Plural formation in Seeku
(Mande, Burkina Faso)

Laura McPherson

Program in Linguistics
Dartmouth College

March 4, 2015 / Boston University
Outline

1. Introduction
   - Today’s talk
   - Background on Seeku

2. Phonological features
   - What are phonological features?
   - Phonological features in Seeku

3. Plural formation
   - Vowel alternations
   - Tone alternations
   - Local summary

4. Conclusions
We will be looking at plural formation in Seeku, a Mande language of Burkina Faso.

Plural formation in English (and many other languages) involves the addition of a plural suffix, spelled -s:

\[(1) \quad \begin{align*}
    a. & \quad \text{dog} \rightarrow \text{dog-s} \\
    b. & \quad \text{cat} \rightarrow \text{cat-s} \\
    c. & \quad \text{horse} \rightarrow \text{horse-s}
    \end{align*}\]

This suffix is a morpheme carrying the meaning PLURAL.
Identifying a separate plural morpheme in Seeku is not as easy. Plurals may show a number of phonological (i.e. pronunciation) differences from the singular:

\[(2)\]

- **TONE**
  - Sg. `bi^{21}`
  - Pl. `bi^{3}`
  - ‘goat(s)’

- **VOWEL INSERTION**
  - Sg. `u^{3}`
  - Pl. `wi^{3}`
  - ‘hare(s)’

- **VOWEL CHANGE**
  - Sg. `ka^{21}`
  - Pl. `kε^{3}`
  - ‘yam(s)’

(NB: Numbers indicate tone (1 = L, 2 = M, 3 = H))

Question: Can we find a unifying plural morpheme responsible for these changes?
Brief answer: Yes.
The analysis relies on featural affixation.
  ▶ The plural is a suffix, but it does not consist of full consonants, vowels, or tones.
  ▶ It consists of floating phonological features that affect the base.

Two crucial features:
  ▶ [front] vocalic feature (affects the vowel, causing it to front)
  ▶ [+upper] tone feature (affects the tone, causing it to raise)

Seeku has “regular” segmental affixes as well, which contrast with this featural affix.
Roadmap of today’s talk

- Background on Seeku
- What are phonological features?
- Analysis of Seeku plural formation
  - Vowel alternations
  - Tone alternations
- Implications and conclusions
Outline

1. Introduction
   - Today’s talk
   - Background on Seeku

2. Phonological features
   - What are phonological features?
   - Phonological features in Seeku

3. Plural formation
   - Vowel alternations
   - Tone alternations
   - Local summary

4. Conclusions
Seeku is one of 69 languages spoken in Burkina Faso (Ethnologue 2014).
Genetic affiliation

- It is a member of the Northwestern group of Mande languages.
Samogo languages

- The Samogo subgroup straddles the Burkina Faso/Mali border.
Seeku language

- Seeku (ISO 639-3: [sos]) has two main dialects:
  - Northern Seeku (Timiku, 5000 speakers)
  - Southern Seeku (Gbeneku, 12,000 speakers)
- Seeku is the endonym for the language:
  - [sẽː²] = ethnicity and [ku²] = ‘language’
- The exonym for the language/ethnicity is Sembla/Sambla.
Previous work and fieldwork

- The only previous works are a grammar sketch of the northern dialect (Prost 1971) and an unpublished master’s thesis on phonological aspects of the southern dialect (Congo 2012).
- I have carried out preliminary fieldwork (1 week in 2012, 5 weeks in 2013) focusing on the dialect spoken in Bouendé.
Typological features

- Like most Mande languages, Seeku word order is S-Aux-O-V-X.
- Three-tone language (L, M, H)
- Most words are monosyllabic
- Isolating language (very little morphology)

(3) \( \text{bɛː}^1 \text{ sɪ}^{13} \text{ bɪ}^{21} \text{ kəː}^3 \text{ nɛ}^3 \text{ ɳɛ}^2 \)

pig be goat chase in not

‘The pig is not chasing the goat.’
Outline

1 Introduction
   - Today’s talk
   - Background on Seeku

2 Phonological features
   - What are phonological features?
   - Phonological features in Seeku

3 Plural formation
   - Vowel alternations
   - Tone alternations
   - Local summary

4 Conclusions
We can break language down into progressively smaller pieces.

(4) a. Words:
   “It is a truth **universally** acknowledged, that a single man in possession of a good fortune, must be in want of a wife.”
   –Jane Austen, Pride and Prejudice (1813)

b. Morphemes:
   **univers**-al-ly

c. Phonemes/segments:
   /junɪvəs/

Can we break things down beyond the level of phonemes or segments?
In fact, every segment is thought to be composed of phonological features.

