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Recommendations for Sawiyano Orthography*

John M. Clifton
May 1988

The following are recommendations regarding the orthography of the Sawiyano (or Ama) language. The basic problem addressed in this paper is how the vowels should be represented in the orthography. Originally Årsjös differentiated seven, then eight vowel vowels in the orthography. However, they symbolise only four vowels in the current orthography. More recently, the possibility of returning to a seven vowel system has been raised by members of New Tribes Mission working in Sawiyano. (The historical development of the orthography is detailed more fully in section 3.)

After examining the situation, my recommendations are:

1. Continue using the four vowel system for most literature, including the New Testament.

2. Experiment with a seven vowel system based on the four vowel system for the purpose of beginning literacy. My first preference is to add diacritics to the three symbols representing more than one phoneme (i̲, o̲, u̲), resulting in a system like the following: i̲, ī, a̲, o̲, ö, ü, u̲. A second possibility, if pressure from Tok Pisin is great, would be to replace ī by e̲. The diacritics would be dropped as readers became more fluent, resulting in the four vowel system presently used.

In the next section, an overview of the general rationale behind these recommendations will be outlined. Following this, more detailed discussion will be presented in later sections.

1. General rationale for recommendations

Initially, the problem appeared to be one of analysis. Most analyses (Conrad and Dye 1975, Årsjö and Årsjö 1974, 1976, Tillitson 1987), propose seven or eight phonemic vowels. Årsjö (1980, 1981), on the other hand, seems to propose only four phonemic vowels. In my analysis, I would agree there are seven or eight vowels. Futhermore, as shown in section 2, I feel that a closer reading of Årsjö (1980, 1981) shows that these papers also justify seven vowels. There is general agreement, then, that the phonemic inventory of Sawiyano contains seven vowels.

Given this general agreement, the real problem is whether underdifferentiation of the vowels is desirable. In general, underdifferentiation is advantageous to the writer, but

disadvantageous to the reader. The advantages to the writer lie in the fact that fewer distinctions have to made when spelling a given word. This can be especially advantageous for the speaker whose phonemic inventory does not contain all the distinctions represented in the orthography. The disadvantages to the reader lie in the fact that underdifferentiation may result in ambiguity. Even if context can clarify the ambiguity in most cases, underdifferentiation minimally eliminates some of the redundancy that makes reading easier.

In light of these observations, it is significant that the primary impetus for the change to the four vowel system was difficulties in spelling. The spelling testing which was done is reviewed in section 4. In spite of claims that the testing was biased by possible misspellings of 'key words' in primers, my conclusions are that the seven vowel system was difficult for writers to master. In section 5 I present evidence that at least two of the three contrasts that are merged in the four vowel orthography seem to be merging in the speech of at least some speakers. In addition, preliminary acoustic analysis seems to indicate that the vowels in some words lie between the 'pure' vowels of the Sawiyano system. These findings would support the view that a seven vowel orthography is problematic for writers.

In spite of the disadvantages of a seven vowel system for writers, I assume that it is more important for readers to obtain meaning from the text than for writers to be able to spell easily. Because of this, my predisposition is to discourage underdifferentiation if there is any indication that fuller differentiation will help reading. Therefore, much of my time in Kauvia and Wopulu was spent in reading testing. The initial results of my testing, reported in section 6, indicate that underdifferentiation of the vowels does not lead to reading difficulties. I also looked at grammatical information that might be lost through underdifferentiation. In section 7 I examine one grammatical morpheme which might be problematic and conclude that it can be handled grammatically, without requiring general full differentiation of vowels.

In general, then, full differentiation of vowels seems to present problems for writers, while underdifferentiation of vowels does not seem to present difficulties for readers who are at least semifluent. At least for these readers, then, there does not seem to be any reason to change the current orthographic practices.

There might be value, however, in fully differentiating the vowels for beginning literates. Presumably these readers are not fluent enough to make use of the contextual cues relevant for disambiguating particular words. In Indonesian six phonemic vowels are generally indicated with five

orthographic symbols, with e̲ representing both /e/ and /ə/. In beginning literacy, as well as in dictionaries, however, a diacritic is placed over any e̲ representing /ə/. The diacrtic is dropped for more fluent readers who can rely on context, resulting in the simpler, underdifferentiated five vowel system. It seems it would be worthwhile to experiment with a similar system in Sawiyano to see if it helps initial literacy efforts. Such a fully differentiated system could also be used in dictionaries since context cues are not present to indicate the meaning of the entry.

It is important to note that such a system will work most easily when the fully differentiated system is directly based on the underdifferentiated system. My first preference is to disambiguate the three symbols that are used for more than one phoneme (i̲, o̲, u̲) by adding a diacritic to the less common phoneme in each case. My first choice of diacritic is umlaut, since it is easily characterised on a standard typewriter keyboard by the double quote. The main potential problem with this system may be that people familiar with Tok Pisin may react adversely to the use of ɪ̲ instead of e̲ for /e/. If this is the case, this change should be made. As is discussed in section 8, ~~either~~ both of these two systems are clearly based on the four vowel system currently in use and so should present no problems for people switching to the underdifferentiated system as they become more fluent.

2. The vowel inventory

The most striking aspect of a comparison of these analyses is that Årsjö (1980, 1981) posits a four vowel system, while all other studies posit a seven (or eight) vowel system. As the choice of a seven vs. four vowel orthographic system seemed at first to rest on the differences in analysis, I will first discuss the analyses themselves. It should be made clear during the discussion that there is no real difference between the analyses; all agree there are at least seven phonemic vowels. Årsjö (1980, 1981) actually argues for underdifferentiation in the orthography, not for a smaller phonemic inventory.

