<td>135</td>
<td>53</td>
<td>35</td>
<td>24</td>
<td>18</td>
<td>79</td>
</tr>
<tr>
<td>Total</td>
<td>636</td>
<td>200</td>
<td>126</td>
<td>123</td>
<td>80</td>
<td>386</td>
</tr>
</tbody>
</table>

2.4 Voice quality alternation

As summarized in Table 3, voice quality alternation is one of the exponents of derivational categories (Andersen 1992–1994: 33). In this table, “breathy” means that the derivational category is characterized by breathy voice quality in the root vowel, and thus may involve a shift from non-breathy voice to breathy
voice, whereas “inherent” means that no voice quality shift takes place. As seen in the table, centripetal, dative and dativized antipassive verbs have breathy voice. To a large extent, this feature also characterizes antipassive verbs, but with some systematic exceptions in terms of the inflectional class of the root and the inflectional category.

2.5 Vowel gradation system of simple transitive verbs

In Andersen (1993) it was shown how vowel quality alternation works in the inflection of simple transitive verbs. The account uncovered a vowel gradation system with three vowel grades across basic vowel qualities (“series”). A slightly revised version of this system is shown in Table 4 (based on Table X in Andersen [1993: 19]) without regard to vowel length.15

For each root there is a basic vowel quality, called grade 1 (1°), and for each grade 1 vowel the table shows the two other grades, called grade 2 (2°) and grade 3 (3°). The upper part of the table shows non-breathy vowels, the lower part shows breathy vowels. Moreover, a distinction is made between grade 1 vowels in three different phonological contexts: vowels that are not preceded by a postconsonantal glide (on the left), vowels that are preceded by a postconsonantal /j/ (in the middle), and vowels that are preceded by a postconsonantal /w/ (on the right). Grade 2 differs from grade 1 in that the low central vowel quality /a/ is fronted and raised to lower-mid /ɛ/ in accordance with a

---

Table 3: Voice quality alternation in verbs with a transitive root.

<table>
<thead>
<tr>
<th>Root class</th>
<th>Derivational (and inflectional) categories</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Simple</td>
</tr>
<tr>
<td></td>
<td>finite</td>
</tr>
<tr>
<td>1F</td>
<td>inherent</td>
</tr>
<tr>
<td>1L</td>
<td>inherent</td>
</tr>
<tr>
<td>2F</td>
<td>inherent</td>
</tr>
<tr>
<td>2H</td>
<td>inherent</td>
</tr>
</tbody>
</table>

15 The /wi̯/ -series in Table 4 was not included in Andersen (1993). It is found in, for instance, the root cwì̯i̯il ‘dispense from a prohibition’ (Class 2F) with the 3SG grade 2 form cwì̯i̯il and the 1SG grade 3 form cwì̯jeel. The glide /w/ is manifested phonetically as a labialalatal [ʔ] before /i/ whether it occurs as onset or in postconsonantal position. The sequence of postconsonantal glides /wi/ is also manifested phonetically as [ʔ].
A morphophonological rule called *Fronting* (Andersen 1993: 21–25). Grade 3 differs from grade 1 in that other vowel qualities than /a/ are lowered in accordance with a morphophonological rule called *Lowering* (Andersen 1993: 25–32), a process which sometimes involves “breaking” which adds a postconsonantal glide. It should be noted that /ɛ/ is not a basic vowel quality, since it is not a member of the grade 1 inventory; it arises either from fronting of /a/ or from lowering of /e/ or /i/.

The situation delineated in Table 4 is somewhat simplified. Thus, the table disregards that grade 1 of the /a/-series has an /ɔ/-alternant, cf. Section 4.4 below. It also disregards that some of the vowels have raised variants, cf. Section 4.3 below. Moreover, the table disregards that the contrast between the qualities /a/ and /ɛ/ which exists in medium and long vowels seems to be absent in short vowels (Andersen 1993: 13–14), in which case I use the symbol /a/ to the exclusion of /ɛ/. This means that grade 2 of the various /a/-series appears as /a/ rather than /ɛ/ in short vowels.

Each of the 11 forms of a simple transitive verb “has” (or “belongs to” or “occurs in”) a particular grade. Thus, grade 1, in addition to occurring in the inflectionally unmarked form, is an exponent of 2SG, 1PL, 3PL, PASS and NF. Grade 2 is an exponent of NTS, 3SG and PASS.CT. And grade 3 is an exponent of 1SG and 2PL. Examples are given in Sections 3 and 4 below. The vowel gradation system shown in Table 4 also plays a significant role in the morphology of nouns (Andersen 2002, 2014).

The rest of this article deals with the nature and role of vowel quality alternation in derived verbs with a transitive root, thus complementing the description of the morphology of transitive roots given in Andersen (1992–1994).

---

**Table 4: Vowel gradation in the inflection of simple transitive verbs (simplified).**

<table>
<thead>
<tr>
<th>Series</th>
<th>Without postcons. glide</th>
<th>With postcons. /j/</th>
<th>With postcons. /w/</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-breathy</td>
<td>1° j e a ə o</td>
<td>je ja jə wj we wa wə</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2° j e ə ə ə o</td>
<td>je jə jə wj we wə wə</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3° jə ə ə a a wə</td>
<td>jə ja jə wj we wə wə</td>
<td></td>
</tr>
<tr>
<td>Breathy</td>
<td>1° j e a ə o u</td>
<td>je ja jə wi we wa wo</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2° j e ə ə ə o u</td>
<td>je je jə wi we wə wə wə</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3° jə ə ə a a ə wə</td>
<td>jə ja jə wj we wə wə jə</td>
<td></td>
</tr>
</tbody>
</table>

16 A vowel symbol enclosed in slashes refers to a vowel quality without regard to vowel length, and the absence of a voice quality diacritic abstracts away from voice quality.
and Andersen (1993). First, it is shown that the vowel grade system set up to account for vowel quality alternation in simple verbs also works for derived verbs, but that the distribution of the grades is different and that the phonological range of Fronting is extended. Second, it is shown that the shift from non-breathy voice to breathy voice, which occurs in some derived verbs, involves some systematic shifts in vowel quality as well.

3 Vowel gradation in derived verbs

3.1 Distribution of vowel grades in derived verbs

In general, the vowel qualities used in derived verbs are the same as those used in the corresponding simple verbs, but the distribution of the alternants is partly different. This can be seen in Tables 5 and 6, which show all forms with the inherently breathy roots gut ‘stab’ and tār ‘spear’, respectively. Both of these roots belong to Class 1 F. Since the root gut in Table 5 has the grade 1 quality /u/, its grade 2 quality is phonologically identical to its grade 1 quality, while its grade

<table>
<thead>
<tr>
<th>Table 5: Forms with the transitive breathy root gut ‘stab’ (Class 1F).</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Simple</strong></td>
</tr>
<tr>
<td>Unm.</td>
</tr>
<tr>
<td>NF</td>
</tr>
<tr>
<td>NTS</td>
</tr>
<tr>
<td>1SG</td>
</tr>
<tr>
<td>2SG</td>
</tr>
<tr>
<td>3SG</td>
</tr>
<tr>
<td>1PL</td>
</tr>
<tr>
<td>2PL</td>
</tr>
<tr>
<td>3PL</td>
</tr>
<tr>
<td>PASS</td>
</tr>
<tr>
<td>PASS.CT</td>
</tr>
</tbody>
</table>

17 Forms followed by an asterisk (*) have not been attested for the particular verbs in question, but these are the predicted forms if the verbs turn out to inflect regularly. For antipassive verbs, as for intransitive verbs in general, there is no plain passive form. Centripetal forms with plural suffixes exhibit free (inter- and intra-individual) tonal variation between between H.L (as given in Tables 5–6 and 8–9) and L.H (Andersen 1992–1994: 57).
Table 6: Forms with the transitive breathy root tər 'spear' (Class 1F).

<table>
<thead>
<tr>
<th></th>
<th>Simple</th>
<th>CF</th>
<th>CP</th>
<th>DAT</th>
<th>AP.DAT</th>
<th>AP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unm.</td>
<td>tər</td>
<td>tɛɛr</td>
<td>tɛɛr</td>
<td>tɛɛr</td>
<td>tɛɛr*</td>
<td>tɛɛr</td>
</tr>
<tr>
<td>NF</td>
<td>tər</td>
<td>təar</td>
<td>təar</td>
<td>təar</td>
<td>təar*</td>
<td>təar</td>
</tr>
<tr>
<td>NTS</td>
<td>tɛɛr</td>
<td>tɛɛr</td>
<td>tɛɛr</td>
<td>tɛɛr</td>
<td>tɛɛr*</td>
<td>tɛɛr</td>
</tr>
<tr>
<td>1SG</td>
<td>rəar</td>
<td>rəar</td>
<td>rəar</td>
<td>rəar</td>
<td>rəar</td>
<td>rəar</td>
</tr>
<tr>
<td>2SG</td>
<td>tər</td>
<td>təar-ɛ</td>
<td>tɛɛr</td>
<td>təar-ɛ</td>
<td>təar-ɛ</td>
<td>təar-ɛ</td>
</tr>
<tr>
<td>3SG</td>
<td>tɛɛr</td>
<td>tɛɛr</td>
<td>tɛɛr</td>
<td>tɛɛr</td>
<td>tɛɛr</td>
<td>tɛɛr</td>
</tr>
<tr>
<td>1PL</td>
<td>tər-ʊ</td>
<td>tɛɛr-ʊ</td>
<td>tɛɛr-ʊ</td>
<td>tɛɛr-ʊ</td>
<td>tɛɛr-ʊ</td>
<td>tɛɛr-ʊ</td>
</tr>
<tr>
<td>2PL</td>
<td>tər-kə</td>
<td>tər-kə</td>
<td>tər-kə</td>
<td>tər-kə</td>
<td>tər-kə</td>
<td>tər-kə</td>
</tr>
<tr>
<td>3PL</td>
<td>tər-kə</td>
<td>tɛɛr-kə</td>
<td>tɛɛr-kə</td>
<td>tɛɛr-kə</td>
<td>tɛɛr-kə</td>
<td>tɛɛr-kə</td>
</tr>
<tr>
<td>PASS</td>
<td>tər-ɛ*</td>
<td>tɛɛr-ɛ*</td>
<td>tɛɛr-ɛ*</td>
<td>tɛɛr-ɛ*</td>
<td>tɛɛr-ɛ*</td>
<td>tɛɛr-ɛ*</td>
</tr>
<tr>
<td>PASS.CT</td>
<td>tɛɛr-ɛ*</td>
<td>tɛɛr-ɛ*</td>
<td>tɛɛr-ɛ*</td>
<td>tɛɛr-ɛ*</td>
<td>tɛɛr-ɛ*</td>
<td>tɛɛr-ɛ*</td>
</tr>
</tbody>
</table>

3 quality is /wo/, cf. Table 4 above. Conversely, since the root tər in Table 6 has the grade 1 quality /a/, its grade 3 quality is phonologically identical to grade 1, while its grade 2 quality is /ɛ/.

Based on the forms in Tables 5 and 6 taken together, and on antipassive forms dealt with in Section 3.2 below, the distribution of the vowel grades can be determined as being what is shown in Table 7. The distribution in transitive derived verbs is the same in all four root classes, cf. Tables 10–13 at the end of this subsection. But in antipassive verbs the distribution depends on the root class, as also shown in Table 7.

Table 7: Vowel height gradation in verbs with a transitive root.

<table>
<thead>
<tr>
<th></th>
<th>Simple</th>
<th>CF</th>
<th>CP</th>
<th>DAT</th>
<th>AP.DAT</th>
<th>AP</th>
<th>1F</th>
<th>1L</th>
<th>2F</th>
<th>2H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unm.</td>
<td>1°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>1°</td>
<td>1°</td>
<td>1°</td>
<td>2°</td>
</tr>
<tr>
<td>NF</td>
<td>1°</td>
<td>3°</td>
<td>3°</td>
<td>3°</td>
<td>3°</td>
<td>1°</td>
<td>1°</td>
<td>1°</td>
<td>1°</td>
<td>1°</td>
</tr>
<tr>
<td>NTS</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
</tr>
<tr>
<td>1SG</td>
<td>3°</td>
<td>3°</td>
<td>3°</td>
<td>3°</td>
<td>3°</td>
<td>3°</td>
<td>3°</td>
<td>3°</td>
<td>3°</td>
<td>3°</td>
</tr>
<tr>
<td>2SG</td>
<td>1°</td>
<td>3°</td>
<td>2°</td>
<td>3°</td>
<td>3°</td>
<td>3°</td>
<td>3°</td>
<td>3°</td>
<td>3°</td>
<td>3°</td>
</tr>
<tr>
<td>3SG</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
</tr>
<tr>
<td>1PL</td>
<td>1°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
</tr>
<tr>
<td>2PL</td>
<td>3°</td>
<td>3°</td>
<td>3°</td>
<td>3°</td>
<td>3°</td>
<td>3°</td>
<td>3°</td>
<td>3°</td>
<td>3°</td>
<td>3°</td>
</tr>
<tr>
<td>3PL</td>
<td>1°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
</tr>
<tr>
<td>PASS</td>
<td>1°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>PASS.CT</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
<td>2°</td>
</tr>
</tbody>
</table>
In derived transitive (i.e., non-antipassive) verbs, as seen in Table 7, the vowel grade is either 2o or 3o, never 1o. The inflectionally unmarked form of such verbs has grade 2, and this is also the grade of NTS, 2SG in centripetal verbs, 3SG, 1PL, 3PL, PASS and PASS.CT. Grade 3 is found in NF, 1SG, 2SG (except in centripetal verbs) and 2PL. Thus, grade 2 here characterizes all the inflectional categories that have either grade 1 or grade 2 in simple verbs, except for NF. Hence, in derived transitive verbs, grade 2 appears to be the default grade and can therefore be taken to be an exponent of the derived status of the verb rather than a means of inflection. Grade 3, by contrast, must be taken to be a means of inflection, namely an exponent of NF, 1SG, 2SG (except in centripetal verbs) and 2PL.