The minimal pair *pill* vs. *bill* shows that /p/ and /b/ are contrastive.

- But not all contrasts are created equal.
- This contrast is more similar than the contrast between /s/ and /b/ (e.g. *sill* and *bill*).

/p/ and /b/ differ in just one dimension—voicing—captured in the phonological feature [voice].
/p/ vs. /b/

- All phonetic dimensions like voicing, length, place of articulation, and manner of articulation are encoded in these features.
- If /p/ and /b/ are atoms, phonological features are the subatomic particles.

(5) \[
\begin{array}{c}
/p/ \\
+\text{consonantal} \\
-\text{continuant} \\
-\text{nasal} \\
+\text{labial} \\
-\text{voice}
\end{array}
\quad
\begin{array}{c}
/b/ \\
+\text{consonantal} \\
-\text{continuant} \\
-\text{nasal} \\
+\text{labial} \\
+\text{voice}
\end{array}
\]
Why have phonological features?

- Allow us to better explain phoneme inventories.
  - If [voice] is a contrastive feature, it explains /p/ vs. /b/, /t/ vs. /d/, /k/ vs. /g/, /s/ vs. /z/. etc.

- Allows us to explain phonological changes in a succinct and natural way.
  - German final devoicing (/rad/ → [rat] ‘wheel’) simply involves [+voice] becoming [-voice].

- Allows us to explain why certain groups of sounds (“natural classes”) undergo a phonological change while others don’t.
  - Only /t/ and /d/ become tap [r] in English because the rule targets [+coronal, -continuant, -nasal] sounds.
Outline

1 Introduction
   - Today’s talk
   - Background on Seeku

2 Phonological features
   - What are phonological features?
   - Phonological features in Seeku

3 Plural formation
   - Vowel alternations
   - Tone alternations
   - Local summary

4 Conclusions
Articulation of vowels

Image from http://sail.usc.edu/~lgoldste/General_Phonetics/Vowels/Vowel_Theories.html
Seeku vowel inventory

- Seeku has seven oral vowel phonemes, shown in (6):

```
  i  u
 / \ / \n|   |   |
e  o  o
 / \ / \n|   |   |
ɛ  ɛ  c
 / \ / |
a  a  a
```

(6)
This vowel space can be re-envisioned in the following way:

(7)

<table>
<thead>
<tr>
<th></th>
<th>Front</th>
<th>Back</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>i</td>
<td>u</td>
</tr>
<tr>
<td>ATR</td>
<td>e</td>
<td>o</td>
</tr>
<tr>
<td></td>
<td>ε</td>
<td>ø</td>
</tr>
<tr>
<td>Low</td>
<td>a</td>
<td></td>
</tr>
</tbody>
</table>

The phonological features [high], [low], [front], [back], and [ATR] can precisely define the vowel space.
Phonetic underpinnings of ATR

- The tongue root is advanced for the vowel [e, o] and not for [ɛ, ɔ].

The tongue root moves forward and back, affecting the size of the vocal cavity through which air moves.
The following feature chart summarizes Seeku oral vowels:

For the sake of analysis, I am assuming a privative contrast in vowel features here (+ vs. Ø).