Conrad and Dye (1975) represents an early, general survey of the entire language family. Therefore, no attempt is made to present allophonic variation. The seven vowel system given as (1) is presented as representative of all the languages in the family.

1)

i		u
e	ʌ	o
a		ɔ

In the other studies, there is general agreement that the following phonetic segments occur in Sawiyano.

2)

i		u
e	ə	o
	ʌ	ɔ
a	ɐ	

These phonetic segments are assigned to seven phonemes in Årsjö and Årsjö (1974) and Tillitson (1987), the only difference being to which phoneme [ʌ] is assigned. As shown in (3), in which the phonemic symbols are substituted for the phonetic symbols in (2), Årsjö and Årsjö assign [ʌ] to /a/.

3)

i		u
e	ɐ	o
	a	ɔ
a	ɐ	

Tillitson, on the other hand, assigns [ʌ] to /ɐ/, resulting in (4).

4)

i		u
e	ɐ	o
	ɐ	ɔ
a	ɐ	

The analysis presented in Årsjö and Årsjö (1976) is very close to those presented above, but [ʌ] is assigned to /a/ when stressed, but to /ɐ/ when unstressed. In addition, [ə] represents a separate phoneme. This system is illustrated in (5).

5)

i		u
e	ə	o
	á/ɐ	ɔ
a	ɐ	

My research into the phonemic structure of Sawiyano would also generally agree with these analyses, although the status of [ə] is problematic.

With this widespread agreement on the general structure of the vowel system, the analyses presented in Årsjö (1980, 1981) at first appear suspicious, as they assign all the phones to four phonemes as indicated in (6).

6)

i		u
i	ɔ	u
	ɔ	ɔ
a	ɔ	

According to the system in (6), there should be no contrasts between [i] and [e], [u] and [o], or [ɐ], [ʌ] and [ə]. This, however, was not the case. Årsjö (1981:8) states that, "perhaps a few minimal pairs should have been ignored..."

More specifically, Årsjö (1980:12) assigns [e] as an allophone of /i/ although "there are practically no minimal pairs between [ɪ] and [ê] [i.e. between [i] and [e] - JMC]." (emphasis mine)

The apparent confusion in (6) seems rooted in the belief at the time that when an orthography proves problematic, the phonemic analysis underlying it is probably incorrect. Shand (1979) discusses a number of instances in which problems in literacy led to a phonemic reanalysis in Ilianen Manobo. Discussing one particular problem, Shand states that:

> "These solutions were considered previously, but discarded since phonemic theory does not permit the assignment of phonetically identical phones to more than one phoneme in the same environment. Our experience in teaching reading leades to a reconsideration of these solutions." (1979:18, emphasis mine)

Similar reasoning is seen in Årsjö and Årsjö's (1976:9) discussion of [ə]. They state "it is difficult to contrast [ə] with the other phonemes," and note it may be the result of a neutralisation of the other vowels in unstressed position. Ultimately, however, they argue it should be a separate phoneme "because the trial-literacy program has shown that this will facilitate reading."

The rationale for the reanalysis presented in Årsjö (1980, 1981) was that while people could read eight symbols correctly, they only wrote four. Given the assumptions of the time, this problem in literacy provided prima facie evidence that the original phonemic analysis was incorrect. In some cases, minimal pairs were intentionally ignored, as stated above. A possible justification for this was presented in Årsjö (1980:8):

> "One theory we have is that /e/ and /o/ are phonemes on their way in or out of the language. They seem to contrast with other vowels just in a few words. In many or most places [e] may easily be written /i/ and [o] /u/. Another thought is that they may have been glides now going towards being a single vowel. We first thought about that for [o] which may be heard as a glide... /uɔ/ is a ... likely choice. The corresponding front glide [e] may then be /ia/. That is exactly what we heard for /e/ [in mimicry drills - JMC] in our first trial literacy [classes - JMC]."

This analysis could result in surface contrasts between the phones [e] and [i], or between [o] and [u], but would trace them to a phonemic difference between /ia/ vs. /i/, or /uɔ/ vs. /u/, respectively.

A careful reading of Årsjö (1980, 1981) indicates the author did not believe there were no contrasts between the phones assigned to given phonemes. In retrospect, this would have been clearer today if the reanalysis had been presented as intentional underdifferentiation of the seven-vowel system. Given the assumptions of the day, however, the presentation as it was made is understandable.

In general, then, I will assume a seven vowel system as given in (7) for the remainder of this paper.

7)
i		u
e		o
a	ɐ	ɔ

3. History of orthography

The initial orthographies used in Sawiyano were based on a seven vowel system. On the basis of the seven vowel system given in (3) (repeated here as (8a)), Årsjö and Årsjö (1974) proposed seven graphemes using umlauts as shown in (8b).

8)a.
i		u
e	ɐ	o
	a	ɔ
	a ɐ	

b.
i		u
e	ä	ö
	a	o
	a ä	

As can be noted, this orthographic system is based on Tok Pisin, although at the time very few Sawiyano speakers knew Tok Pisin.

As noted above, the phonemic analysis represented by (3) (or (8a)) was modified in Årsjö and Årsjö (1976), resulting in (5) (repeated here as (9a)). The resulting orthography is given in (9b).

9)a.
i		u
e	ə	o
	á/ɐ	ɔ
	a ɐ	

b.
i		u
e	ɨ	oo
	a/aa	o
	a aa	

The symbol ɨ was used for the eighth vowel, /ə/, and [ʌ] was represented as a only when stressed. In addition, the umlauted graphemes were replaced by digraphs since the orthography committee at the time felt digraphs were less problematic than diacritics.