Although the generalizations expressed in Table 7 are based on breathy roots, they also cover non-breathy roots. But here the situation is complicated by the fact that some derived categories exhibit voice quality shift, and for some non-breathy vowels the shift to breathy voice is accompanied by a change in vowel quality, as described in Section 4 below. In general, however, the vowel quality alternation in verbs with their inherently non-breathy voice shifted to breathy voice is the same as in verbs with inherently breathy voice, cf. Table 4 above. This situation is exemplified in Tables 8 and 9, while exceptions are dealt with in Section 4 below. In Table 9, similarly, the breathy grade 2 vowel /i̯/ behaves like an /i̯/ in an inherently breathy root, i.e. it has /je/ as its grade 3 counterpart, cf. Table 4 above. In Table 8 the breathy grade 2 vowel /i̯/ behaves like an /i̯/ in an inherently breathy root, i.e. it has /je/ as its grade 3 counterpart, cf. again Table 4 above.

**Table 8:** Forms with the transitive Class 2F root mìit 'pull'.

<table>
<thead>
<tr>
<th></th>
<th>Simple</th>
<th>CF</th>
<th>CP</th>
<th>DAT</th>
<th>AP.DAT</th>
<th>AP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unm.</td>
<td>mìit</td>
<td>mìit</td>
<td>mìit</td>
<td>mìit</td>
<td>mìit</td>
<td>mìit</td>
</tr>
<tr>
<td>NF</td>
<td>mìit</td>
<td>mjêεet</td>
<td>mjêeet</td>
<td>mjêet</td>
<td>mjêeet</td>
<td>mjêit</td>
</tr>
<tr>
<td>NTS</td>
<td>mìit</td>
<td>mìit</td>
<td>mìit</td>
<td>mìit</td>
<td>mìit</td>
<td>mìit</td>
</tr>
<tr>
<td>1SG</td>
<td>mjêεet</td>
<td>mjêεet</td>
<td>mjêeet</td>
<td>mjêet</td>
<td>mjêeet</td>
<td>mjêet</td>
</tr>
<tr>
<td>2SG</td>
<td>mìit</td>
<td>mjêεet</td>
<td>mjêit</td>
<td>mjêet</td>
<td>mjêeet</td>
<td>mjêit, mìit</td>
</tr>
<tr>
<td>3SG</td>
<td>mìit</td>
<td>mìit</td>
<td>mìit</td>
<td>mìit</td>
<td>mìit</td>
<td>mìit</td>
</tr>
<tr>
<td>1PL</td>
<td>mìit-kù</td>
<td>mìit-kù</td>
<td>mìit-kù</td>
<td>mìit-kù</td>
<td>mìit-kù</td>
<td>mìit-kù</td>
</tr>
<tr>
<td>2PL</td>
<td>mjêεt-kà</td>
<td>mjêεt-kà</td>
<td>mjêet-kà</td>
<td>mjêet-kà</td>
<td>mjêet-kà</td>
<td>mjêet-kà</td>
</tr>
<tr>
<td>3PL</td>
<td>mìit-kê</td>
<td>mìit-kê</td>
<td>mìit-kê</td>
<td>mìit-kê</td>
<td>mìit-kê</td>
<td>mìit-kê</td>
</tr>
<tr>
<td>PASS</td>
<td>mìit</td>
<td>mìit-kê</td>
<td>mìit-kê</td>
<td>mìit-kê</td>
<td>mìit-kê</td>
<td>mìit-kê</td>
</tr>
<tr>
<td>PAS.CT</td>
<td>mìit-kê</td>
<td>mìit-kê</td>
<td>mìit-kê</td>
<td>mìit-kê</td>
<td>mìit-kê</td>
<td>mìit-kê</td>
</tr>
</tbody>
</table>
The tables also show the inflectionally unmarked form and the non-finite forms with the transitive Class 1F root bār 'take along'.

Table 9: Forms with the transitive Class 1F root bār 'take along'.

<table>
<thead>
<tr>
<th></th>
<th>Simple</th>
<th>CF</th>
<th>CP</th>
<th>DAT</th>
<th>AP.DAT</th>
<th>AP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unm.</td>
<td>bār</td>
<td>bēr</td>
<td>bēr</td>
<td>bēr</td>
<td>bēr</td>
<td>bēr</td>
</tr>
<tr>
<td>NF</td>
<td>bār</td>
<td>bār</td>
<td>bār</td>
<td>bār</td>
<td>bār</td>
<td>bār</td>
</tr>
<tr>
<td>NTS</td>
<td>bēr</td>
<td>bēr</td>
<td>bēr</td>
<td>bēr</td>
<td>bēr</td>
<td>bēr</td>
</tr>
<tr>
<td>1SG</td>
<td>bār</td>
<td>bār</td>
<td>bār</td>
<td>bār</td>
<td>bār</td>
<td>bār</td>
</tr>
<tr>
<td>2SG</td>
<td>bār</td>
<td>bār-ē</td>
<td>bēr</td>
<td>bār-ē</td>
<td>bār-ē</td>
<td>bār-ē</td>
</tr>
<tr>
<td>3SG</td>
<td>bēr</td>
<td>bēr</td>
<td>bēr</td>
<td>bēr</td>
<td>bēr</td>
<td>bēr</td>
</tr>
<tr>
<td>1PL</td>
<td>bār-kū</td>
<td>bēr-kū</td>
<td>bēr-kū</td>
<td>bēr-kū</td>
<td>bēr-kū</td>
<td>bēr-kū</td>
</tr>
<tr>
<td>2PL</td>
<td>bār-kā</td>
<td>bār-kā</td>
<td>bār-kā</td>
<td>bār-kā</td>
<td>bār-kā</td>
<td>bār-kā</td>
</tr>
<tr>
<td>3PL</td>
<td>bār-kē</td>
<td>bēr-kē</td>
<td>bēr-kē</td>
<td>bēr-kē</td>
<td>bēr-kē</td>
<td>bēr-kē</td>
</tr>
<tr>
<td>PASS</td>
<td>bār</td>
<td>bēr-ē</td>
<td>bēr-ē</td>
<td>bēr-ē</td>
<td>bēr-ē</td>
<td>bēr-ē</td>
</tr>
<tr>
<td>PAS.CT</td>
<td>bēr-ē*</td>
<td>bēr-ē*</td>
<td>bēr-ē*</td>
<td>bēr-ē*</td>
<td>bēr-ē*</td>
<td>bēr-ē*</td>
</tr>
</tbody>
</table>

As mentioned above, the distribution of vowel grades in transitive derived verbs is the same in all four root classes. This fact is illustrated in Tables 10–13. Each of these tables shows a paradigm from each root class, centrifugal in Table 10, centripetal in Table 11, dative in Table 12 and dativized antipassive in Table 13. The tables also show the inflectionally unmarked form and the non-finite form of the corresponding simple verbs.

Table 10: Vowel height gradation in centrifugal verbs.

<table>
<thead>
<tr>
<th>Root class</th>
<th>1F 1L</th>
<th>2F 2H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gloss</td>
<td>'pull'</td>
<td>'plait'</td>
</tr>
<tr>
<td>Simple</td>
<td>Unm.</td>
<td>1°</td>
</tr>
<tr>
<td></td>
<td>NF</td>
<td>1°</td>
</tr>
<tr>
<td>CF</td>
<td>Unm.</td>
<td>2°</td>
</tr>
<tr>
<td></td>
<td>NF</td>
<td>3°</td>
</tr>
<tr>
<td></td>
<td>NTS</td>
<td>2°</td>
</tr>
<tr>
<td></td>
<td>1SG</td>
<td>3°</td>
</tr>
<tr>
<td></td>
<td>2SG</td>
<td>2°</td>
</tr>
<tr>
<td></td>
<td>3SG</td>
<td>2°</td>
</tr>
<tr>
<td></td>
<td>1PL</td>
<td>2°</td>
</tr>
<tr>
<td></td>
<td>2PL</td>
<td>3°</td>
</tr>
<tr>
<td></td>
<td>3PL</td>
<td>2°</td>
</tr>
<tr>
<td></td>
<td>PASS</td>
<td>2°</td>
</tr>
</tbody>
</table>

18 PASS.CT forms are not included in these tables since they are identical to the PASS forms.
Table 11: Vowel height gradation in centripetal verbs.

<table>
<thead>
<tr>
<th>Root class</th>
<th>Gloss</th>
<th>1F</th>
<th>1L</th>
<th>2F</th>
<th>2H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple</td>
<td>Unm.</td>
<td>1°</td>
<td>jôr</td>
<td>mijit</td>
<td>t’ôoc</td>
</tr>
<tr>
<td></td>
<td>NF</td>
<td>1°</td>
<td>jôor</td>
<td>mijit</td>
<td>t’ôooc</td>
</tr>
<tr>
<td></td>
<td>CP</td>
<td>2°</td>
<td>jûur</td>
<td>mijit</td>
<td>t’uuc</td>
</tr>
<tr>
<td></td>
<td>NF</td>
<td>3°</td>
<td>jwôor</td>
<td>mijëet</td>
<td>twôooc</td>
</tr>
<tr>
<td></td>
<td>NTS</td>
<td>2°</td>
<td>jûur</td>
<td>mijit</td>
<td>t’uuc</td>
</tr>
<tr>
<td></td>
<td>1SG</td>
<td>3°</td>
<td>jwôor</td>
<td>mijëet</td>
<td>twôooc</td>
</tr>
<tr>
<td></td>
<td>2SG</td>
<td>2°</td>
<td>jûur</td>
<td>mijit</td>
<td>t’uuc</td>
</tr>
<tr>
<td></td>
<td>3SG</td>
<td>2°</td>
<td>jûur</td>
<td>mijit</td>
<td>t’uuc</td>
</tr>
<tr>
<td></td>
<td>1PL</td>
<td>2°</td>
<td>jûur-kû</td>
<td>mijit-kû</td>
<td>t’uuc-kû</td>
</tr>
<tr>
<td></td>
<td>2PL</td>
<td>3°</td>
<td>jwôor-kà</td>
<td>mijëet-kà</td>
<td>twôooc-kà</td>
</tr>
<tr>
<td></td>
<td>3PL</td>
<td>2°</td>
<td>jûur-kê</td>
<td>mijit-kê</td>
<td>t’uuc-kê</td>
</tr>
<tr>
<td>PASS</td>
<td>2°</td>
<td>jûur-ê</td>
<td>mijit-ê</td>
<td>t’uuc-ê</td>
<td></td>
</tr>
</tbody>
</table>

Table 12: Vowel height gradation in dative verbs.

<table>
<thead>
<tr>
<th>Root class</th>
<th>Gloss</th>
<th>1F</th>
<th>1L</th>
<th>2F</th>
<th>2H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple</td>
<td>Unm.</td>
<td>1°</td>
<td>nàj</td>
<td>ɔɔol</td>
<td>nàaan</td>
</tr>
<tr>
<td></td>
<td>NF</td>
<td>1°</td>
<td>nàaj</td>
<td>ɔɔol</td>
<td>nàaan</td>
</tr>
<tr>
<td>DAT</td>
<td>Unm.</td>
<td>2°</td>
<td>nëej</td>
<td>ɔôol</td>
<td>ngep</td>
</tr>
<tr>
<td></td>
<td>NF</td>
<td>3°</td>
<td>nàaj</td>
<td>ɔôol</td>
<td>ngep</td>
</tr>
<tr>
<td></td>
<td>NTS</td>
<td>2°</td>
<td>nëej</td>
<td>ɔôol</td>
<td>ngep</td>
</tr>
<tr>
<td></td>
<td>1SG</td>
<td>3°</td>
<td>nàaj</td>
<td>ɔôol</td>
<td>ngep</td>
</tr>
<tr>
<td></td>
<td>2SG</td>
<td>3°</td>
<td>nàaj-ê</td>
<td>ɔôol-ê</td>
<td>ngep-ê</td>
</tr>
<tr>
<td></td>
<td>3SG</td>
<td>2°</td>
<td>nëej</td>
<td>ɔôol</td>
<td>ngep</td>
</tr>
<tr>
<td></td>
<td>1PL</td>
<td>2°</td>
<td>nëej-kù</td>
<td>ɔôol-kù</td>
<td>ngep-kù</td>
</tr>
<tr>
<td></td>
<td>2PL</td>
<td>3°</td>
<td>nëej-kà</td>
<td>ɔôol-kà</td>
<td>ngep-kà</td>
</tr>
<tr>
<td></td>
<td>3PL</td>
<td>2°</td>
<td>nëej-kê</td>
<td>ɔôol-kê</td>
<td>ngep-kê</td>
</tr>
<tr>
<td>PASS</td>
<td>2°</td>
<td>nëej-ê</td>
<td>ɔôol-ê</td>
<td>ngep-ê</td>
<td></td>
</tr>
</tbody>
</table>

3.2 Vowel grades in antipassive verbs

3.2.1 Introduction to vowel gradation in antipassive verbs

The morphophonology of the antipassive is more complex than that of the other derivational categories. This concerns not only vowel length, voice quality and
tone (Andersen 1992–1994), but also vowel quality alternation. The following subsections therefore deal in more detail with the antipassive for each of the four root classes. Table 14 summarizes the inflection of antipassive verbs by means of paradigms of generalized forms. Since the inflection of verbs with Class 2F roots depends on the lexical voice quality of the root, two paradigms are given for this class. In the generalized forms, the vowel grade is indicated by a subscript number after the coda consonant, and the voice quality symbol /ŋ/ indicates that the form is breathy, whereas the absence of a voice quality symbol indicates that the form has the voice quality which is inherent in the root.