- i.e. features are like tags and not like switches
Long vowels

All vowels can also be long (i.e. length is contrastive); featurally, this is marked with \([\text{long}]\):

<table>
<thead>
<tr>
<th>Long</th>
<th>Example</th>
<th>Gloss</th>
<th>Short</th>
<th>Example</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>iː</td>
<td>siː¹</td>
<td>‘water jar’</td>
<td>i</td>
<td>si³</td>
<td>‘tree sp.’</td>
</tr>
<tr>
<td>eː</td>
<td>bɛː¹</td>
<td>‘pig’</td>
<td>e</td>
<td>bɛ¹</td>
<td>‘give’</td>
</tr>
<tr>
<td>aː</td>
<td>kaː¹</td>
<td>‘eight’</td>
<td>a</td>
<td>ka²¹</td>
<td>‘yam’</td>
</tr>
<tr>
<td>oː</td>
<td>doː¹</td>
<td>‘beer’</td>
<td>o</td>
<td>do²¹</td>
<td>‘shoulder’</td>
</tr>
<tr>
<td>uː</td>
<td>kuː²¹</td>
<td>‘thing’</td>
<td>u</td>
<td>ku²¹</td>
<td>‘language’</td>
</tr>
</tbody>
</table>
Vowels can also be nasalized, marked with the feature [nasal].

- Crucially, [ATR] and [nasal] are incompatible, leaving a five vowel inventory: [ı̃, ẽ, ā, ō, ŭ].

<table>
<thead>
<tr>
<th>Nasal</th>
<th>Example</th>
<th>Gloss</th>
<th>Oral</th>
<th>Example</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>ı̃</td>
<td>sǐ̃¹³</td>
<td>‘be’</td>
<td>i</td>
<td>sì¹</td>
<td>‘water jar’</td>
</tr>
<tr>
<td>ẽ</td>
<td>bě̃²¹</td>
<td>‘rain (v.)’</td>
<td>ẽ</td>
<td>bẽ¹</td>
<td>‘pig’</td>
</tr>
<tr>
<td>ā</td>
<td>bā³</td>
<td>‘hit’</td>
<td>a</td>
<td>ba¹</td>
<td>‘put’</td>
</tr>
<tr>
<td>ō̄</td>
<td>dō¹</td>
<td>‘today’</td>
<td>ō</td>
<td>dō²¹</td>
<td>‘shoulder’</td>
</tr>
<tr>
<td>ŭ̄</td>
<td>bū³</td>
<td>‘sand’</td>
<td>ŭ</td>
<td>bu²¹</td>
<td>‘grass’</td>
</tr>
</tbody>
</table>
Outline

1. Introduction
   - Today’s talk
   - Background on Seeku

2. Phonological features
   - What are phonological features?
   - Phonological features in Seeku

3. Plural formation
   - Vowel alternations
   - Tone alternations
   - Local summary

4. Conclusions
Main data patterns

Front-vowel stems show no vowel changes in the plural (i.e. tone is the only indicator):

\[(11) \begin{array}{ccc}
\text{Singular} & \text{Plural} \\
bi^{21} & ‘goat’ & bi^{3} & ‘goats’ \\
bɛː^{1} & ‘pig’ & bɛː^{2} & ‘pigs’ \\
ke^{1}re^{1} & ‘day’ & ke^{2}re^{2} & ‘days’ \\
\end{array}\]

Laura McPherson (Dartmouth College)

Plural formation in Seeku

March 4, 2015 / BU
Main data patterns

- Final /a/ becomes [ɛ] in the plural:

(12) | Singular | Plural |
--- | --- | ---
| dyo\textsuperscript{1}ŋwa\textsuperscript{3} | ‘cat’ | dyo\textsuperscript{1}ŋwɛ\textsuperscript{3} | ‘cats’ |
| ka\textsuperscript{21} | ‘yam’ | kɛ\textsuperscript{3} | ‘yams’ |
Main data patterns

- Back-vowel stems show fronting of the final vowel, which is preceded by a back glide [w]:

\[
\begin{array}{ccc}
\text{Singular} & \text{Plural} \\
\text{ʃu}^3 & \text{ʃwi}^3 & \text{hare’} & \text{hares’} \\
gwɛ:\text{1} & \text{gwɛ:\text{2}} & \text{field’} & \text{fields’} \\
s\text{o\text{21}} & \text{swe}\text{3} & \text{horse’} & \text{horses’}
\end{array}
\]

- All other features of the final vowel (height, ATR, length) are preserved; only [front] and [back] are affected.
Summary of changes