This orthography was used for a number of years in literacy classes. According to Årsjö (1980, 1981), however, while people were able to read the eight vowels accurately, they made only a four way contrast in writing. On the basis of spelling and reading testing (to be discussed below), Årsjö (1980, 1981) proposed the phonemic inventory presented in

(6) (repeated here as (10a)), with the four grapheme orthographic system shown in (10b) based on it.

10)a.
```
i         u
  i   ɔ   u
      ɔ   ɔ
    a   ɔ
```

b.
```
i       u
  i   o   u
      o   o
    a   o
```

As noted above, not all minimal pairs could be accounted for in this system. Årsjö (1980) suggested the system should be modified in a few instances. For example, monosyllabic forms with [o] would be written (and phonemicised) as uo. In this way, minimal pairs as in (11) could be differentiated.

11)a.	[to]	/tuo/	tuo	'sago'
b.	[tu]	/tu/	tu	'thumb'

The justification here was that few polysyllabic words differed only in regard to [u] vs. [o]. Thus, this contrast seemed important only in relation to monosyllabic forms.

The spelling of specific words was modified over time as people became more compentent with the system. The overall system as outlined in (10b) has been used until the present, however.

4. Spelling Testing

Most of the testing reported by Årsjö (1980, 1981) on which the four vowel analysis rests, dealt with spelling problems. Over a period of time, eight subjects were asked to transcribe a list of 265 words from cassette. In an attempt to check consistency, some of the words occurred more than once in the list, and three of the subjects were asked to transcribe the list on two separate occassions. The eight subjects were also asked to read material prepared in various orthographies to see if their reading fluency was affected.

In analysing this testing, it is important to note that little formal testing had been done previously in the area of orthography testing. Thus, the team did not have the benefit of examples to follow in their testing. The following comments from the orthography committee that considered Årsjö (1980) should give an idea of the feelings at that time.

> "The Committee members were all agreed that this is an exceptionally good paper with thorough work and shows the value of ample psycho-linguistic testing of the orthography...

> "The committee would like to encourage the publication of this paper as it is highly valuable for other similar situations."

Given this background, the actual spelling testing will be examined in the rest of this section, while reading testing will be discussed in a later section. I will first discuss some of the problems with the experimental design. After this, I will examine some objections raised to the testing by Kalk (personal communication).

A major problem with the written report of the spelling testing is in the analysis. First, the actual list of words tested is not given anywhere. Furthermore, there is no indication of which words proved most problematic for the subjects. For example, while 61% of the words with [e] were spelt with i, 30% were spelt with e. There is no indication of whether this figure means that some words were (relatively) consistently written with e, or whether e was used randomly. It is noted that one subject (with a grade 4 education) spelt 100% of these forms with e, while another subject spelt 87% with i. Thus, at least between subjects there are nonrandom factors. The statistics given in Årsjö (1980) do not allow conclusions to be drawn regarding different lexical items. (Årsjö (1981) is an abridged form of this report, but not including any of the statistics.)

Related to this problem is the problem that the consistency checks were impressionistic. Årsjö (1981:7) states that:

> "No actual counts of consistency were made but the impression is that no writer was completely consistent though they show certain definite patterns."

It is unclear from the reports how much of the variation was due to the subject, how much was due to the individual lexical item, and how much was due to random factors.

The problems in isolating the various factors involved are highlighted in an explanation for the results of the spelling testing proposed by Kalk (personal communication). Kalk claims that some of the 'key words' used to teach the basic vowel sounds were misspelt in the primers used. In particular, he claims certain instances of /e/, /o/ and /ɔ/ were written as i, u, and aa, respectively. According to this analysis, people failed to differentiate between the seven vowels in the experiment due to confusion as to the differences between i and e, u and oo, and aa and o.

While this hypothesis is attractive, it does not seem to account for many of the actual statistics reported in Årsjö (1980). Thus Årsjö (1980:7) notes that of the 17 words in the test list containing [o], 3 were taught with u, and one was taught with o. The other 13, however, were actually

taught with oo as indicated by the system in (9b). In the experiment, however, only 15% of all occurrences of [o] were written as oo, while 50% were written as o or u, and 21% were written as ou or uo. Even if some of the words were mistaught in literacy classes, the extremely low figures for the 'correct' spellings are difficult to account for entirely in these terms.

In addition, B. Arsjö (personal communication) points out that the only key word which is directly relevant to this argument is the key word used to teach /i/, 'sugar cane'. This word was spelt ikau in the primer, while Kalk claims it is /ekau/. While the spelling of other key words may be in dispute, the disputed vowels were not focused on. (That is, the key words were used to illustrate some other segment.) Thus, it seems unlikely that misspellings of key words can account for the results of the spelling testing.

Part of Kalk's objections to the spelling testing may relate to his claim that people can consistently differentiate between all seven vowels, while he feels the spelling testing claims they cannot. The problem seems to be rooted in a confusion between several aspects of spelling as enumerated in (12).

12)a. Can subjects consistently transcribe the difference between i and e, u and oo, and o and aa in clearly constrastive words (i.e. those with minimal pairs)?
   b. Can subjects consistently transcribe any given vowel when their attention is drawn to it?
   c. Can subjects consistently transcribe vowels when their attention is not drawn to them?