Table 13: Vowel height gradation in dativized antipassive verbs.

<table>
<thead>
<tr>
<th>Root class</th>
<th>1F</th>
<th>1L</th>
<th>2F</th>
<th>2H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gloss</td>
<td>‘catch’</td>
<td>‘dust’</td>
<td>‘milk’</td>
<td>‘send’</td>
</tr>
<tr>
<td>Simple</td>
<td>Unm.</td>
<td>1° dʒm</td>
<td>têŋ</td>
<td>râak</td>
</tr>
<tr>
<td></td>
<td>NF</td>
<td>1° dʒm</td>
<td>têŋ</td>
<td>râak</td>
</tr>
<tr>
<td></td>
<td>AP.DAT</td>
<td>Unm.</td>
<td>2° dʒom</td>
<td>têŋ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2° dʒom</td>
<td>têŋ</td>
<td>ṛạaḳ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2° dʒom</td>
<td>têŋ</td>
<td>ṛg̣ẹḳ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2° dʒom-kà</td>
<td>têŋ-kà</td>
<td>ṛg̣ẹḳ-kù</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2° dʒom-kè</td>
<td>têŋ-kè</td>
<td>ṛg̣ẹḳ-kè</td>
</tr>
<tr>
<td>PASS</td>
<td></td>
<td>2° dʒom-è</td>
<td>têŋ-è</td>
<td>ṛg̣ẹḳ-è</td>
</tr>
</tbody>
</table>

Table 14: Inflection of antipassive verbs, shown by generalized forms.

<table>
<thead>
<tr>
<th></th>
<th>1F</th>
<th>1L</th>
<th>2F, -breathy</th>
<th>2F, + breathy</th>
<th>2H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unm.</td>
<td>CÝVC₂</td>
<td>CÝVC₃</td>
<td>CÝVC₂</td>
<td>CÝVC(V)C₂</td>
<td>CÝC₁</td>
</tr>
<tr>
<td>NF</td>
<td>CÝC₁</td>
<td>CÝVC₁</td>
<td>CÝVC₂</td>
<td>CÝVC(V)C₂</td>
<td>CÝC₁</td>
</tr>
<tr>
<td>NTS</td>
<td>CÝVC₂</td>
<td>CÝVC₂</td>
<td>CÝVC₂</td>
<td>CÝVC(V)C₂</td>
<td>CÝVC₂</td>
</tr>
<tr>
<td>1SG</td>
<td>CÝVC₃</td>
<td>CÝVC₃</td>
<td>CÝVC₃</td>
<td>CÝVC(V)C₃</td>
<td>CÝVC₃</td>
</tr>
<tr>
<td>2SG</td>
<td>CÝVC₃-è</td>
<td>CÝVC₃-è</td>
<td>CÝVC₃-è</td>
<td>CÝVC(V)C₃-è</td>
<td>CÝVC₃-è</td>
</tr>
<tr>
<td>3SG</td>
<td>CÝVC₂</td>
<td>CÝVC₂</td>
<td>CÝVC₂</td>
<td>CÝVC(V)C₂</td>
<td>CÝVC₂</td>
</tr>
<tr>
<td>1PL</td>
<td>CÝVC₂-kù</td>
<td>CÝVC₂-kù</td>
<td>CÝVC₂-kù</td>
<td>CÝVC(V)C₂-kù</td>
<td>CÝC₁-kù/CÝVC₂-kù</td>
</tr>
<tr>
<td>2PL</td>
<td>CÝVC₃-kà</td>
<td>CÝVC₃-kà</td>
<td>CÝVC₃-kà</td>
<td>CÝVC(V)C₃-kà</td>
<td>CÝC₃-kà/CÝVC₃-kà</td>
</tr>
<tr>
<td>3PL</td>
<td>CÝVC₂-kè</td>
<td>CÝVC₂-kè</td>
<td>CÝVC₂-kè</td>
<td>CÝVC(V)C₂-kè</td>
<td>CÝC₁-kè/CÝVC₂-kè</td>
</tr>
<tr>
<td>PASS.CT</td>
<td>CÝVC₂-è</td>
<td>CÝVC₂-è</td>
<td>CÝVC₂-è</td>
<td>CÝVC(V)C₂-è</td>
<td>CÝVC₂-è</td>
</tr>
</tbody>
</table>
3.2.2 Antipassive with Class 1F roots

Table 15 shows paradigms with four antipassive verbs with Class 1F roots, non-breathy bâr 'take along' and mòc 'shoot', and breathy gùt 'stab' and tjâk 'bury'. The table also shows the inflectionally unmarked form and the non-finite form of the corresponding simple verbs.

**Table 15:** Paradigms with antipassive (AP) verbs with Class 1F roots.

<table>
<thead>
<tr>
<th>Gloss</th>
<th>'take along'</th>
<th>'shoot'</th>
<th>'stab'</th>
<th>'bury'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple Unm.</td>
<td>1° bâr</td>
<td>mòc</td>
<td>gùt</td>
<td>tjâk</td>
</tr>
<tr>
<td>NF</td>
<td>1° bâr</td>
<td>mòc</td>
<td>gùt</td>
<td>tjâk</td>
</tr>
<tr>
<td>AP Unm.</td>
<td>2° bëgër</td>
<td>mûuc</td>
<td>gûut</td>
<td>tjëek*</td>
</tr>
<tr>
<td>NF</td>
<td>1° bâr</td>
<td>mòc</td>
<td>gùt</td>
<td>tjâk</td>
</tr>
<tr>
<td>NTS</td>
<td>2° bëgër*</td>
<td>mûuc</td>
<td>gûut*</td>
<td>tjëek*</td>
</tr>
<tr>
<td>1SG</td>
<td>3° bâr</td>
<td>mwôoc</td>
<td>gwôot</td>
<td>tjâak</td>
</tr>
<tr>
<td>2SG</td>
<td>3° bâr-ê</td>
<td>mwôoc-ê</td>
<td>gwôot-ê</td>
<td>tjâak-ê</td>
</tr>
<tr>
<td>3SG</td>
<td>2° bëgër</td>
<td>mûuc</td>
<td>gûut</td>
<td>tjëek</td>
</tr>
<tr>
<td>1PL</td>
<td>2° bëgër-kû</td>
<td>mûuc-kû</td>
<td>gûut-kû</td>
<td>tjëek-kû</td>
</tr>
<tr>
<td>2PL</td>
<td>3° bâr-kà</td>
<td>mwôoc-kà</td>
<td>gwôot-kà</td>
<td>tjâak-kà</td>
</tr>
<tr>
<td>3PL</td>
<td>2° bëgër-kê</td>
<td>mûuc-kê</td>
<td>gûut-kê</td>
<td>tjëek-kê</td>
</tr>
<tr>
<td>PASS.CT</td>
<td>2° bëgër-ê*</td>
<td>mûuc-ê</td>
<td>gûut-ê*</td>
<td>tjëek-ê*</td>
</tr>
</tbody>
</table>

The distribution of vowel grades in antipassive verbs with Class 1F roots is the same as in derived transitive verbs, except for the non-finite form. Unlike the other forms, which have a medium-length vowel characterized by breathy voice, the non-finite form has a short vowel with inherent voice quality. In fact, it is phonologically identical to the inflectionally unmarked form of the simple verb, and it may therefore be said to occur in grade 1.

3.2.3 Antipassive with Class 1L roots

Antipassive verbs with Class 1L roots differ from antipassive verbs with other roots in that they are not characterized by breathy voice, but retain the inherent voice quality of the simple verb. This is seen in Table 16, which shows paradigms with the two non-breathy roots jör 'water' and nàj 'plait', and the two breathy roots buît 'build' and kôt 'scratch'.

Antipassive verbs with Class 1L roots furthermore differ from transitive derived verbs in that their inflectionally unmarked form has grade 3 rather than grade 2, and in that their non-finite form has grade 1 rather than grade 3.
Table 16: Paradigms with antipassive (AP) verbs with Class 1L roots.

<table>
<thead>
<tr>
<th>Gloss</th>
<th>‘water’</th>
<th>‘plait’</th>
<th>‘build’</th>
<th>‘scratch’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple Unm.</td>
<td>1°</td>
<td>jör</td>
<td>nág</td>
<td>bût</td>
</tr>
<tr>
<td>NF</td>
<td>1°</td>
<td>jör</td>
<td>nág</td>
<td>bût</td>
</tr>
<tr>
<td>AP Unm.</td>
<td>3°</td>
<td>jwɔɔr</td>
<td>nàaj</td>
<td>bwɔɔt</td>
</tr>
<tr>
<td>NF</td>
<td>1°</td>
<td>jör</td>
<td>nàaj</td>
<td>bût</td>
</tr>
<tr>
<td>NTS</td>
<td>2°</td>
<td>jöor*</td>
<td>nëej*</td>
<td>bût</td>
</tr>
<tr>
<td>1SG</td>
<td>3°</td>
<td>jwɔɔr</td>
<td>nàaj</td>
<td>bwɔɔt</td>
</tr>
<tr>
<td>2SG</td>
<td>3°</td>
<td>jwɔɔr-è</td>
<td>nàaj-è</td>
<td>bwɔɔt-è</td>
</tr>
<tr>
<td>3SG</td>
<td>2°</td>
<td>jöor</td>
<td>nëej</td>
<td>bût</td>
</tr>
<tr>
<td>1PL</td>
<td>2°</td>
<td>jöor-kù</td>
<td>nëej-kù</td>
<td>bût-kù</td>
</tr>
<tr>
<td>2PL</td>
<td>3°</td>
<td>jwɔɔr-kà</td>
<td>nàaj-kà</td>
<td>bwɔɔt-kà</td>
</tr>
<tr>
<td>3PL</td>
<td>2°</td>
<td>jöor-kè</td>
<td>nëej-kè</td>
<td>bût-kè</td>
</tr>
<tr>
<td>PASS.CT</td>
<td>2°</td>
<td>jöor-è*</td>
<td>nëej-è*</td>
<td>bût-è</td>
</tr>
</tbody>
</table>

Taken in isolation, the non-finite forms jöor of ‘water’, bût of ‘build’ and kôt of ‘scratch’ are ambiguous between grades 1 and 2, while, conversely, the non-finite form nàaj of ‘plait’ is ambiguous between grade 1 and grade 3; but for exactly this reason, all of these forms must be taken to have grade 1.

3.2.4 Antipassive with Class 2F roots

The formation of antipassive verbs with Class 2F roots depends on the inherent voice quality of the root vowel. All forms have breathy voice quality, but the two subclasses differ with respect to vowel length and tone (Andersen 1992–1994). With non-breathy roots, as exemplified in Table 17, the inflectionally unmarked form has a medium-length vowel and a low tone, while the non-finite form has a long vowel and a high tone.

In three of the four paradigms in Table 17, it is indeterminable whether the vowel quality grade of the inflectionally unmarked form and the non-finite form is 1° or 2° when viewed in isolation. This is the case for /j/ in ‘pull’, /ŋ/ in ‘drive’, and /ɔ/ in ‘milk’. In the paradigm with ‘hate’, however, the /ŋ/ unambiguously belongs to grade 2. So generalizing, the vowel qualities /j/, /ŋ/ and /ɔ/ in the other paradigms may also be taken to belong to grade 2. Given this generalization, Table 17 further reveals that for roots with the non-breathy quality /ŋ/, there are three different breathy grade 2 alternants: /ŋ/ in ‘hate’, /ŋ/ in ‘drive’ and /ɔ/ in ‘milk’. This alternation is dealt with and discussed in Section 4.4 below.
Table 17: Paradigms with antipassive (AP) verbs with non-breathy Class 2F roots.

<table>
<thead>
<tr>
<th>Gloss</th>
<th>‘pull’</th>
<th>‘hate’</th>
<th>‘drive’</th>
<th>‘milk’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unm.</td>
<td>1°</td>
<td>mjit</td>
<td>māan</td>
<td>kwàat</td>
</tr>
<tr>
<td>NF</td>
<td>1°</td>
<td>mjit</td>
<td>māaan</td>
<td>kwàaṭ</td>
</tr>
<tr>
<td>AP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unm.</td>
<td>2°</td>
<td>mjit</td>
<td>m ĕnn</td>
<td>kwēet</td>
</tr>
<tr>
<td>NF</td>
<td>2°</td>
<td>mjit</td>
<td>m ĕenn</td>
<td>kwēeṭ</td>
</tr>
<tr>
<td>NTS</td>
<td>2°</td>
<td>mjit</td>
<td>m ĕenn*</td>
<td>kwēeet*</td>
</tr>
<tr>
<td>1SG</td>
<td>3°</td>
<td>mjēeet</td>
<td>māaan</td>
<td>kwēeet</td>
</tr>
<tr>
<td>2SG</td>
<td>3°/2°</td>
<td>mjēeet- ĕ, mjit</td>
<td>m ĕnn</td>
<td>kwēeet- ĕ, kwēeṭ</td>
</tr>
<tr>
<td>3SG</td>
<td>2°</td>
<td>mjit</td>
<td>m ĕenn</td>
<td>kwēeet</td>
</tr>
<tr>
<td>1PL</td>
<td>2°</td>
<td>mjēt- kū</td>
<td>m ĕnn-kō</td>
<td>kwēeet-kū</td>
</tr>
<tr>
<td>2PL</td>
<td>3°</td>
<td>mjēet-kā</td>
<td>māan-kā</td>
<td>kwēeet-kā</td>
</tr>
<tr>
<td>3PL</td>
<td>2°</td>
<td>mjēt- kē</td>
<td>m ĕnn-kē</td>
<td>kwēeet-kē</td>
</tr>
<tr>
<td>PASS.CT</td>
<td>2°</td>
<td>mjēt- ĕ</td>
<td>m ĕenn- ĕ*</td>
<td>kwēeet- ĕ*</td>
</tr>
</tbody>
</table>

Table 17 also illustrates that the 2SG form of antipassive verbs with roots of this subclass exhibits free variation between a form with the suffix - ĕ and with grade 3 in the root (C̣VVC̣- ĕ) and a form without a suffix and with grade 2 in the root (C̣VVC̣).19 Thus, for instance, there is free variation between mjēeet- ĕ and mjit with the root mjit ‘pull’ and between kwēeet- ĕ and kwēeṭ with the root kwàat ‘drive’.