- Front vowels: no change
- Low vowels: change to [ɛ] (a front vowel)
- Back vowels: change to front equivalent (plus insertion of [w])
- Overarching pattern: Plural forms end in a front vowel.
The proposal

- Phonological features can operate independently, and morphemes can consist of only a (set of) phonological feature(s).
- A floating (i.e. independent/unassociated) [front] suffix is responsible for the vocalic changes.
  - Why a suffix? Only the final vowel is affected.
  - \( \text{jo}^{1}\eta \text{wa}^{3} \rightarrow \text{jo}^{1}\eta \text{we}^{3} \) ‘cat(s)’,
  - \( \text{bo}^{1}\text{-ko}^{13} \rightarrow \text{bo}^{1}\text{-kw}^{13} \) ‘billygoat(s)’
The [front] feature from the plural merges with the [front] feature of the stem.

\[(14) \quad \text{bi}^{21} \rightarrow \text{bi}^3 \text{ ‘goat(s)’} \]

\[
\begin{array}{c}
\text{CV} \\
\mid \\
[+\text{front}_1] \quad [\text{front}]_2 \\
\mid \\
[+\text{high}] \\
\end{array}
\rightarrow
\begin{array}{c}
\text{CV} \\
\mid \\
[+\text{front}_{1/2}] \\
\mid \\
[+\text{high}] \\
\end{array}
\]
Low-vowel derivation

- The [front] plural feature dislodges the [low] feature due to a ban on front low vowels (*æ).

\[(15) \quad ka^{21} \rightarrow k\varepsilon^{3} \text{ ‘yam(s)’} \]

\[
\begin{array}{c|c}
CV & CV \\
\hline
 [+low] & [+low] \\
 [+front] & [+front] \\
\end{array}
\]

- Realizing [front] is more important than realizing [low].
[back] and [front] are mutually incompatible features, but rather than deleting [back], it is preserved as a glide.

\[(16) \quad \text{go}\_1 \rightarrow \text{gw}\_2 \, 'field(s)' \]

\[
\begin{array}{c}
\text{CV} \\
\downarrow \\
[+\text{back}] [+\text{front}], [+\text{long}]
\end{array}
\rightarrow
\begin{array}{c}
\text{CV} & \text{V} \\
\downarrow & \\
[+\text{back}] [+\text{front}] & [\text{-syll}] [+\text{long}]
\end{array}
\]

- Why a glide? The plural should contain the same number of **moras** as the singular.
  - glide = 0 moras, short vowel = 1 mora, long vowel = 2 moras
Why not vocalic suffixation?

- How do we know this is featural affixation rather than regular vocalic suffixation? Why not /-ε/?
- What this analysis would entail:
  - Vowel harmony (the suffix takes on [high], [ATR], and [long] from the root, but crucially not [back])
  - Glide formation of round vowels
  - Vowel hiatus resolution ($V_1 V_2 \rightarrow V_2$)

(17) UR /bi-ε/ /gɔː-ε/
Vowel harmony bi-i gɔː-ɛː
Glide formation — gw-ɛː
Hiatus resolution b-i —
SR [bi] [gwɛː]
Evidence 1: Diphthongs

- Diphthongs are permitted in Seeku roots.
  - Spreading of features [high] or [long] is not automatic (though ATR is always harmonic).
  - Hiatus resolution isn’t automatic (two vowels are allowed in the same syllable).

(18) a. biɛ́21 ‘mud’
    b. mɔ̄ɛ́21 ‘millet’
    c. soɛŋ² ‘one’
Evidence 2: Antipassive

- The antipassive (suppresses the object of a verb) is a vocalic suffix -ε that contrasts in behavior with the plural.

\[(19)\]

a. \(sã-ε \rightarrow sẼ\): ‘buy’

b. \(bã-ε \rightarrow bẼ\): ‘hit’

c. \(fɔ-ε \rightarrow fɔε\): ‘uproot’

d. \(gyõ-ε \rightarrow gyõẼ\): ‘grill’

- The suffix adds a mora (it adds a vowel to the CV tier).
- Back vowels do not glide—a diphthong is formed.
- If the plural were a vocalic suffix, we would expect the same results.
Outline

1. Introduction
   - Today’s talk
   - Background on Seeku

2. Phonological features
   - What are phonological features?
   - Phonological features in Seeku

3. Plural formation
   - Vowel alternations
   - Tone alternations
   - Local summary

4. Conclusions
Data patterns

The tone facts are a bit more straightforward than the vocalic facts.