The experimentation reported in Arsjö (1980, 1981) essentially tested (12c) without checking (12a-b). Kalk's claim that people can differentiate consistently between vowels, on the other hand, relates to (12a-b). Even if Kalk is correct that people can differentiate between vowels in situations (12a-b), this does not necessarily imply that people are able to consistently transcribe vowels when not concentrating on them. Note that if subjects can differentiate consistently between vowels in situations (12a-b), but not in (12c) this may indicate the differentiation is psycholinguistically unimportant. As Sampson (1987:133) notes:

> "It used to be axiomatic in linguistics that small perseptual differences between phonemes do not exist - that the very fact of phonological constrast between two sounds guarantees that competent speakers will hear the distinction clearly. But we now know that this is untrue."

At this point, then, it is difficult to determine the significance of the spelling testing that was done. While it definitely seems to show people underdifferentiated in their spelling, the cause of this underdifferentiation is unclear.

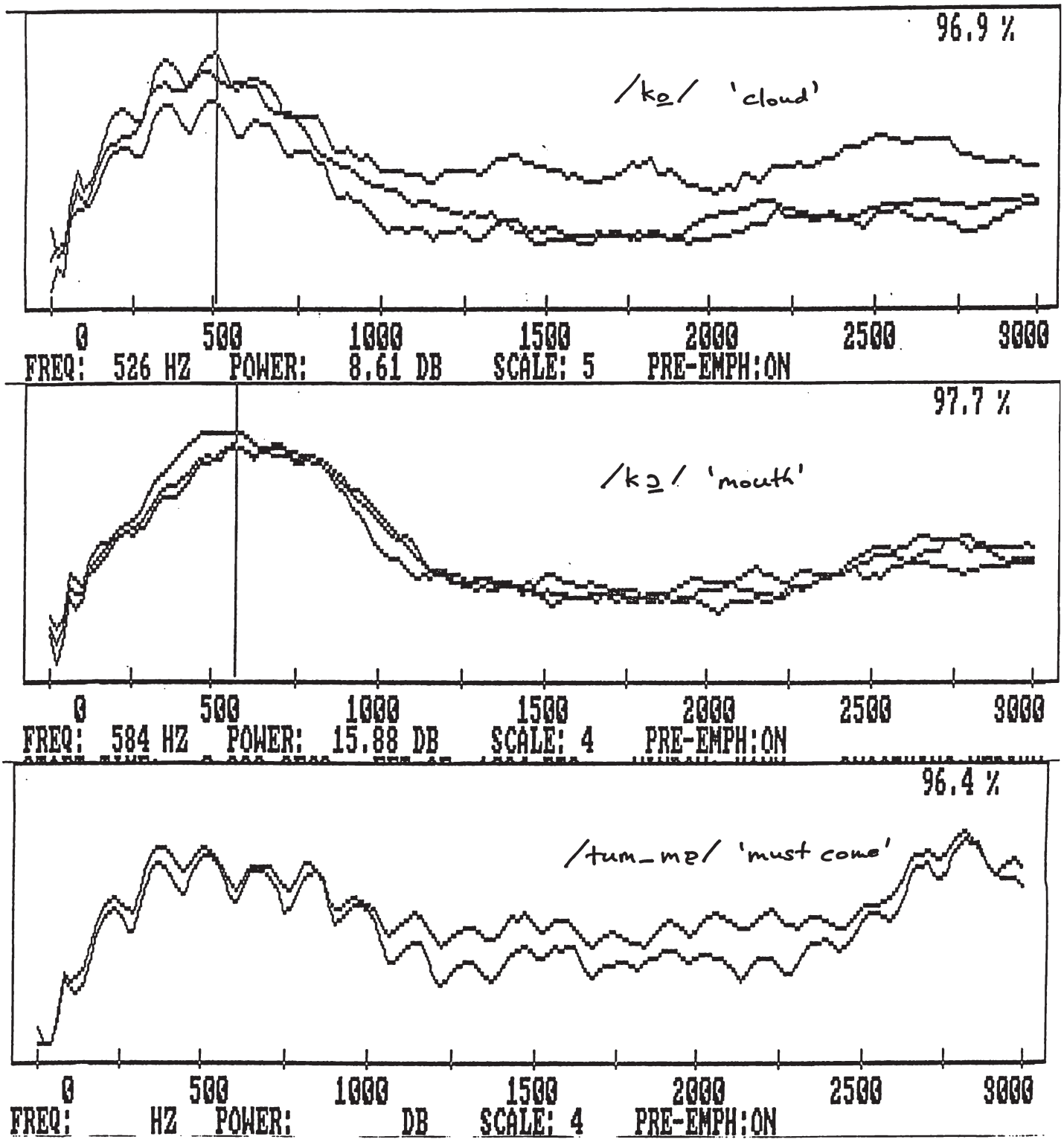
5. Phonetic Variation

One possible source of the spelling problems seen above is phonetic variation between speakers and between words. The variation between speakers seems to affect the mid vowels /e/ and /o/ most obviously. All of the previous analyses of Sawiyano agree that these vowels are higher than the norm in European languages. Especially among younger speakers, these vowels are generally higher yet, frequently merging with the high vowels /i/ and /u/. If the mid and high vowels are in fact merging, this could partially account for the difficulty in some cases of identifying whether a particular vowel was /i/ or /e/; /u/ or /o/.

Kalk (personal communication) has suggested that this merger of the high and mid vowels may be due to 'spelling' pronunciations; that is, since the vowels are being spelt the same, they are being pronounced the same. While this is a possibility, I would expect spelling pronunciations to be more prominent when the speaker is speaking slowly, concentrating on being 'correct'. In this case, the mergers are more common in fast speech. In slow speech the mid vowels are more commonly differentiated from the high vowels.