With breathy Class 2F roots, as illustrated in Table 18, the inflectionally unmarked form has a medium or long vowel and a high tone, while the non-finite form also has a medium or long vowel, but a low tone.20 In this case it seems to be indeterminable whether these two forms belong to grade 1 or grade 2. The reason is that, apparently, there are no transitive roots with a medium breathy /a/. Such roots would have the quality /a/ in grade 1 and the quality /e/ in grade 2. But given the evidence from the corresponding forms of antipassive verbs with non-breathy Class 2F roots, the forms in question may be taken to belong to grade 2.

---

19 This inter- and intra-individual variation was not reported in Andersen (1992–1994). One speaker systematically gave me only disyllabic forms, while another speaker systematically gave me both disyllabic forms and monosyllabic forms. A similar variation is found in 2SG forms of simple intransitive verbs. Compare, for instance, the inflectionally unmarked form njiñ ‘sleep’ (1°) and the 2SG forms njiñ- ĕ (3°) ~ njiñ (1°).

20 It is not clear whether the length variation between medium and long is free or lexically determined.
Table 18: Paradigms with antipassive (AP) verbs with breathy Class 2F roots.

<table>
<thead>
<tr>
<th>Gloss</th>
<th>'crack'</th>
<th>'withhold'</th>
<th>'wake up'</th>
<th>'ask'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple Unm.</td>
<td>1°</td>
<td>tōok</td>
<td>pēeen</td>
<td>pwōoc</td>
</tr>
<tr>
<td>NF</td>
<td>1°</td>
<td>tōook</td>
<td>pēeen</td>
<td>pwōoc</td>
</tr>
<tr>
<td>AP Unm.</td>
<td>2°</td>
<td>tōook</td>
<td>pēeen</td>
<td>pwōoc</td>
</tr>
<tr>
<td>NF</td>
<td>2°</td>
<td>tōook</td>
<td>pēeen</td>
<td>pwōoc</td>
</tr>
<tr>
<td>NTS</td>
<td>2°</td>
<td>tōook-é</td>
<td>pēeen*</td>
<td>pwōoc*</td>
</tr>
<tr>
<td>1SG</td>
<td>3°</td>
<td>tōōk</td>
<td>pēēen</td>
<td>pijāc</td>
</tr>
<tr>
<td>2SG</td>
<td>3°</td>
<td>tōōk-é</td>
<td>pēēen-é</td>
<td>pijāc-é</td>
</tr>
<tr>
<td>3SG</td>
<td>2°</td>
<td>tōook</td>
<td>pēeen</td>
<td>pwōoc</td>
</tr>
<tr>
<td>1PL</td>
<td>2°</td>
<td>tōook-kû</td>
<td>pēeen-kû</td>
<td>pwōoc-kû</td>
</tr>
<tr>
<td>2PL</td>
<td>3°</td>
<td>tōōk-kâ</td>
<td>pēēen-kâ</td>
<td>pijāc-kâ</td>
</tr>
<tr>
<td>3PL</td>
<td>2°</td>
<td>tōook-kê</td>
<td>pēeen-kê</td>
<td>pwōoc-kê</td>
</tr>
<tr>
<td>PASS.CT</td>
<td>2°</td>
<td>tōook-ê</td>
<td>pēeen-ê</td>
<td>pwōoc-ê</td>
</tr>
</tbody>
</table>

3.2.5 Antipassive with Class 2H roots

The formation and inflection of antipassive verbs with Class 2H roots are exemplified with four roots in Table 19: the non-breathy roots lǒ̂k ‘wash’ and Ṉāañ ‘open’, and the breathy roots ḍēēt ‘transport’ and kǒɔm ‘thresh’.

The inflectionally unmarked form and the non-finite form both have a short vowel. But whereas the inflectionally unmarked form is characterized by breathy voice like the other finite forms, the non-finite form retains the inherent voice quality of the root. Determining the vowel grade of these two forms, however, is problematic. Grade 3 is excluded, because the forms do not exhibit lowering. But

Table 19: Paradigms with antipassive (AP) verbs with Class 2H roots.

<table>
<thead>
<tr>
<th>Gloss</th>
<th>'wash'</th>
<th>'open'</th>
<th>'transport'</th>
<th>'thresh'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple Unm.</td>
<td>1°</td>
<td>lǒ̂k</td>
<td>Ṉāañ</td>
<td>ḍēēt</td>
</tr>
<tr>
<td>NF</td>
<td>1°</td>
<td>lǒ̂k</td>
<td>Ṉāañ</td>
<td>ḍēēt</td>
</tr>
<tr>
<td>AP Unm.</td>
<td>1°</td>
<td>lǒ̂k</td>
<td>Ṉāañ</td>
<td>ḍē</td>
</tr>
<tr>
<td>NF</td>
<td>1°</td>
<td>lǒ̂k</td>
<td>Ṉāañ</td>
<td>ḍē</td>
</tr>
<tr>
<td>NTS</td>
<td>2°</td>
<td>lǒ̂k</td>
<td>ḍēēp*</td>
<td>ḍēēt*</td>
</tr>
<tr>
<td>1SG</td>
<td>3°</td>
<td>lǒ̂k</td>
<td>Ṉāañ</td>
<td>ḍē</td>
</tr>
<tr>
<td>2SG</td>
<td>3°</td>
<td>lǒ̂k-é</td>
<td>Ṉāañ-é</td>
<td>ḍēēt-é</td>
</tr>
<tr>
<td>3SG</td>
<td>2°</td>
<td>lǒ̂k</td>
<td>ḍēēp</td>
<td>ḍē</td>
</tr>
<tr>
<td>1PL</td>
<td>1°/2°</td>
<td>lǒ̂k/lǒ̂k-kû</td>
<td>ḍēēp-kû</td>
<td>ḍē/ḍēēt-kû</td>
</tr>
<tr>
<td>2PL</td>
<td>3°</td>
<td>lǒ̂k/lǒ̂k-kâ</td>
<td>Ṉāañ-kâ</td>
<td>ḍē/ḍēēt-kâ</td>
</tr>
<tr>
<td>3PL</td>
<td>1°/2°</td>
<td>lǒ̂k/lǒ̂k-kê</td>
<td>ḍēēp-kê</td>
<td>ḍē/ḍēēt-kê</td>
</tr>
<tr>
<td>PASS.CT</td>
<td>2°</td>
<td>lǒ̂k-ê</td>
<td>ḍēēp-ê</td>
<td>ḍēēt-ê</td>
</tr>
</tbody>
</table>
there is no way of distinguishing between grade 1 and grade 2 here, since I assume that the contrast between the qualities /a/ and /ɛ/ in medium-length and long vowels is absent in short vowels (cf. Section 2.5 above), and since fronting, which is the basis for positing grade 2, only applies to /a/. For reasons of parsimony, however, I posit grade 1 for these forms, since grade 1 is overall the “unmarked” grade.

The root vowel of the three plural forms varies freely between short and medium. The root vowel of the 2PL form belongs to grade 3, since ‘wash’, ‘transport’ and ‘thresh’ exhibit lowering with both vowel lengths. The 1PL and 3PL forms with a medium vowel belong to grade 2, since ‘open’ undergoes fronting. But when the root vowel of these forms is short, the above-mentioned problem of distinguishing between grade 1 and grade 2 recurs, and again I posit grade 1. As a consequence of this analysis, the inflection of antipassive verbs with Class 2H roots, when the root vowel is short in the plural forms, follows the same pattern as that of simple verbs with Class 1F or 1L roots, except for the non-finite form and the 2SG form.

3.3 Range of Fronting in grade 2

In simple verbs, the morphophonological rule of Fronting, which characterizes grade 2, applies only to the low central vowel quality /a/, as exemplified in (4) with the non-breathy root bər ‘take along’ (Class 1F) and in (5) with the breathy root tər ‘spear’ (Class 1F). Vowel grade specification of the verb is indicated in parentheses after the sentences.

(4)  a. məc ə = bər  təŋ. (1°)
    man  D = take_along spear
    ‘The man is taking a spear along.’

   b. wən ə = bɛr. (2°)
    cow  D = take_along.3SG
    ‘He is taking the cow along.’

(5)  a. məc ə = tər  ləj. (1°)
    man  D = spear animal
    ‘The man is spearing an animal.’

21 One speaker gave me the shorter forms, another speaker the longer forms. In Andersen (1992–1994: 43), the three plural forms were described as having a short root vowel.

22 The verb forms in (4a) and (5a) are inflectionally unmarked forms, not 3SG forms. Verbs are not inflected for subject when preceded by a subject NP or when having a covert subject, which is a third person pronominal, cf. Andersen (1991, 1992–1994).
b. láj _INCREMENT_ à = tjikker. (2°)
animal D = spear.3SG
‘He is spearing the animal.’

As seen in the 3SG forms, which are grade 2 forms, Fronting has the effect of changing /a/ to /ɛ/ whether the voice quality is non-breathy (4b) or breathy (5b). In derived verbs, however, Fronting may in addition apply to roots with the rounded lower-mid back vowel quality /ɔ/ (whether non-breathy or breathy) and to roots which have breathy /o̞/ as a raised variant of /ɔ/. In that case, Fronting also involves unrounding. I have not examined how common this extension of the range of Fronting is.

Fronting of non-breathy /ɔ/ to /ɛ/ is seen in derived verbs that do not undergo voice quality shift, i.e., centrifugal verbs with roots of any of the four classes and antipassive verbs with Class 1L roots. The application of Fronting to /ɔ/ in centrifugal verbs is illustrated in (6) with the root cɔol ‘call’ (Class 2F).

(6) a. tiik _INCREMENT_ à = cɔɔol meṭ. (1°)
woman D = call. child
‘The woman is calling the child.’

b. meṭ _INCREMENT_ à = cɔɔol. (2°)
child D = call. 3SG
‘She is calling the child.’

c. tiik _INCREMENT_ à = cɔɔol/ɛɛɛɛl meṭ. (2°)
woman D = call.CF child
‘The woman is calling the child (away).’

d. meṭ _INCREMENT_ à = cɔɔol/ɛɛɛɛl. (2°)
child D = call.CF.3SG
‘She is calling the child (away).’

e. tiik _INCREMENT_ à = cɔɔol meṭ. (2°)
woman D = call.CP child
‘The woman is calling the child hither.’

f. meṭ _INCREMENT_ à = cɔɔol. (2°)
child D = call.CP.3SG
‘She is calling the child hither.’

In (6a) we find the vowel quality /ɔ/ as grade 1 in cɔɔol, the inflectionally unmarked form of the simple verb. In (6b) the 3SG form of the simple verb, cɔɔol, occurs in grade 2, but has the same vowel quality. In the centrifugal grade 2 forms in (6c-d), Fronting applies optionally, so that the inflectionally unmarked or 3SG form cɔɔol varies freely with the fronted variant cɛɛɛɛl. Centripetal and other derived categories
characterized by breathiness are not affected by Fronting since their vowel quality is /o/ rather than /ɔ/, as illustrated in (6e-f).

The application of Fronting to /ɔ/ in antipassive verbs with Class 1L roots is illustrated in (7) with the root tɔŋ 'light a cow-dung fire'.

(7) a. mɔc ə = tɔŋ gɔl. (1°)
   man D = light cow_dung_fire
   ‘The man is lighting a cow-dung fire.’

b. kɔ tɔŋ/teŋ. (2°)
   and light.AP.3SG
   ‘and he is lighting.’

As seen in (7b), the 3SG antipassive form varies freely between non-fronted tɔŋ and fronted teŋ.

Fronting may also apply to roots in which /ɔ/ is preceded by postconsonantal /j/, as in (8) with the root rjɔ 'pay wages, hire, rent' (Class 1F).

(8) a. bɔn ə = rjɔ pɔc = k-ɛ. (1°)
   chief D = pay person.PL-CS2 = PL-3SG
   ‘The chief is paying his people.’

b. bɔn ə = rjɛp uɔt. (2°)
   chief D = pay.CF house
   ‘The chief is renting a house (for somebody or away).’

As seen in (8b), the inflectionally unmarked form of the centrifugal verb has been attested with the fronted form rjɛp.

Again, Fronting applies optionally in grade 2 to a non-breathy /ɔ/ preceded by a postconsonantal /w/, but here with an additional consequence, as illustrated in (9) with the root bwɔt 'follow' (Class 2F).

(9) a. jʊ ə = bwɔt mɔc. (1°)
   dog D = follow man
   ‘The dog is following the man.’

b. jʊ ə = bwɔt/bjɛt mɔc rʊoor. (2°)
   dog D = follow.CF man bush.LOC
   ‘The dog is following the man (away) into the bush.’

c. jʊ ə = cé mɔc bjaaat rʊoor. (3°)
   dog D = PF man follow.CF.NF bush.LOC
   ‘The dog has followed the man (away) into the bush.’
Corresponding to the simple verb with the inflectionally unmarked grade 1 form bwɔɔt in (9a), the centrifugal, inflectionally unmarked grade 2 form bwɔɔɔt in (9b) varies freely with the fronted form bjɛɛt. In the latter variant, the postconsonantal labiovelar glide /w/ has been replaced with the palatal glide /j/. This is similar to the grade 3 alternant of such verbs, as seen in (9c), where the grade 3 form is bjɑɑat. Thus, the unrounding of /ɔ/ is accompanied by unrounding of the preceding /w/, presumably as a result of assimilation.