We essentially find a chain shift:

- \( L (1) \rightarrow M (2) \rightarrow H (3) \)

(20)  

a. \( b\epsilon:^{1} \rightarrow b\epsilon:^{2} \) ‘pig(s)’

b. \( bi^{21} \rightarrow bi^{3} \) ‘goat(s)’

c. \( j\epsilon^{3} \rightarrow j\epsilon^{3} \) ‘hare(s)’
Featural analysis

- These changes too can be understood in terms of phonological features.
- Tonal features (Yip 1980, Pulleyblank 1986, etc.):

(21) *Seeku tonal features*

- Upper: $+ \, (+) \, - \, -$
- Raised: $+ \, (-) \, + \, -$

- Chain shift is created by the suffixation of [+upper].
Two M tones?

The feature system predicts two featurally distinct M tones, but the language appears to be a three-tone language.

- Can we find any evidence for this distinction?

I would argue yes, from two sources:

1. Phonotactics
2. Low level tone rules
Phonotactics

- Phonotactics: the study of the possible combinations and placements of sounds.
  - The sequence /rs/ is permissible at the end of a word (course) but not at the beginning (*rsoke).
  - The sounds /h/ and /s/ may not occur next to each other in that order.

- A curious asymmetry in lexical tone:
  - We find level L and level H on singular nouns, but never level M.

<table>
<thead>
<tr>
<th></th>
<th>Sg. Tone</th>
<th>Singular</th>
<th>Pl. Tone</th>
<th>Plural</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>bɛː¹</td>
<td>M</td>
<td>bɛː²</td>
<td>‘pig’</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>ʃu³</td>
<td>H</td>
<td>ʃwi³</td>
<td>‘hare’</td>
<td></td>
</tr>
</tbody>
</table>
Instead, we see lots of ML nouns and verb stems. These fill in the \( M \) slot on the plural chain shift.

\[
\begin{align*}
\text{L} & \rightarrow \text{M} \\
\text{ML} & \rightarrow \text{H} \\
\text{H} & \rightarrow \text{H}
\end{align*}
\]

(23)  
\begin{align*}
a. & \quad \text{bi}^{21} \rightarrow \text{bi}^3 \text{ ‘goat(s)’} \\
b. & \quad \text{ka}^{21} \rightarrow \text{ke}^3 \text{ ‘yam(s)’} \\
c. & \quad \text{go}:^{21} \rightarrow \text{gwε}:^3 \text{ ‘tree(s)’}
\end{align*}
Phonotactics

Featurally, singular M(L) and plural M are distinct:

- Sg. M: [-upper, +raised]; addition of [+upper] derives H.
- Pl. M: [+upper, -raised]; derived from L with the addition of [+upper].

I argue that phonotactics does not allow [-upper, +raised] in word-final position.

- L is epenthesized as a repair.

(24) UR /bi^2/_sg /bi^2/_pl
Plural — bi^3
Phonotactics bi^21 —
SR [bi^21] [bi^3]
Further evidence for the M tone distinction could come from tone rules.

- Do the two M tones behave any differently in context?

This is a somewhat difficult question to answer precisely because underived M must always be followed by L, but preliminary evidence suggests yes.
Tone rules

- In a sequence of two derived M tones (+upper, -raised), the second is pronounced slightly higher (upstep).

\[(25) \quad \text{mi}^3 \text{ bɛ}^2 \uparrow \text{bā}^2\]
\[1\text{PL pig.PL hit.PST} \]
\[\text{‘We hit pigs.’}\]

- When two underived M-toned words come together in a compound or in a reduplicated word, there is no upstep:

- In this reduplicated word, we find no upstep:

\[(26)\]
\[\text{a. mō̃č}^2 \text{-kwo}^21 \text{ ‘millet paste’}\]
\[\text{b. ko}^2 \text{-ko}^21 \text{ ‘rooster’}\]
A tonal suffix

Like the vowel feature [front], this tone feature is a suffix:
  ▶ Non-final tones are not affected.