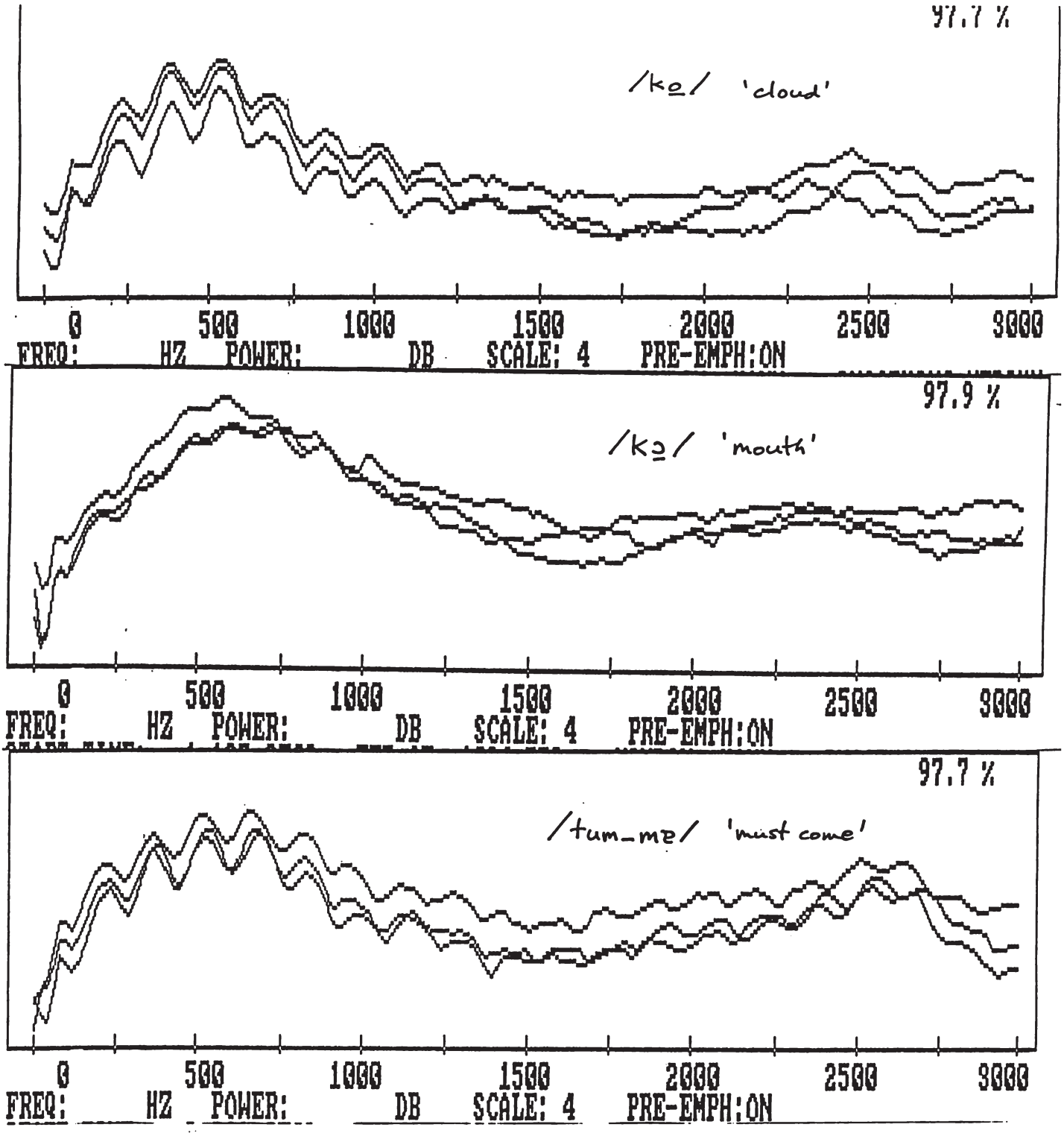
Kalk also indicated he questions the younger men's pronunciation because they are more likely to be influenced by Tok Pisin. At least in Wopuru, Kalk reports some of the young men are using Tok Pisin to the extent that they seem to be forgetting at least certain words or grammatical distinctions in Sawiyano. One particular item which he mentioned was the loss of the inclusive/exclusive distinction in Sawiyano. While it seems clear that Tok Pisin may be affecting the lexical and morphological command of the younger men, however, there does not seem to be any evidence that it is affecting their pronunciation.

In addition to variation between speakers, there seems to be variation between the realisation of specific vowels between different words. I was able to do a good amount of taping both at Ukarumpa and in the village for acoustic analysis. Only a little preliminary analysis has been completed, but it has yielded some interesting results thus far. Kalk had indicated the speakers he was working with felt that the morpheme 'must' was /-ɔ/, while the Årsjös had been writing it u on the basis that the speakers they were working with felt it was /-o/. Figures 1-3 show spectral analyses for the vowels in /ko̲/ 'cloud', /kɔ/ 'mouth', and /tum_mɐ/ 'must