In Andersen (1993: 21) it was argued, on the basis of the morphology of simple verbs, that although either of grades 1 and 2 could be considered basic, it is simpler to take grade 1 to be basic. We now see independent and decisive evidence for this analysis in the following fact: The contrast between /a/ and /ɔ/, which exists in grade 1, is (optionally) neutralized in grade 2 forms of centrifugal verbs. Hence grade 2 cannot be basic.

Fronting of breathy /ɔ̃/ to /ɛ̃/ in derived verbs is illustrated in (10) with the root kɔ̃l ‘fan’ (Class 1F).

(10) a. tǐk ǎ = kɔ̃l mɛt. (1°)
   woman  D = fan  child
   ‘The woman is fanning the child.’

b. mɛt ǎ = kɔ̃l. (2°)
   child  D = fan.3SG
   ‘She is fanning the child.’

c. tǐk ǎ = kɛɛl jɑɑr. (2°)
   woman  D = fan.CF  leaf
   ‘The woman is fanning (with) a leaf.’

d. jɑɑr ǎ = kɛɛl. (2°)
   leaf  D = fan.CF.3SG
   ‘She is fanning (with) the leaf.’

e. tǐk ǎ = kɛɛl jɑɑr. (2°)
   woman  D = fan.CP  leaf
   ‘The woman is fanning (with) a leaf hither.’

f. jɑɑr ǎ = kɛɛl. (2°)
   leaf  D = fan.CP.3SG
   ‘She is fanning (with) the leaf hither.’

In (10a-b) the verb ‘fan’ is simple, with the inflectionally unmarked form kɔ̃l occurring in grade 1, and the 3SG form kɔ̃l occurring in grade 2. In (10c-d) the
verb is centrifugal and in (10e-f) centripetal, and the forms given here also occur in grade 2, but with the fronted quality /ɛ/. 23

Free inter- and intra-individual variation between the non-fronted quality /ɔ/ and the fronted quality /ɛ/ is exemplified in (11) with the root gɔt 'write' (Class 1F). As seen in (11b), the 3SG antipassive verb varies freely between gɔt and gẽt.

(11) a. bán  /*#__  = gɔt  atooor. (1°)
   chief  D  = write  letter
   ‘The chief is writing a letter.’
   b. kù  gɔt/gẽt. (2°)
   and  write.AP.3SG
   ‘and he is writing.’

In derived verbs, Fronting also applies in grade 2 to breathy /o/ preceded by a postconsonantal /w/, as illustrated with the root bwɔok 'slap' (Class 2F) in (12).

(12) a. móc  /*#__  = bwɔok  mɛt. (1°)
   man  D  = slap  child
   ‘The man is slapping the child.’
   b. móc  /*#__  = bjêek  e  cĩn  pĩn. (2°)
   man  D  = slap.CF  3SG  hand  ground.ALL
   ‘The man is slapping his hand onto the ground.’
   c. móc  /*#__  = cẽe  cĩn  bjâaak  pĩn. 24 (3°)
   man  D  = PF.3SG  hand  slap.CF.NF  ground.ALL
   ‘The man has slapped his hand onto the ground.’

The centrifugal counterpart of the inflectionally unmarked form of the simple verb bwɔok in (12a) has the form bjêek, as seen in (12b). As in (9) above, the fronting here has the additional consequence that the postconsonantal /w/ is turned into /j/. This change in the postconsonantal glide is also seen in the grade 3 form bjâaak in (12c) as a result of Lowering. The fact that Fronting applies to /wɔ/ is evidence that /wɔ/ is a raised form of underlying /wo/, an analysis argued for in Andersen (1993: 16 and 28–29). The fronting in (12b) may thus be said to apply to the underlying form /bwɔɔk/ with the output /bjêek/, which in turn undergoes raising to the actual form bjêek.

23 On the argument alternation that can be observed in (10), between the object being a patient (10a-b) and a theme (or instrument) (10c-f), see Andersen (2012a: 41–44).
24 The form [cẽe] in (12c) is a contraction of PF cẽ and 3SG ẽ.
4 Voice quality shift and vowel quality

4.1 From /ɔ̰/ to /ʊ̰/, and from /o̰/ to /ṵ/

The shift from non-breathy voice to breathy voice, which is an exponent of derivation, may involve a shift in vowel quality, more specifically a shift in height and, to a more limited extent, a shift in rounding.

The basics of voice quality shift (VQS) are most clearly seen in the antipassive of Class 2H roots, since the set of forms with this derivational status here arguably exhibits all three vowel alternation grades (cf. Section 3.2.5 above), whereas other derivational categories characterized by VQS only involve grades 2 and 3. Table 20 shows, for each of the five non-breathy grade 1 vowels without a preceding postconsonantal glide, the following four forms: the simple verb’s inflectionally unmarked form (which has grade 1) and three representative forms of the antipassive verb, namely the inflectionally unmarked form, which has grade 1, the 3SG form, which has grade 2, and the 1SG form, which has grade 3.

Table 20: Voice quality shift in the antipassive of non-breathy Class 2H roots.

<table>
<thead>
<tr>
<th></th>
<th>Simple Antipassive</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unm.</td>
</tr>
<tr>
<td>1°</td>
<td>ḏi̱l</td>
</tr>
<tr>
<td>/i̱/</td>
<td>w̱e̱c</td>
</tr>
<tr>
<td>/e̱/</td>
<td>ṉe̱n</td>
</tr>
<tr>
<td>/a̱/</td>
<td>ḻɔ̱k</td>
</tr>
<tr>
<td>/ɔ̱/</td>
<td>ṉo̱t</td>
</tr>
<tr>
<td>/o̱/</td>
<td>j̱ɔ̱l</td>
</tr>
<tr>
<td>/ɔ̰/</td>
<td>ḏɔ̱m</td>
</tr>
</tbody>
</table>

As seen in the table, the unrounded vowels /i̱/, /e̱/ and /a̱/ retain their quality in grade 1 when they become breathy. By contrast, the rounded vowels /ɔ̱/ and /o̱/ are raised to /o̱/ and /u̱/, respectively. Thus, both of them are raised by one step: /ɔ̱/ from lower-mid to higher-mid, and /o̱/ from higher-mid to high. This alternation is completely regular, as illustrated with centripetal verbs in (13) and (14), which show the inflectionally unmarked form of simple verbs and of the corresponding centripetal verbs.

(13) Simple CP
    cɔ̱ol c̱o̱ool ‘call’ (2F)
    dɔ̱m ḏɔ̱om ‘catch’ (1F)
In transitive derived verb categories characterized by breathy voice, there are no grade 1 forms. When a non-breathy /a/ becomes breathy in such categories, it either undergoes fronting (and raising) to /ɛ̃/ in grade 2 forms or it is manifested as /a̞/ in grade 3 forms.

Once having become breathy, the vowels in Table 20 conform to the same vowel gradation system as inherently breathy root vowels, cf. Table 4 above.

4.2 From /wɔ/ to /a̞/

In grades 1 and 2 of simple verbs, there is complementary distribution between /wɔ/ and /a̞/ after an onset consonant (Andersen 1993: 18). Thus, /wɔ/ only occurs after labial onsets, while /a̞/ only occurs after non-labial onsets and after a postconsonantal /j/. As exemplified with inflectionally unmarked forms in (15), /wɔ/ thus occurs after the labial consonants /p/ (15a), /b/ (15b) and /m/ (15c).

(15) a. pwɔɔt ‘skin, bark’ (2F)
    b. bwɔɔk ‘blow (of wind)’ (1F)
    bwɔɔt ‘follow’ (2F)
c. mwɔc ‘give’ (2F)
mwɔk ‘churn’ (2F)

As similarly exemplified with inflectionally unmarked forms in (16), /ɔ/ occurs after interdentals (16a), alveolars (16b), palatals (16c), and velars (16d).

(16) a. tɔn ‘send for’ (1F)
dɔm ‘stalk’ (1F)
b. tɔn ‘knock’ (2H)
dɔk ‘spin’ (1F)
lɔk ‘wash’ (2H)
rɔm ‘share’ (1F)
c. cɔl ‘call’ (2F)
jɔt ‘lift’ (1F)
nɔr ‘bewitch’ (1L)
jɔŋ ‘mistreat’ (1L)
fjɔn ‘press’ (2H)
d. kɔc ‘sew, mend’ (2F)
gɔl ‘begin’ (1F)
ŋɔk ‘vomit’ (1F)
uɔc ‘buy’ (2F)

Given this distribution, Andersen (1993: 18) analyzed post-onset /wɔ/ as derived from underlying /ɔ/ by a rule of Labialization after labial onsets.

When roots with post-onset /wɔ/ undergo voice quality shift, the postconsonantal /w/ disappears, as seen in (17).

(17) a. mɛt ə = bwɔt mān. (1°)
   child D = follow mother.3SG
   ‘The child is following his mother.’
   b. mɛt ə = bwɔot māan wjiːr. (2°)
       child D = follow.CF mother.3SG river.LOC
       ‘The child is following his mother to the river.’
   c. mɛt ə = bʊot. (2°)
      child D = follow.AP
      ‘The child is following.’
   d. mɛt ə = bʊot māan lāaan. (2°)
       child D = follow.CP mother.3SG side.CS1.DEM1
       ‘The child is following his mother this way.’
The simple verb ‘follow’ has a postconsonantal /w/ in the inflectionally unmarked form \(bwɔɔt\) (17a), a /w/ which also occurs in the inflectionally unmarked centrifugal form \(bwɔɔt\) (17b). But in the breathy forms with this root, there is no postconsonantal /w/, as seen in the inflectionally unmarked antipassive form \(bɔɔt\) with grade 2 in (17c), in the inflectionally unmarked centripetal form \(bɔɔt\) with grade 2 in (17d), and in the non-finite centripetal form \(bɔɔt\) with grade 3 in (17e). Thus, /wɔ/ (with a postconsonantal /w/) behaves in the same way as /ɔ/ (without a postconsonantal /w/), its breathy counterparts being /o/ in grade 2 and /ɔ/ in grade 3, cf. Section 4.1 above. So VQS does not apply to the surface form with /wɔ/, but to the underlying form with /ɔ/.

### 4.3 Raising

In some cases, the voice quality shift involves more vowel quality changes than those dealt with in Section 4.1 above. In particular, some vowels undergo raising conditioned by the preceding consonant. Such raising, which is possibly specific to the Agar dialect, is accounted for in the following subsections. It is argued that in some cases the raising is an integral part of the voice quality shift, whereas in other cases it is due to a separate process.

#### 4.3.1 From /a/ to /e/ after /w/

When /a/ undergoes voice quality shift, it basically becomes /a/ in grade 1, /ɛ/ in grade 2, and /a/ in grade 3. However, when /a/ is preceded by /w/, it becomes /ɛ/ in grades 1 and 2, and /ɛ/ in grade 3. This is the case whether the preceding /w/ is an onset or occurs in postconsonantal position. The clauses in (18) illustrate the phenomenon with /w/ as onset in the non-breathy root \(wáak\) ‘rinse’ (Class 2H).

\[(18) \quad \begin{array}{ll}
\text{a.} & \text{mèt} \quad \hat{a} = wáak \quad ȃlāət. \quad (1°) \\
& \text{child} \quad D = \text{rinse} \quad \text{cloth} \\
& \text{‘The child is rinsing a cloth.’} \\
\text{b.} & \text{tīlk} \quad \hat{a} = wèk. \quad (1°) \\
& \text{woman} \quad D = \text{rinse.AP} \\
& \text{‘The woman is rinsing.’}
\end{array}\]
c. \( k\u0120 \ w\u0122ek \) (2°)
and rinse.AP.3SG
‘and she is rinsing.’
d. \( k\u0120 \ w\u0122ek \) (3°)
and rinse.AP.1SG
‘and I am rinsing.’

In (18a) the root occurs as a simple verb in its inflectionally unmarked form. In (18b) it occurs in the corresponding inflectionally unmarked antipassive form \( w\u0122ek \) with the grade 1 vowel /ḛ/. In (18c) it occurs in the 3SG antipassive form \( w\u0122ek \) with the grade 2 vowel /ḛ/. And in (18d) it occurs in the 1SG antipassive form \( w\u0122ek \) with the grade 3 vowel /ḛ/. In this way, the breathy alternants of /a̰/ here merge with the breathy alternants of /ḛ/. This is seen when (18) is compared with the parallel set of forms with the non-breathy root \( \text{g\u0120et} \) ‘roast’ (Class 2H) in (19).

(19) a. \( m\u0124l\u00e9n \ a = g\u0120et \ \text{n\u0120m}. \) (1°)
maternal_aunt.1SG  D = roast  sesame.PL
‘My maternal aunt is roasting sesame.’
b. \( m\u0124l\u00e9n \ a = g\u0120t. \) (1°)
maternal_aunt.1SG  D = roast.AP
‘My maternal aunt is roasting.’
c. \( k\u0120 \ g\u0120et \ \text{\u0122a}j\u00e5. \) (2°)
and  roast.AP.3SG  also
‘and she is also roasting.’
d. \( k\u0120 \ g\u0120et \ \text{\u0122a}j\u00e5. \) (3°)
and  roast.AP.1SG  also
‘and I am also roasting.’

As in (18), grades 1 and 2 are /ḛ/, and grade 3 is /ḛ/.
That /w/ has the same effect in postconsonantal position is seen in (20) with the non-breathy root \( \text{j\w\u00e9\u0120r} \) ‘collect’ (Class 2H).