(27)  
  a.  \( \text{jo}^1 \text{wa}^3 \rightarrow \text{jo}^1 \text{we}^3 \) ‘cat(s)’
  b.  \( \text{ko}^2{-}\text{ko}^12^1 \rightarrow \text{ko}^2{-}\text{we}^3 \) ‘rooster(s)’
  c.  \( \text{ku}^1 \text{n}\text{u}1^21 \rightarrow \text{ku}^1 \text{n}\text{i}1^3 \) ‘stone(s)’
A tonal suffix

- If both syllables of a root have the same tone, they are both affected:

(28) a. $ji^1ge^1 \rightarrow ji^2ge^2$ ‘dog(s)’
    b. $kɔ^2rɛ^21 \rightarrow kɔ^3rɛ^3$ ‘man/men’

- This suggests these roots have just a single tone associated to both syllables (/jige$^1$/, /kɔrɛ$^2$/).
Example tone derivation

(29) \( \text{jige}^1 \rightarrow \text{jige}^2 \text{ dog(s)} \)

\[
\begin{array}{c}
\text{jige} \\
\checkmark \\
T \\
| \\
[-\text{upper}] \\
[-\text{raised}]
\end{array} \quad \rightarrow \quad \begin{array}{c}
\text{jige} \\
\checkmark \\
T \\
| \\
[+\text{upper}] \\
[-\text{raised}]
\end{array}
\]

Laura McPherson (Dartmouth College)
Outline

1 Introduction
   • Today’s talk
   • Background on Seeku

2 Phonological features
   • What are phonological features?
   • Phonological features in Seeku

3 Plural formation
   • Vowel alternations
   • Tone alternations
   • Local summary

4 Conclusions
A featural suffix

- Original question: Can we identify a plural morpheme in Seeku?
- Answer: Yes! The plural in Seeku is a suffix consisting of two phonological features:
  - A [+front] vocalic feature
  - A [+upper] tonal feature
- In some words, both make an audible difference.
  - e.g. $ka^{21} \rightarrow k\epsilon^{3}$ ‘yam(s)’
- In others, only the tone or the vowel change is audible.
  - Tone: $bi^{21} \rightarrow bi^{3}$ ‘goat(s)’
  - Vowel: $\text{\textperiodcentered}u^{3} \rightarrow \text{\textperiodcentered}wi^{3}$ ‘hare(s)’
We have seen that affixes can consist of only phonological features.

- Phonological features do more than just characterize phonemes.

A language can have both featural affixes and full-fledged segmental affixes.

- Minimal pair: plural (featural) vs. antipassive (segmental)

Plural formation gives evidence for tonal features in Seeku, which may aid the analysis of complicated tonal facts elsewhere in the language.
Future directions

- A few interesting patterns remain to analyze.
- Non-final morpheme is affected:
  - e.g. $k\alpha^1-\nu\varepsilon^1 \rightarrow k\varepsilon^2-\nu\varepsilon^2$ ‘bird(s)’
- Plural copying on both members of a compound:
  - e.g. $g\gamma^1-\nu\varepsilon^3 \gamma\zeta^3 \rightarrow g\nu\varepsilon^1-\nu\varepsilon^3 \gamma\varepsilon^3$ ‘cornfield(s)’
- Variable creation of “extra-high” on pluralized H tones:
  - e.g. $j\eta^1\eta m\alpha^3 \rightarrow j\eta^1\eta m\varepsilon^4$ ‘cat(s)’
- Future fieldwork and text collection will help show how these patterns emerge in natural speech.
I would like to thank the BU Linguistics Association, the Department of Romance Studies, and the African Studies Center for the opportunity to come present. This work has benefitted from audience feedback at Mandelang-4, MIT Phonology Circle, and Dartmouth College, as well as discussions with Kie Zuraw and Stephanie Shih. I am very grateful to my consultants, Sy Clément Traore, Gni Emma Traore, and Gni Fatou Traore for all of the data. This work has been financially supported by NSF grant BCS-1263150 (P.I. Jeffrey Heath) and the Dartmouth College Burke Award.


References II