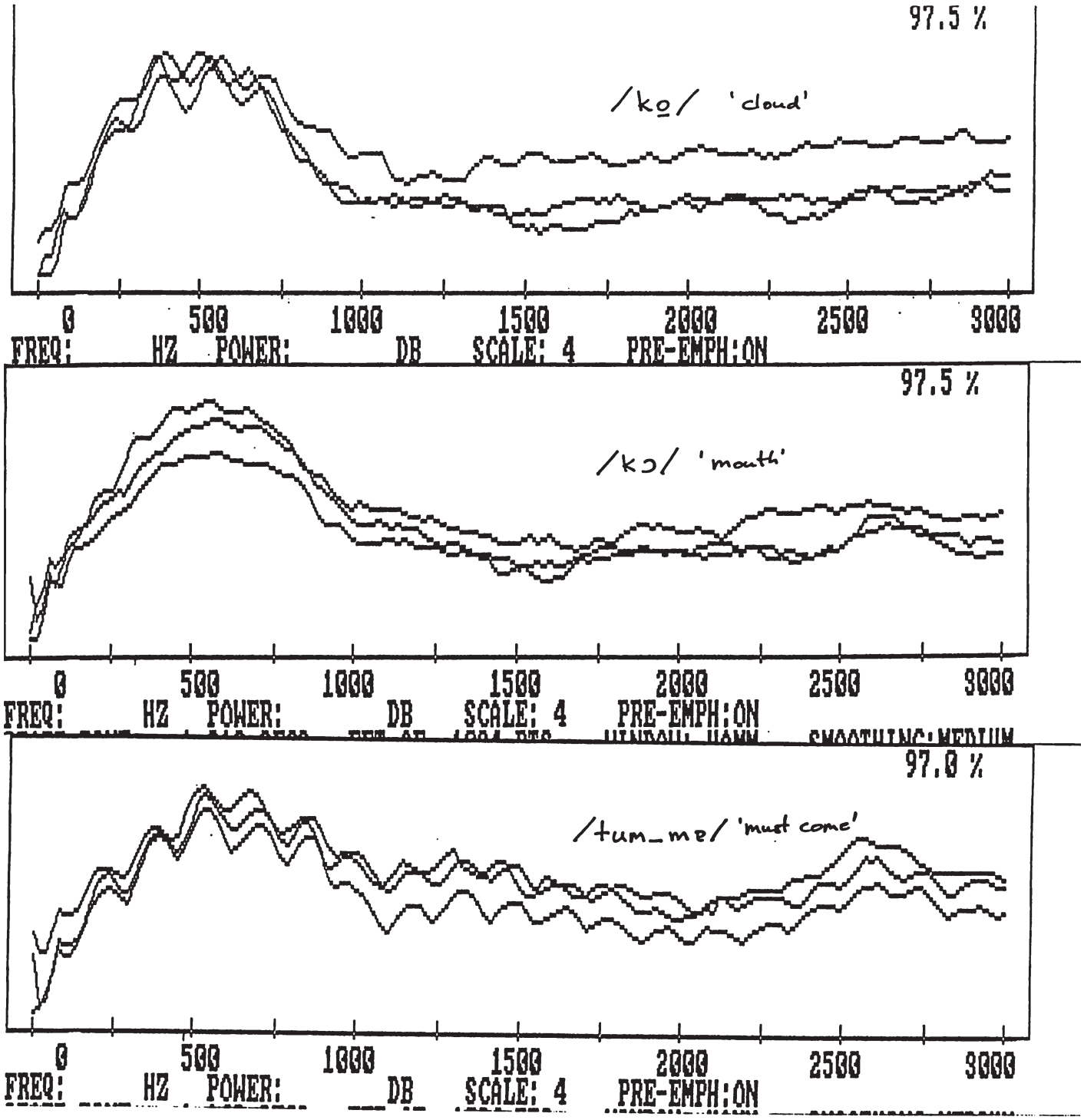
Speaker: Albert

Figure 1



speaker: Tut:

Figure 2



Speaker: Taitus

Figure 3

come' for four speakers. The middle vowel in 'must come' is of interest to us.

For each of the speakers, the frequency of the peak for the /o/ in /ko/ is lower (i.e. closer to 0) than the frequency of the peak for the /ɔ/ in /kɔ/. At the same time, the peak for the /ɔ/ is generally smooth while the peak for the /o/ is wavy. The frequency of the peak of the middle vowel in /tum_mɐ/ is close to that of /kɔ/ but it is wavy like the /o/ in /ko/, not smooth. This ambivalent nature of the vowel could very well account for the difficulty speakers have in specifying whether it is /ɔ/ or /o/.

This ambiguous nature of the vowel quality of 'must' is highlighted by the following comments made by Kalk (personal communication).

> "You said that there was a unanimous feeling at Kowiya that 'mas i kam' was the same as 'sno' - koˆ. I am not doubting that you got that conclusion from the people. But after checking it out with the people here again, I'm convinced that they made an honest mistake, or honest wrong guess on this one. When I first checked it out at Wopulu... guess what? they said the same as the Kowiya guys, they said it's like sno - koˆ. Well, knowing from my former studies that this was not the case, I went and found examples and comparisons with the must marker on every consonant except the p.... After doing that and checking it out with 4 individuals on every consonant, it came out consistent... Not that they never said the opposite. Sometimes they did. But then I had them say them outloud and then recomparing them, they realized their mistakes." [emphasis mine - JMC]

While it is certainly possible that the initial reaction was mistaken, it is also possible that the vowel in question is ambiguous. If this is the case, I would expect the language consultants to 'realize their mistakes' and choose the second possibility if the language worker implied they had misidentified the vowel on the first try.

6. Reading testing

Even if writers cannot handle all seven vowels consistently, it is important to differentiate between them in published material if it can be shown that this facilitates reading. On the other hand, if underdifferentiation does not cause major reading problems, there is no reason to burden the writer with making all possible differences. Because of this, it is important to test reading under a four vowel system.

Årsjö (1980:2; 1981:7) indicates the reading testing showed no drop in reading fluency for underdifferentiated systems.

While there is no indication in the written report of how reading difficulties were determined, S. Årsjö (personal communication indicates it was impressionistic. Thus, the statement that different orthographies did not cause additional problems in reading is difficult to evaluate.