(20) a. \( m\u0120c \ a = j\w\u00e9\u00f2r \ \text{u\j\u00e6k}. \) (1°)
man  D = collect  cow.PL
‘The man is collecting cows.’
b. \( m\u0120c \ a = j\w\u00e9\u00f2r. \) (1°)
man  D = collect.AP
‘The man is collecting.’
In (20a) the root occurs as a simple verb in its inflectionally unmarked form. In (20b) it occurs in the corresponding inflectionally unmarked antipassive form *jwēr* with the grade 1 vowel */e/.* In (20c) the root occurs in the inflectionally unmarked dative form *jwēr*, with the vowel */e/ here belonging to grade 2. And in (20d) it occurs in the non-finite dative form *jwēr*, whose vowel */e/ belongs to grade 3.

The same phenomenon is seen in (21) with the non-breathy root *gwâr* ‘clear a field’ (Class 1F).

(21) a. *wáamazonat* à = *gwâr* dòm íc. (1°)  
brother.1SG D = clear field stomach  
‘My brother is clearing the field.’

b. *ku* *gwâr*.(2°)  
and clear.AP.3SG  
‘and he is clearing.’

c. *ku* *gwâr*. (3°)  
and clear.AP.1SG  
‘and I am clearing.’

In (21b) the 3SG antipassive verb has the grade 2 form *gwâr*, and in (21c) the 1SG antipassive verb has the grade 3 form *gwâr*. Again, the breathy alternants of */a/ here merge with the breathy alternants of */e/,* cf. the parallel set of examples in (22) with the root *cwêt* ‘eat meat’ (Class 1F).

(22) a. *mèt* à = *cwêt* rîn. (1°)  
child D = eat meat  
‘The child is eating meat.’

b. *ku* *cwêt*. (2°)  
and eat.AP.3SG  
‘and he is eating.’

c. *ku* *cwêt*. (3°)  
and eat.AP.1SG  
‘and I am eating.’
A /w/ has no raising effect on forms whose root has an inherently breathy /a/. This is the case whether the /w/ is an onset or occurs in postconsonantal position, as seen in (23)–(24). The /w/ is postconsonantal in the root gwâr ‘grind’ (Class 1F) in (23), which parallels and contrasts with (21) with the root gwâr ‘clear a field’.

(23) a. nà ̀ a = gwâr ràp. (1°)
   girl D = grind sorghum.PL
   ‘The girl is grinding sorghum.’

b. kù gwèer. (2°)
   and grind.AP.3SG
   ‘and she is grinding.’

c. kù gwâar. (3°)
   and grind.AP.1SG
   ‘and I am grinding.’

In the 3SG antipassive form in (23b), the grade 2 vowel is manifested as /ɛ̤/, and in the 1SG antipassive form in (23c), the grade 3 vowel is manifested as /a̤/. In (24) the preceding /w/ occurs in onset position in the root wâl ‘pour’ (Class 1F), and grade 2 is again manifested as /ɛ̤/, here in the inflectionally unmarked antipassive form in (24b).

(24) a. tìlk ̀ a = wâl pìiw. (1°)
   woman D = pour water.PL
   ‘The woman is pouring water.’

b. tìlk ̀ a = wèel. (2°)
   woman D = pour.AP
   ‘The woman is pouring.’

Because only roots with a lexically non-breathy vowel are affected by a preceding /w/, the raising of the breathy alternant of non-breathy /a/ from /a/ to /ɛ̤/ after /w/ in grades 1 and 2 must be an integral part of the VQS itself. If it were a result of a general assimilation rule raising grade 1 /a/ to /ɛ̤/, grade 2 /ɛ̤/ to /ɛ̤/ and grade 3 /a̤/ to /ɛ̤/ after the high semivowel /w/, then such a rule should also affect the corresponding inherently breathy vowels, but as seen in (23)–(24), this is not the case. Hence, when grade 3 is /ɛ̤/, the corresponding grade 2 vowel /ɛ̤/ is underlyingly /ɛ̤/ and not just a raised manifestation of underlying /ɛ̤/.
4.3.2 From /ə/ to /e/ after a palatal

Raising may also affect the breathy alternants of /ə/ after the palatal postconsonantal glide /j/, but here there is some variability. In (25) raising affects the breathy alternants of /ə/ in the root njac ‘squeeze’ (Class 1F).

(25) a. tiðk ə = njac ələat. (1°)
   woman D = squeeze cloth
   ‘The woman is wringing a cloth.’

b. akúuur ə = njec måan cjeec. (2°)
   Akur D = squeeze.DAT mother.3SG honey
   ‘Akur is squeezing honey for her mother.’

c. akúuur ə = cé måan njec cjeec. (3°)
   Akur D = PF mother.3SG squeeze.DAT.NF honey
   ‘Akur has squeezed honey for her mother.’

Here the breathy grade 2 alternant of /ja/ is /je/, as seen in the inflectionally unmarked dative form njec in (25b). The breathy grade 3 alternant is manifested in the same way, as seen in the homonymous non-finite dative form njec in (25c). The same pattern is found in (26) with the root tjak ‘marry, pay bride price’ (Class 2F).

(26) a. mıc ə = tjak tiðk. (1°)
   man D = marry woman
   ‘The man is marrying a woman.’

b. raan ə = tjeeek tiðk. (2°)
   person D = marry.CP woman
   ‘The person is marrying a woman and bringing her here.’

c. raan ə = cé tiðk tjeeek. (3°)
   person D = PF woman marry.CP.NF
   ‘The person has married a woman and brought her here.’

Thus, the breathy alternants of /ja/ are here indistinguishable from the inherently breathy /je/ series, which is exemplified in (27) with the root tjec ‘ask’ (Class 2F).

(27) a. tiðk ə = tjec cóol. (1°)
   woman D = ask Col
   ‘The woman is asking Col.’

b. kaw ə = tjeeec bóol. (2°)
   Kau D = ask.AP.DAT Bol
   ‘Kau is asking on behalf of Bol.’
c. ƙàaw ƙà = cè bòol tjęeec. (3°)
Kau D=PF Bol ask.AP.DAT.NF
‘Kau has asked on behalf of Bol.’

Here grades 2 and 3 are also both /je/, like grade 1. So the raising that occurs when the roots njáč in (25) and tjáak in (26) become breathy seems to be an integral part of VQS.

For unknown reasons, the situation is different for some other roots with /ja/, for instance tjáam ‘win’ (Class 2H), which exhibits another pattern, as seen in (28).

(28) a. dààk à = tjáam téeec. (1°)
boy D = win game
‘The boy is winning the game.’

b. mëët àà = tjeem wwo òon = d-ën. (2°)
child.PL D.PL = win.AP.DAT cattle_camp.CS2 = SG-3PL
‘The children are winning for their cattle camp.’

c. mëët àà = cè wwo òon = d-ën tjáam. (3°)
child.PL D.PL = PF cattle_camp.CS2 = SG-3PL win.AP.DAT.NF
‘The children have won for their cattle camp.’

In (28b) the breathy grade 2 alternant of /ja/ is /je/, as in (25b) above, but the grade 3 alternant is /ja/, as seen in (28c).25 Thus, the breathy forms with this root behave (more) like forms of roots with inherently breathy /ja/, as seen in (29) with the root tják ‘bury’ (Class 1F) and in (30) with the root djáam ‘destroy’ (Class 1F).

(29) a. mòc à = tják mán = d-è. (1°)
man D = bury child.CS2 = SG-3SG
‘The man is burying his child.’

b. mòc à = tjeek/tjeek. (2°)
man D = bury.AP
‘The man is burying.’

c. kù t:jáak. (3°)
and bury.AP,1SG
‘and I am burying.’

25 What happens to /a/ after a postconsonantal /j/ when undergoing voice quality shift has been examined for nine roots. In six of these roots, /a/ becomes /e/ in grade 3, namely in ljáac ‘impregnate’, ljàt ‘peer at’, njáč ‘squeeze’, njàar ‘love’, tjáak ‘marry’, and tjáan ‘hide’. In three of the roots, /a/ becomes /a/ in grade 3, namely in ljáam ‘attack from behind’, ljàan ‘drip’, and tjáam ‘win’.
Here grade 2 varies between /jɛ/ and /je/, as in (29b) and (30b), so the raising of /jɛ/ to /je/ is optional, while grade 3 is invariably /ja/, as illustrated in (29c) and (30c). Hence the raising in (28b) above is not an integral part of VQS, but is a process occurring after the voice quality shift.

A palatal onset may have the same effect as a postconsonantal /j/ when /a/ undergoes voice quality shift. That is, the grade 2 quality /ɛ/ may be raised to /e/, while the grade 3 quality /a/ is unaffected. This can be seen in the behaviour of the root ṭam ‘eat’ (Class 1F) in (31), the root ṭak ‘create’ (Class 1F) in (32), and the root ṭam ‘lick’ (Class 1F) in (33) with variation recorded.

(31) a. mét ə = ṭam cw’in. (1°)
   child D = eat porridge
   ‘The child is eating porridge.’
b. mét ə = cêem. (2°)
   child D = eat.AP
   ‘The child is eating.’
c. kü câam. (3°)
   and eat.AP.1SG
   ‘and I am eating.’

(32) a. njàlic ə = câk ràaan. (1°)
   God D = create person
   ‘God is creating a human being.’
b. mét ə = cêek mét. (2°)
   man D = create.AP.DAT child
   ‘The man is naming a child.’
c. mét ə = cê mét câak. (3°)
   man D = PF child create.AP.DAT.NF
   ‘The man has named a child.’
(33) a. ʃo ɗə = jë̀n kúur ƙc. (1°)
dog D = lick grinding_stone stomach
‘The dog is licking the grinding stone.’
b. ʃo ɗə = jë̀nɛn/jë̀nɛn. (2°)
dog D = lick.AP
‘The dog is licking.’

Again, such raising also occurs in grade 2 of roots with an inherently breathy /a/ after a palatal onset, as in (34) with the root càp ‘put’ (Class 1F).

(34) a. tììk ɗə = càp abwe̠oc. (1°)
woman D = put pot
‘The woman is encircling the pot with sand (in order to support it).’
b. tììk ɗə = ccép abwe̠oc mëɛɛc. (2°)
woman D = put.CF pot fire.ALL
‘The woman is putting the pot on fire.’
c. tììk ɗə = càcabwòoc càap mëɛɛc. (3°)
woman D = PF.pot put.CF.NF fire.ALL
‘The woman has put the pot on fire.’

This shows that the raising in (31)–(33) is not an integral part of VQS, but rather is due to an optional phonetic rule of raising that raises underlying /ɛ/ to [e].

4.3.3 From /e/ to /e/ in grade 3 after a palatal

When /e/ undergoes VQS, grades 1 and 2 appear as /ɛ/, and grade 3 normally appears as /ɛ/, as exemplified in Section 4.1 above, and as further illustrated in (35) with the root gëëer ‘row’ (Class 2H).

(35) a. màc ɗə = gëëer rjàaj. (1°)
man D = row boat
‘The man is rowing a boat.’
b. màc ɗə = gëëer rjàaj. (2°)
man D = row.CP boat
‘The man is rowing a boat hither.’
c. màc ɗə = cë rjàaj gëëer. (3°)
man D = PF boat row.CP.NF
‘The man has rowed a boat hither.’

26 The form [càabwòoc] in (34c) is a contraction of cë abwe̠oc.
However, when /e/ is preceded by a palatal, its breathy grade 3 alternant is /ḛ/ rather than /ɛ̰/, as illustrated in (36) with the root cèec 'chase' (Class 2H) and in (37) with the root jèp 'cut' (Class 1F).

(36) a. lwàal à = cèec djèet. (1°)
   Lual D = chase bird.PL
   'Lual is chasing birds.'

b. lwàal à = cèec tòok. (2°)
   Lual D = chase.CP goat.PL
   'Lual is chasing goats hither.'

c. lwàal à = cè tòok cèec. (3°)
   Lual D = PF goat.PL chase.CP.NF
   'Lual has chased goats hither.'

(37) a. mòc à = jèp tìim. (1°)
   man D = cut tree
   'The man is cutting down a tree.'

b. lwàal à = jèp mòc tìim. (2°)
   Lual D = cut.DAT man tree
   'Lual is cutting down a tree for the man.'

c. lwàal à = cè tìim jèp mòc. (3°)
   Lual D = PF tree cut.DAT.NF man
   'Lual has cut down a tree for the man.'

In (36) and (37) the palatal that precedes /e/ is the onset, but a postconsonantal /j/ has the same effect, as seen in (38) with the root lijèp 'open' (Class 1F).

(38) a. tiłk à = lijèp àtifìn. (1°)
   woman D = open door
   'The woman is opening the door.'

b. tiłk à = lijèp àtifìn mòc. (2°)
   woman D = open.DAT door man
   'The woman is opening the door for the man.'

c. tiłk à = càtifìn lijèp mòc.27 (3°)
   woman D = PF door open.DAT.NF man
   'The woman has opened the door for the man.'

27 The form [càtifìn] in (38c) is a contraction of cè àtifìn.
This is like the situation with inherently breathy roots, as illustrated in (39) with the root tjëep ‘taste’ (Class 2F), and as also seen with the root tjëec ‘ask’ (Class 2F) in Section 4.3.2 above.

(39) a. tìik ḡ̑̂ tìjëep rîń. (1°)
   woman D = taste meat
   ‘The woman is tasting the meat.’
b. tìik ḡ̑̂ tìjëep nàn = d-è. (2°)
   woman D = taste.AP.DAT girl.CS2 = SG-3SG
   ‘The woman is tasting on behalf of her daughter.’
c. tìik ḡ̑̂ cē nàn = d-è tjëep. (3°)
   woman D = PF girl.CS2 = SG-3SG taste.AP.DAT.NF
   ‘The woman has tasted on behalf of her daughter.’

Because of this similarity, it must be concluded that the raising of grade 3 /ɛ̇/ to /ė/ is not an integral part of VQS, but is due to a more general assimilation rule whereby breathy lower-mid /ɛ̇/ becomes higher-mid /ė/ after a palatal.

4.3.4 From /jɔ/ to /jȯ/ in grade 3

When /jɔ/ undergoes VQS, grades 1 and 2 appear as /ȯ/, and grade 3 normally appears as /ɔ̇/, as exemplified in Section 4.1 above, and as further illustrated in (40) with the root dɔm ‘catch’ (Class 1F).

(40) a. dɔɔk ḡ̑̂ dɔm wôn. (1°)
   boy D = catch cow
   ‘The boy is catching a cow.’
b. dɔɔk ḡ̑̂ dɔm môc wôn. (2°)
   boy D = catch.DAT man cow
   ‘The boy is catching a cow for the man.’
c. dɔɔk ḡ̑̂ cê môc dɔm wôn. (3°)
   boy D = PF man catch.DAT.NF cow
   ‘The boy has caught a cow for the man.’

However, when /jɔ/ is preceded by a postconsonantal /j/, its breathy grade 3 alternant is often /ȯ/ rather than /ɔ̇/. This is illustrated in (41) with the root fij̃ɲ ‘press’ (Class 2H) and in (42) with the root rj̃p ‘pay wages, hire, rent’ (Class 1F).
(41) a. lũuŋ ə = tʃ̩ɔŋ tʃɔŋ. (1°)
   mud_fish D = press mud
   ‘The mud fish is pressing the mud.’

b. lwàal ə = tʃ̪̩ɔŋ tʃɔŋ l̪ːaːŋ. (2°)
   Lual D = press.CP mud side.CS1.DEM1
   ‘Lual is pressing the mud this way.’

c. lwàal ə = cɛ tʃɔŋ tʃ̪̩ɔŋ l̪ːaːŋ. (3°)
   Lual D = PF mud press.CP.NF side.CS1.DEM1
   ‘Lual has pressed the mud this way.’

(42) a. tiłk ə = rjɔp dʒɔk. (1°)
   woman D = pay boy
   ‘The woman is hiring a boy.’

b. kʊ rjɔp. (2°)
   and pay.AP.3SG
   ‘and he is paying.’

c. kʊ rjɔp/rjɔp. (3°)
   and pay.AP.1SG
   ‘and I am paying.’

As seen here, grade 3 merges with grade 2, the grade 3 forms tʃ̩ɔŋ (41c) and rjɔp (42c) being homonymous with the corresponding grade 2 forms in (41b) and (42b), respectively. In this respect, /j̪ɔ/ differs from its inherently breathy counterpart /j̩ɔ/, whose behaviour is exemplified in (43) with the root rjɔp ‘pound’ (Class 1F) to be compared with the root rjɔp ‘pay’ in (42).

(43) a. tiłk ə = rjɔp rɔp. (1°)
   woman D = pound sorghum.PL
   ‘The woman is pounding sorghum.’

b. kʊ rjɔp/rj̪̩ep. (2°)
   and pound.AP.3SG
   ‘and she is pounding.’

c. kʊ rj̪̩ap. (3°)
   and pound.AP.1SG
   ‘and I am pounding.’

As seen in (43c), grade 3 of /jo/ is /ja/, so that (43c) is distinct from (42c). This is the case in spite of the fact that the grade 2 forms of the two verbs may be homonymous, cf. (43b) and (42b), with the grade 2 form rjɔp in (43b) having the fronted variant rj̪̩ep. Given these facts, it must be concluded that /o/ in
(42c), where it varies with /ɔ/, is due to raising of /ɔ/ and thus not an integral part of VQS.

Raising of grade 3 /ɔ/ to /o/ does not occur after a palatal onset, as seen in (44) with the non-breathy root jɔ̀t 'jump over' (Class 2H).

(44) a. wáлен ə = jɔ̀t kɔɔl なん. (1°)
paternal_uncle.1SG D = jump_over hole head
‘My paternal uncle is jumping over the hole.’
b. kù jɔ̀t. (2°)
and jump_over.AP.3SG
‘and he jumped.’
c. kù jɔ̀t. (3°)
and jump_over.AP.1SG
‘and I jumped.’

Here, as in (40) above, the /ɔ/ which has undergone VQS behaves in the same way as an inherently breathy /o/. The vowel gradation of the latter is exemplified in (45) with the root jɔ́k 'find' (Class 1L).

(45) a. rάaan ə = jɔ́k mjèet. (1°)
person D = find food
‘The person is finding food.’
b. mjèet ə = jɔók. (2°)
food D = find.3SG
‘He is finding food.’
c. mjèet ə = jɔók. (3°)
food D = find.1SG
‘I am finding food.’

4.4 From /a/ to /ɔ/

Another complication in the effect of voice quality shift on vowel quality is found in antipassive forms with Class 2F roots. Antipassive verbs with such roots normally conform to the vowel gradation seen in Table 20 in Section 4.1 above. This is exemplified in (46) with the root dìim 'filter'.

(46) a. tηik ə = dìim màaw. (1°)
woman D = filter beer
‘The woman is filtering beer.’
b. ʧik ʰa = ʤim. (2°)
woman D = filter.AP
‘The woman is filtering.’
c. ƙu ʤèem. (3°)
and filter.AP.1SG
‘and I am filtering.’

While (46a) shows the inflectionally unmarked form of the simple verb, (46b) shows the inflectionally unmarked form of the antipassive verb, which has the shape CV̰VC with a grade 2 vowel. The corresponding grade 3 vowel is seen in (46c).

However, whereas the vowel /a/ normally becomes /ɛ/ (or /e/) in grade 2 when undergoing vowel quality shift, there is a systematic exception to this in antipassive verbs with Class 2F roots. Here the breathy counterpart of /a/ either has the normal quality /ɛ/ (or the raised variant /e/) or it has the quality /ɔ/. The distribution of these alternants is determined by the preceding consonant, as can be observed in Table 21, which shows the inflectionally unmarked form of the simple verb and of the antipassive verb.

**Table 21: The effect of voice quality shift on /a/ in antipassive verbs with Class 2F roots.**

<table>
<thead>
<tr>
<th>Preceding consonant</th>
<th>Simple, infl. unmarked</th>
<th>2° AP, infl. unmarked</th>
<th>3° AP, infl. unmarked</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labial</td>
<td>ṃan</td>
<td>/ɛ/</td>
<td>/ɛ̤/ ṃɛn</td>
</tr>
<tr>
<td></td>
<td>ḅaaj</td>
<td>/ɛ/</td>
<td>/ɛ̤/ ḅɛj</td>
</tr>
<tr>
<td></td>
<td>p̣an</td>
<td>/ɛ/</td>
<td>/ɛ̤/ p̣ɛn</td>
</tr>
<tr>
<td>Postconsonantal glide</td>
<td>ʨ̣aak</td>
<td>/ɛ/</td>
<td>/ɛ̤/ ʨ̣ɛk</td>
</tr>
<tr>
<td></td>
<td>kwạat</td>
<td>/ɛ/</td>
<td>/ɛ̤/ kwạɛt</td>
</tr>
<tr>
<td>Alveolar</td>
<td>ṛaak</td>
<td>/ɔ/</td>
<td>/ɔ̤/ ṛɔk</td>
</tr>
<tr>
<td></td>
<td>ḷar</td>
<td>/ɔ/</td>
<td>/ɔ̤/ ḷɔr</td>
</tr>
<tr>
<td>Palatal</td>
<td>c̣aŋ</td>
<td>/ɔ/</td>
<td>/ɔ̤/ c̣ɔŋ</td>
</tr>
<tr>
<td></td>
<td>j̣aŋ</td>
<td>/ɔ/</td>
<td>/ɔ̤/ j̣ɔŋ</td>
</tr>
</tbody>
</table>

As seen in the table, /ɛ/ occurs after a labial onset, /ɛ/ occurs after a post-consonantal glide, and /ɔ/ occurs after an alveolar or palatal onset, whereas no instances have been attested in which the vowel occurs immediately after an interdental or velar onset. The variation is exemplified by the sets of clauses in (47)-(50) with the roots ṃaŋ ‘hate’, ʨ̣aak ‘marry’, kwạat ‘drive’ and ṛaak ‘milk’. The (a)-clauses illustrate the use of the inflectionally unmarked form of the simple verb, and the (b)-clauses illustrate the use of the inflectionally unmarked form of the antipassive verb, while the (c)-clauses show the 1SG form of the antipassive verb.
(47) a. mùc à = màn tìjìk. (1°)  
    man D = hate woman  
    ‘The man hates the woman.’

b. mùc à = mën. (2°)  
    man D = hate.AP  
    ‘The man hates.’

c. kù mànàan. (3°)  
    and hate.AP.1SG  
    ‘and I hate.’

(48) a. mùc à = tjàak tìjìk. (1°)  
    man D = marry woman  
    ‘The man is marrying a woman.’

b. mùc à = tjàak. (2°)  
    man D = marry.AP  
    ‘The man is marrying.’

c. kù tjàak. (3°)  
    and marry.AP.1SG  
    ‘and I am marrying.’

(49) a. mét à = kwàat uèk. (1°)  
    child D = drive cow.PL  
    ‘The child is driving cows.’

b. mét à = kwèet. (2°)  
    child D = drive.AP  
    ‘The child is driving.’

c. kù kwèet. (3°)  
    and drive.AP.1SG  
    ‘and I am driving.’

(50) a. tìjìk à = ràak wòŋ. (1°)  
    woman D = milk cow  
    ‘The woman is milking a cow.’

b. tìjìk à = ràak. (2°)  
    woman D = milk.AP  
    ‘The woman is milking.’

c. kù ràak. (3°)  
    and D = milk.AP.1SG  
    ‘and I am milking.’
All the grade 2 variants behave like inherently breathy grade 2 vowels with respect to vowel gradation, as seen in the (c)-clauses of (47)-(50), whose verb has a grade 3 vowel. Thus, /ɛ/ and /ɔ/ become /a/ in grade 3, while /e/ becomes /ɛ/ after a postconsonantal /w/, but remains as /e/ after a postconsonantal /j/.

It is not clear why /ɔ/ occurs as a breathy counterpart of /a/ here, while the normal counterpart of /a/ is /ɛ/. Nor is it clear why /ɛ/ occurs specifically and only after labials here. As shown in Andersen (1993: 15–16), the quality /ɔ/ also appears as the medium counterpart of short breathy /a/ in grade 1 of simple transitive verbs. This alternation is exemplified by the sentences in (51).

(51) a. mọc ̀ ̀ ̀ = dàk ̀ ̀ ̀ wje en. (1°)
    man ̀ ̀ ̀ = untie ̀ ̀ ̀ rope 
    ‘The man is untying the rope.’

b. mọc ̀ ̀ ̀ = cế ̀ ̀ ̀ wje en dàɔk. (1°)
    man ̀ ̀ ̀ = PF ̀ ̀ ̀ rope ̀ ̀ ̀ untie.NF
    ‘The man has untied the rope.’

The inflectionally unmarked form of the simple transitive verb ‘untie’ in (51a) has a short breathy [ał], whereas the non-finite form in (51b), which also belongs to the range of vowel grade 1, has a medium breathy [ɔɔ]. However, this shift from an unrounded to a rounded vowel is independent of the preceding consonant, as seen in Table 22.

Table 22: Examples of the alternation between short [ał] and medium [ɔɔ] or [òò] as grade 1 vowels in simple transitive verbs (Class 1F).

<table>
<thead>
<tr>
<th>Preceding consonant</th>
<th>Simple, infl. unm.</th>
<th>Simple, NF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labial</td>
<td>pàl</td>
<td>pwọgoł</td>
</tr>
<tr>
<td></td>
<td>màr</td>
<td>mwọgor</td>
</tr>
<tr>
<td>Interdental</td>
<td>tàr</td>
<td>ẹjàr</td>
</tr>
<tr>
<td></td>
<td>dàl</td>
<td>dọọl</td>
</tr>
<tr>
<td>Alveolar</td>
<td>dàk</td>
<td>dọọk</td>
</tr>
<tr>
<td>Palatal</td>
<td>càp</td>
<td>cọọp</td>
</tr>
<tr>
<td></td>
<td>pàŋ</td>
<td>pọọŋ</td>
</tr>
<tr>
<td>Labiovelar</td>
<td>wàl</td>
<td>wọọl</td>
</tr>
<tr>
<td>Postconsonantal /j/</td>
<td>tjàk</td>
<td>tjàọk</td>
</tr>
<tr>
<td>Postconsonantal /w/</td>
<td>gwàr</td>
<td>gwọọr</td>
</tr>
</tbody>
</table>

Thus, the alternation between [ał] and [ɔɔ] or its variant [òò] has been attested after onsets that are labial, interdental, alveolar, palatal and labiovelar, and also after postconsonantal /j/ and /w/, while [ał] has not been attested immediately
after a velar onset. As also seen in Table 22, the [ɔ̃] alternant undergoes Labialization after a labial, and raising after a glide (Andersen 1993: 16–17).

As pointed out in Andersen (1993: 15–16), positing a rule that rounds a non-short breathy /a/ to /ɔ̃/ also accounts for the absence of simple transitive verbs with a medium breathy /a/ in the inflectionally unmarked form and the corresponding presence of simple transitive verbs with a medium breathy /ɔ̃/ in this form. Again, the occurrence of this /ɔ̃/ and its raised variant /õ/ is not constrained by the preceding consonant, since it occurs after consonants with all points of articulation, as seen in Table 23. As also seen in this table, /ɔ̃/ is raised to /õ/ after a postconsonantal glide.

Table 23: Examples of simple transitive verbs with medium /ɔ̃/, or its raised variant /õ/, in the inflectionally unmarked form.