Due to the importance of reading considerations, I undertook further reading testing during the period of 29 March to 7 April 1988. The testing (reported more fully in Clifton (in progress,b)), involved having subjects read different types of texts. Three different texts were used, each written with four vowels and with seven vowels. Subjects were asked to read texts written with both systems to determine the effects of underdifferentiation. All testing was taped so scoring could be done later.

The two seven vowel orthographies are given in (13).

13a)	i		u		b)	i		u
	e		o			î		û
	a	c	ö			a	o	ô

I had previously contacted Kalk, informing him of my plans to conduct reading testing and asking if he had taught any people to use a seven vowel system. Although he had not, he took the opportunity to begin to teach a number of people the system in (13a). For other subjects, I used the system in (13b). This system is based on the current four vowel system so subjects would not be confused, but all seven vowels are represented. Before each subject was tested, I familiarised them with the seven vowel system they were to use by using commonly known minimal pairs.

Some of the texts were modified 'cloze' tests, in which the second half of every other word was deleted. These texts were used to check comprehension, the theory being that subjects will not be able to 'fill in the blank' unless they understand the passage. The rest were regular texts. These were timed and errors made during the reading were analysed.

Although a full analysis has not been completed, preliminary analysis indicates there were no significant differences between reading with four vowels vs. seven vowels. Differences in the time it took to read texts with four vs. seven vowels were insignificant. The significance of this finding is difficult to determine, however. Given that subjects who used (13b) had no previous exposure to this system, it is likely they simply ignored the diacritics, thus resulting in the random results. Similarly, the subjects who used (13a) had little exposure to the system.

A preliminary analysis of errors, however, supports the claim that underdifferentiation does not seem to lead to

reading difficulties. Representative errors are given in (14).

14)a. /tanɐki/ for /tanɐkainɐki/ tanokainoki
b. /teyɐumu/ for /leyɐumɐ/ liyoumo
c. /ɐmifasɐ/ for /ɐumɐifaso/ aumoifaso

In (14a) two syllables are omitted. This is a common type of error, especially when the omitted syllables are affixes. Two errors are evident in (14b). First, l is pronounced /t/, which is graphemically similar. Second, final o is pronounced /u/. It is difficult to trace this problem to the underdifferentiation, as o is never pronounced /u/ in the four vowel orthography. Finally, in (14c) both diphthongs are pronounced as single vowels. Very few if any reading errors can be directly traced to the underdifferentiation of vowels.

One possible explanation for the lack of effect underdifferentiation apparently has on reading is related to the relative frequencies of each vowel. These frequencies are indicated in the following chart based on an analysis of portions of the first twelve chapters of Genesis as translated and spelt by Kalk using a seven vowel system.

	Total text		Word list	
	#	%	#	%
i	2889	18.37%	817	19.07%
e	1503	9.56%	480	11.20%
a	3094	19.68%	729	17.01%
ɐ	6959	44.25%	1776	41.45%
ɔ	223	1.42%	69	1.61%
u	714	4.54%	274	6.39%
o	343	2.18%	140	3.27%

Chart 1
Vowel Frequencies

Figures are given on the total text (5890 words), as well on a word list compiled from the total text (1039 words. In each case, the actual number of occurances of each phoneme is given, along with the percentage of all vowels represented by the phoneme in question.

The figures on the total text can be used to determine how frequently a particular orthographic symbol will occur in normal text. These figures are not necessarily a reliable indication of the importance of each phoneme for lexical contrasts, however, since a few very common words can inflate the relative number of the vowels in those words. Although the figures on the word list can also give a

distorted picture of the lexical load of each phoneme (because a particular morpheme may occur in many words), they do give a better approximation than the figures from the total text. Since, moreover, the two set of figures are close, they give mutual support to each other.

Especially in the cases of /ɔ/ and /o/ the percentages are very low. While the percentages for /e/ are considerably higher, they are still much lower than /i/. It is possible that this apparently low functional load results in the failure of underdifferentiation to unduly affect reading.

7. Grammatical neutralisation

Another area where underdifferentiation can potentially have effects is the neutralisation of grammatical contrasts. Note, for example, the forms in (15) as transcribed by Kalk (personal communication).

15)a. /tumɐ/ 'came (near past)'
   b. /tumɔ/ 'must come'

In section 5, I discussed the possibility that (15b) could also be /tumo/. For the purposes of discussion, however, I will assumee the transcriptions are correct and the suffix for 'must' is /-ɔ/. When added to the root /tumɐ/, the root final /ɐ/ deletes. The problem here is that both forms would be written tumo in the four vowel orthography.

To determine how serious this problem is, however, we need to examine other factors. For example, the 'must' form generally takes a second affix /-mɐ/, while the 'near past' form does not. Thus, the two will generally be written as in (16) in the four vowel orthography.

16)a. tumo 'come (near past)' (/tumɐ/)
   b. tumomo 'must come' (/tumɔmɐ/)

In context it is not clear that a potential neutralisation like this would be problematic for the four vowel system.

Moreover, even if this (or some other) grammatical contrast was shown to be problematic, it would not necessarily mean seven vowels would have to be consistently represented in the orthography. In the current orthography, the two forms are written as in (17).

17)a. tumo 'come (near past)'
   b. tumumo 'must come'

This spelling is based on native speaker reaction that 'must come' contains the same vowel as /ko/ 'cloud'. Even if this is phonetically incorrect, the spelling could be maintained,

with 'must' taught as a grammatical functor, not phonetically.

A related solution is used in Siane, where tone is not generally marked although it is phonemic. Tone is marked with an acute accent for negatives, however, since it is the only thing differentiating positives from negatives. Another option for the contrast between 'come' and 'must come' is given in (18).