<table>
<thead>
<tr>
<th>Preceding consonant</th>
<th>Simple, infl. unm.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labial + postconsonantal /w/</td>
<td>pwọow</td>
</tr>
<tr>
<td></td>
<td>bwọok</td>
</tr>
<tr>
<td></td>
<td>mwọọt</td>
</tr>
<tr>
<td>Interdental</td>
<td>ọọt</td>
</tr>
<tr>
<td>Alveolar</td>
<td>ọọw</td>
</tr>
<tr>
<td></td>
<td>ọọt</td>
</tr>
<tr>
<td></td>
<td>ọọp</td>
</tr>
<tr>
<td>Palatal</td>
<td>ọọn</td>
</tr>
<tr>
<td></td>
<td>ọọp</td>
</tr>
<tr>
<td>Velar</td>
<td>ọọm</td>
</tr>
<tr>
<td></td>
<td>ọọj</td>
</tr>
<tr>
<td></td>
<td>ọọl</td>
</tr>
<tr>
<td>Postconsonantal /j/</td>
<td>ọọọk</td>
</tr>
<tr>
<td>Postconsonantal /w/</td>
<td>ọọọọt</td>
</tr>
</tbody>
</table>

4.5 Summary of voice quality shift

The basics of voice quality shift are summarized in Figure 1. The arrows show the shift from non-breathy grade 1 vowels to the corresponding breathy grade 1 vowels and subsequently grades 2 and 3 of these breathy vowels. Excluded from the figure are (i) special vowel quality changes connected with preceding postconsonantal glides and (ii) variants that are the effect of raising caused by the preceding consonant.
5 Conclusion and comparative reflections

As shown in this article, the vowel quality alternation system (called vowel gradation) which is operative in simple transitive verbs is also operative in derived verbs with a transitive root, but with three modifications. First, the distribution of the vowel grades in derived verbs is partly different from the distribution in simple verbs. In simple verbs, both grade 2 and grade 3 are exponents of inflection (together with vowel length and tone); but in derived verbs, grade 2 is mainly an exponent of the derived derivational status (whose specific status is expressed by voice quality, vowel length and tone), and therefore in most cases, only grade 3 is an exponent of inflection (together with tone and, in antipassive verbs, vowel length). Second, in derived verbs the morphophonological rule of Fronting, which defines
grade 2, applies not only to /a/, as in simple verbs, but also (optionally) to /ɔ/.

Third, although vowel quality is basically, or to a large extent, independent of voice quality, the morphophonological rule of voice quality shift, which changes the voice quality from non-breathy to breathy, affects some vowel qualities. Most saliently, voice quality shift affects the height of rounded vowels so that non-breathy /ɔ̰/ and /o̰/ become breathy /o̤/ and /ṳ/ respectively.

As an expansion of Table 4 in Section 2.5, Table 24 shows the full vowel gradation system of verbs with a transitive root, comprising both simple verbs and derived verbs.

Table 24: Vowel quality alternation in simple and derived verbs with a transitive root.

<table>
<thead>
<tr>
<th>Non-breathy vowels</th>
<th>Without postconsonantal glide</th>
<th>With postconsonantal /j/</th>
<th>With postconsonantal /w/</th>
</tr>
</thead>
<tbody>
<tr>
<td>1°</td>
<td>i</td>
<td>e</td>
<td>a</td>
</tr>
<tr>
<td>2°</td>
<td>i</td>
<td>e</td>
<td>e</td>
</tr>
<tr>
<td>3°</td>
<td>je</td>
<td>e</td>
<td>a</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Non-breathy vowels having undergone voice quality shift</th>
<th>Without postconsonantal glide</th>
<th>With postconsonantal /j/</th>
<th>With postconsonantal /w/</th>
</tr>
</thead>
<tbody>
<tr>
<td>1°</td>
<td>i</td>
<td>e</td>
<td>a, e</td>
</tr>
<tr>
<td>2°</td>
<td>i</td>
<td>e</td>
<td>e, e, ɔ</td>
</tr>
<tr>
<td>3°</td>
<td>je</td>
<td>e</td>
<td>a, e</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Breathy vowels</th>
<th>Without postconsonantal glide</th>
<th>With postconsonantal /j/</th>
<th>With postconsonantal /w/</th>
</tr>
</thead>
<tbody>
<tr>
<td>1°</td>
<td>i</td>
<td>e</td>
<td>a, ɔ</td>
</tr>
<tr>
<td>2°</td>
<td>i</td>
<td>e</td>
<td>e, ɔ</td>
</tr>
<tr>
<td>3°</td>
<td>je</td>
<td>e</td>
<td>a</td>
</tr>
</tbody>
</table>

Vertically, the table has three parts: inherently non-breathy root vowels (at the top), inherently non-breathy root vowels having undergone voice quality shift (in the middle), and inherently breathy root vowels (at the bottom). Each of these parts shows the three vowel grades. Horizontally, the table also has three parts: root vowels inherently not preceded by a postconsonantal glide in grade 1 (on the left), root vowels inherently preceded by a postconsonantal /j/ in grade 1 (in the middle), and root vowels inherently preceded by a postconsonantal /w/
in grade 1 (on the right). Some cells include more than one variant. Three types of variation are distinguished in the table by the symbol that separates the variants: A dot (x, y) indicates variation involving extension of the range of Fronting in derived verbs in the second variant; a semicolon (x; y) indicates variation involving rounding in the second variant; and a comma (x, y) indicates variation involving raising in the second variant.

Table 24 takes non-breathy /ɔ/ and /o̰/, as grade 1 vowels, to be the functional counterparts of breathy /o̤/ and /ṳ/, respectively. Non-breathy /a̰/, as a grade 1 vowel, has two different breathy functional counterparts, namely /a̤/ and /ɔ̤/. As noted in Andersen (2006: 17), they must be assumed to go back to the same vowel in Proto-Western Nilotic vowel, namely /ʌ/, cf. Table 25 below.

Table 25: Regular reflexes of Proto-Western Nilotic vowels in five languages.

<table>
<thead>
<tr>
<th></th>
<th>PWN</th>
<th>Mabaan</th>
<th>Jumjum</th>
<th>Mayak</th>
<th>Päri</th>
<th>Dinka</th>
</tr>
</thead>
<tbody>
<tr>
<td>[−ATR]</td>
<td>*i</td>
<td>*ĩi</td>
<td>ĩi</td>
<td>ĩi</td>
<td>ĩi</td>
<td>j̃i</td>
</tr>
<tr>
<td></td>
<td>*e</td>
<td>*ee</td>
<td>ĩe</td>
<td>ĩĩe</td>
<td>e</td>
<td>ẽe</td>
</tr>
<tr>
<td></td>
<td>*a</td>
<td>*aa</td>
<td>a</td>
<td>aa</td>
<td>a</td>
<td>ãg</td>
</tr>
<tr>
<td></td>
<td>*ɔ</td>
<td>*ɔɔ</td>
<td>ua</td>
<td>uua</td>
<td>ɔ</td>
<td>ɔ̰a</td>
</tr>
<tr>
<td></td>
<td>*ʊ</td>
<td>*ʊʊ</td>
<td>uu</td>
<td>uu</td>
<td>ʊ</td>
<td>ʊ̰a</td>
</tr>
<tr>
<td></td>
<td>*a</td>
<td>*aa</td>
<td>a</td>
<td>aa</td>
<td>a</td>
<td>ãg</td>
</tr>
<tr>
<td></td>
<td>*ɔ</td>
<td>*ɔɔ</td>
<td>ua</td>
<td>uua</td>
<td>ɔ</td>
<td>ɔ̰a</td>
</tr>
<tr>
<td>[+ATR]</td>
<td>*i</td>
<td>*ĩi</td>
<td>ĩe</td>
<td>ĩĩe</td>
<td>ĩi</td>
<td>j̃i</td>
</tr>
<tr>
<td></td>
<td>*e</td>
<td>*ee</td>
<td>ẽe</td>
<td>ẽe</td>
<td>ĩi</td>
<td>ẽe</td>
</tr>
<tr>
<td></td>
<td>*a</td>
<td>*aa</td>
<td>a</td>
<td>aa</td>
<td>ãg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>*ɔ</td>
<td>*ɔɔ</td>
<td>ũa</td>
<td>ũua</td>
<td>ɔ̃a</td>
<td></td>
</tr>
<tr>
<td></td>
<td>*ʊ</td>
<td>*ʊʊ</td>
<td>ũu</td>
<td>ũu</td>
<td>ʊ̃a</td>
<td></td>
</tr>
<tr>
<td></td>
<td>*a</td>
<td>*ãa</td>
<td>ãa</td>
<td>ãa</td>
<td>ãa</td>
<td></td>
</tr>
<tr>
<td></td>
<td>*ɔ</td>
<td>*ɔ̃a</td>
<td>ũãa</td>
<td>ũãa</td>
<td>ɔ̃a</td>
<td></td>
</tr>
</tbody>
</table>

As illustrated in this article, almost all of the morphology in Dinka is expressed by alternations in phonological material of the root. Many of these alternations can be explained historically as reflecting former suffixes, as evidenced by a comparison with other Western Nilotic languages. In Andersen (1990), a comparison of Dinka with Päri, a Northern Lwo language, revealed that some vowel length alternations in Dinka are due to lengthening that compensated for a lost

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28 No verb form has been attested in which the /wɔ̃/-series occurs with voice quality shift in grade 1. Therefore, the corresponding cell in Table 24 is empty.

29 External evidence for this comes from a comparison with other Western Nilotic languages. Thus, Dinka /g/ and /ɔ/ both correspond to Päri /ʌ/, as in Dinka nąk ‘kill’, Päri nąk ‘kill’, and Dinka tąt ‘forge’, Päri tąt ‘forge’.
suffix vowel and which gave rise to the ternary vowel length contrast in this language. Moreover, as argued in Andersen (2014: 239–240), assimilation of the root vowel to such suffix vowels explains some of the vowel height alternations in Dinka. More specifically, a comparison with the Northern Burun language Surkum suggests that in non-derived verbs in Dinka, vowel grade 2, which raises grade 1 /a/ to /ɛ/, reflects a suffixal non-low front vowel and that grade 3, which lowers the other vowel qualities, reflects a suffixal low central vowel. This umlaut explanation can be extended to derived verbs, as seen by a comparison with Kurmuk, another Northern Burun language. As shown in Section 3.1 above, the inflectionally unmarked form of derived transitive verbs and of some sub-classes of antipassive verbs has grade 2 vowels. Corresponding verb forms in Kurmuk all have a derivational suffix with a high vowel. This is illustrated in (52)-(56) with SV(O) clauses, in which the verb has an inflectionally unmarked form in both Dinka and Kurmuk (Andersen 2015b). The examples are selected in such a way that the verbs are cognate in the two languages. The root ‘sweep’ is used in the simple verbs in (52), in the centrifugal verbs in (53), in the centripetal verbs in (54), and in the antipassive verbs in (55), and the root ‘hoe’ is used in the dative verbs in (56).

The transcription of the Kurmuk examples indicates surface tones rather than underlying tones. The basic aspects of the phonology of Kurmuk are described in Andersen (2007b).

(52) a. tǐk ̀a = wèec ıpın. (Dinka)
   woman D = sweep ground
   ‘The woman is sweeping the ground.’

b. kámbál ṭwéeʃ ʔoutôn. (Kurmuk)
   girl sweep place
   ‘The girl is sweeping the place.’

(53) a. tǐk ̀a = wèeɛc ̀ānwɔɔn. (Dinka)
   woman D = sweep.CF weed
   ‘The woman is sweeping the weed away.’

b. kámbál wèɛʃ-ì  tà̱búr wóo. (Kurmuk)
   girl sweep-CF dust out
   ‘The girl is sweeping dust out.’

(54) a. tǐk ̀a = wèeɛc ̀ānwɔɔn. (Dinka)
   woman D = sweep.CP weed
   ‘The woman is sweeping the weed hither.’
Like Dinka, Kurmuk has no suffix in the inflectionally unmarked form of an underived verb, as seen (52). Unlike Dinka, however, Kurmuk has a derivational suffix in the inflectionally unmarked form of derived verbs, namely centrifugal -(C)i (53), centripetal -uu/-uu (54), antipassive -(C)i/-i(C) (55), and dative -(C)if/-i(C)if (56). Three of these suffixes include a high front vowel, which may be what has brought about grade 2 in corresponding Dinka forms.

As argued in Andersen (1999: 117–118), the voice quality contrast in Dinka between non-breathy and breathy goes back to a contrast between [-ATR] and [+ATR], which is found in many other Western Nilotic languages, and which can be reconstructed for Proto-Western Nilotic (PWN). Table 25 from Andersen (2006: 17) shows regular correspondences between root vowels in Mabaan, Jumjum, Mayak, Päri and Dinka, and the corresponding reconstructed PWN vowel system, with short and long vowels. The vowel systems of Surkum and Kurmuk are identical to that of Mayak in the table.

The alternation between non-breathy and breathy vowels in Dinka is much older than the vowel height alternations and most of the vowel length alternations. This is evidenced by the fact that in the other Western Nilotic languages, those derived verbs that are characterized by breathy voice in Dinka are characterized by [+ATR] (or [-ATR] evolved from [+ATR] by regular sound changes, as in Mabaan, Jumjum and Mayak), namely
centripetal verbs, dative verbs and antipassive verbs. For this reason, the
[ATR] alternation must be considered to go back to Proto-Western Nilotic. In
those Western Nilotic languages which have an [ATR] contrast, the [+ATR]
vowels are higher than their [−ATR] counterparts. This may explain why in
Dinka, the non-breathy rounded back vowels /ʊ/ and /o/ are lower than their
breathy counterparts /u/ and /o/. By contrast, there is no considerable height
difference between, on the one hand, the non-breathy front vowels /i/ and
/e/, and on the other hand, their breathy counterparts /ɪ/ and /ɛ/. The
reason may be that Dinka has an extra front vowel quality, namely /ɛ/,
which arose as a result of fronting of /a/ (or /ɔ/) or lowering of /e/ or /ɪ/, and which reduced the available vowel space for /i/ and /e/.

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