18)a. tumo 'come (near past)' (/tumɐ/)
b. tumö 'must come' (/tumɔ/)

In this case, the orthographic symbol ö would represent the grammatical affix 'must', not the phoneme /ɔ/.

8. Possible seven vowel orthographic systems

Thus far no justification has been found for rejecting the underdifferentiation of vowels in Sawiyano orthography, at least in the case of (fairly) fluent readers. It is possible, however, that beginning readers who have not learned to use context effectively may be helped by having all seven vowels marked. In this section I will examine a number of possible systems in which all seven vowels are marked.

The generally accepted seven vowel system for Sawiyano is repeated here.

19) i u
e o
a ɐ ɔ

A similar system has been posited for the neighbouring and related language of Iteri (Kalk: personal communication). The language workers there have adopted the following orthographic conventions (Buser: personal communication).

20) i u
e o
a v c

This was also one suggestion made in Tillitson (1987:16). The use of v and c for the sixth and seventh vowels is questionable. Buser (personal communication) states that due to the low use of Tok Pisin, and the isolation of the Iteri people, these symbols do not pose transfer problems. This argument seems weak at best. A similar solution was tried in Dani (Irian Jaya), with q and v being used for the sixth and seventh vowels on the basis of their extreme isolation. The people did not stay isolated permanently, however, and ultimately they rejected the use of what were perceived as consonant symbols for vowel sounds. In an orthographic

reform, these symbols were changed to more traditional vowel symbols.

Most Sepik languages in which more than five vowels are distinguished use diacritics to mark the additional vowels. Tillitson (1987:16) has suggested either umlauts (e.g. o̲) or slashes (e.g. ø). In the discussion that follows, I will use the umlaut since it changes the basic form of the vowel less radically than the slash.

The initial suggestion made in Tillitson (1987:16) is the following.

21)

i		u
e		o
a	ä	ö

In assessing this system, it is important to consider the relative frequency of symbols using diacritics (including the slash). This is important for at least the following reasons.

1) People frequently leave off the diacritics.
2) A text with large numbers of diacritics looks less like English or Tok Pisin and so is more likely to be rejected by the users.

For both of these reasons, a system using the minimal number of diacritics is preferable.

On the basis of Chart 1 given above, system (21) does use a diacritic for the least frequent vowel (/ɔ/), but it also uses a diacritic for the most frequent vowel (/ɐ/), representing over 40% of all vowel occurrences. This situation could be improved by assigning diacritics as in (22).

22)

i		u
e		o
ä	a	ö

In terms of the frequency of segments using diacritics, system (22) is much preferable to system (21). One other system which should be considered at this point is represented in (23).

23)

i		u
e		ü
a	o	ö

System (23) is preferable to system (22) in at least two areas. First, it uses even fewer diacritics than does system (22), as it marks the two least frequent vowels according to

Chart 1, /ɔ/ and /o/. In addition, it matches up better with the current orthographic system, represented in (24).

24)

i		u
i		u
a	o	o

While the base forms of the nonfront vowels is the same in system (23) as in the current system (24), they are different in two places when system (22) is compared to system (24) (/o/ is represented by o̲ vs. u̲; /a/ by a̲ vs. o̲. A comparison of the systems with Tok Pisin will be made below.

One last system to examine is given in (25).

25)

i		u
ī		ü
a	o	ö

The advantage of this system over (23) is that it is even closer to current practice in that all base symbols are identical. A disadvantage of the system is that it uses more diacritics than system (23) (although the total number of diacritics per page would be less with system (25) than with system (22)).

It could be argued that while system (22) is further from current practice than either (24) or (25), it is closer to Tok Pisin. This is not entirely clear, at least in the case of the mid vowels /e/ and /o/ however, as phonetically they are higher in Sawiyano than they are in Tok Pisin. Thus, it is an open question as to whether they are viewed as closer to Tok Pisin /e/ and /o/ or /i/ and /u/, respectively. In a meeting with about ten men in Kauvia, the feeling seemed to be that system (25) was preferred over (23) and (22). Obviously, this may be due to current orthographic practice, but it cannot be ignored.

In general, I would recommend that system (25) be tried first in any test of a seven vowel system. The similarity of this system to current practice would minimise transitional problems for those already literate in the current orthography. Secondly, reading tests measuring the differences between seven and four vowel systems will be more accurate the closer the two systems are. If the influence of Tok Pisin makes the use of ī for /e/ problematic, my second choice is system (23). Due to the relative frequency of /o/ vs. /a/, as well as similarities to the current orthography, I feel system (23) is far superior to system (22).

It is an empirical question as to whether or not fully differentiating the vowels will help in literacy. Årsjös

(personal communication) report that they actually had considerably more problems in the four to five year period in which they used a fully differentiated system than in the following seven years in which the current four vowel has been in use. If the seven vowel system does not prove to be advantageous for beginning literacy or dictionaries, the diacritics could be dropped from (25) (or even from (23)), resulting in the current four vowel system. On the other hand, my research suggests that even if the seven vowel system proves advantageous for new readers, the diacritics can probably be quickly dropped in other literature as fluency improves.

Footnotes

* This analysis is based on materials gathered from 4 - 23 February, 1988, at Ukarumpa with four language consultants and Sören and Britten Arsjö, and from 28 March - 5 April, 1988, in the villages of Kauvia and Wobaru, as well as from written materials supplied by Richard Kalk of New Tribes Mission. I am grateful to Arsjös, Kalk, and Phillip Gudemi for discussion regarding the phonological structure of Sawiyano, and to Elaine Good for helpful comments on this paper. All remaining mistakes are, of course, my own.

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