

Coding Instructions for Sociomatrices  
Renting, Hiring, and Borrowing Equipment, 2000 Household Questionnaire  
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This memo describes how the sociomatrices for equipment renting, hiring, and borrowing are constructed for the 2000 household networks.

**Relevant Questions from 2000 Household Questionnaire:**

Question 6.76 asks “In the last year has this household used any agricultural equipment?” If the answer is yes, then they are asked the number of large tractors, iron buffalo, and rice threshers that were used. For each type of equipment that was used, they are asked whether or not they own the equipment. If the household used a type of equipment but does not own it, they are asked whether they hired, rented, or borrowed it. If they did so, the name of the person from whom it was hired, rented, or borrowed and their location are recorded.

**Relations and Sociomatrices**

Sociomatrices are organized at the village level. There are 51 villages, corresponding to the 1984 villages. In all sociomatrices the rows are the households responding to the survey and the columns are the locations from which equipment could be received. Ties are recorded as the number of kinds of equipment and types of arrangement to the household from other households in the village, other villages in Nang Rong district, other districts in Buriram province, or other provinces in Thailand (including ties abroad).

Three kinds of equipment (large tractor, iron buffalo, and rice thresher) and types of arrangements (rent, hire, borrow) are coded in a single valued relation.

There are four sociomatrices for each village:

$X^v$ : household by household, for equipment to households in village  $v$  from other households in village  $v$

$Y^v$ : household by village, for equipment to households in village  $v$  from other villages within Nang Rong district

$Z^v$ : household by district, for equipment to households in village  $v$  from other districts in Buriram province

$W^v$ : household by province, for equipment to households in village  $v$  from other provinces outside Buriram province, including equipment from outside Thailand

## **Diagonal Entries**

Diagonal entries in each household by household matrix code the combination of kinds of equipment that the household uses.

- 1 only uses large tractor
- 2 only uses iron buffalo
- 3 only uses rice thresher
- 4 uses large tractor and iron buffalo
- 5 uses large tractor and rice thresher
- 6 uses iron buffalo and rice thresher
- 7 uses all three kinds of equipment

## **Coding Equipment from Unknown Locations or Abroad**

There are four kinds of anomalous data that arise when equipment was rented/hired/shared from sources with unknown location or from abroad. These are coded in extra columns in either the household by household sociomatrix or the household by province sociomatrix. The household by household matrix has one extra column and the household by province matrix has three extra columns.

- 1) Equipment from within the village but the household id is unknown. This is coded as one extra column in the household by household matrix
- 2) Equipment from abroad. This is coded in the 1<sup>st</sup> extra column in the household by province matrix.
- 3) Equipment from outside the village but the location is unknown. This is coded in the 2<sup>nd</sup> extra column in the household by province matrix.
- 4) Equipment from an unknown location that could be either inside or outside the village (it was impossible to track down the location of the equipment). This is coded in the 3<sup>rd</sup> extra column in the household by province matrix.

## **Row labels**

Row labels for households in all sociomatrices will be formed using the 2000 village number followed by the house number (variable HHID00; 9 digits).

## **Column labels**

### **Households**

Same format as row labels (9 characters)  
9999999 for the extra column (n + 1<sup>st</sup> column, n = # of households in the village) for equipment from within the village, household id unknown

### **Villages**

2000 village numbers (6 characters)

### **Districts**

2000 district numbers (2 characters)

## Provinces

2000 province numbers (2 characters)

Extra columns in the household by province matrix

col \_\_ : 98 for help from people living abroad

col \_\_: 99 for help from outside village, location unknown

col \_\_: 97 missing data, location unknown (help might be from inside or outside village)

## Data Format

line 1: 1984 village number (51 villages)

line 2: number of rows in the sociomatrix

line 3: number of columns in the sociomatrix

line(s) 4: list of row labels, separated by spaces

line(s) 5: list of column labels, separated by spaces

remaining rows, one for each household in the village: sociomatrix entries separated by spaces

## Differences between 2000 and 1994 Equipment Networks

In 1994 ties were based on renting, hiring, or sharing three kinds of equipment: large tractor, walking tractor (also called iron buffalo) and water pump. In 2000 the ties are based on renting, hiring, or borrowing three kinds of equipment: large tractor, iron buffalo, and rice thresher.

## Aggregating ties

For each of the three kinds of equipment (large tractor, iron buffalo, and rice thresher) there are three kinds of arrangements (rent, hire, borrow) and for each of these nine combinations (equipment by kind of arrangement) there are up to three possible locations named. We will aggregate all kinds of equipment and kinds of arrangements into a single set of matrices ( $\mathbf{X}^v$ ,  $\mathbf{Y}^v$ ,  $\mathbf{Z}^v$ ,  $\mathbf{W}^v$ ) for each village. To code aggregate ties we accumulate responses to all renting, hiring, and or borrowing equipment questions. The instructions below describe coding a single kind of arrangement for a single kind of equipment. This is then repeated for each kind of tie and the results are summed into a count of the number of times household  $i$  mentioned household or location  $j$  across all three kinds of equipment and three kinds of arrangements.

## Coding instructions:

### 1. Hiring large tractor:

The following instructions code ties for hiring a large tractor. These instructions can be used for all other hiring, renting, or borrowing of different kinds of equipment with the appropriate substitutions of variables (listed below). The result is four matrices for each village in which valued ties count the number of kinds of equipment rented, hired or borrowed by household  $i$  from household, village, district or province  $j$ .

*Relevant variables for hiring large tractor:*

X6\_76T1 uses a large tractor

X6\_76T3 hire large tractor or not

X676T3H1 1st place hire large tractor

X676T3H2 2nd place hire large tractor

X676T3H3 3rd place hire large tractor

*Whether the household uses a large tractor or not:*

If X6\_76T1 = 0 then the household does not use a large tractor and we skip to the next kind of equipment

If X6\_76T1 is not equal to 0 then code a tie from the household to itself  $x_{ii}^v$ .

Use the codes

1 only uses large tractor

2 only uses iron buffalo

3 only uses rice thresher

4 uses large tractor and iron buffalo

5 uses large tractor and rice thresher

6 uses iron buffalo and rice thresher

7 uses all three kinds of equipment

(Comment: The value of  $x_{ii}^v$  will likely change as the uses of other kinds of equipment are coded.)

*Variables with locations for hiring large tractor:*

If X6\_76T3= 1 then the household hires a large tractor

X676T3H1 is the number of the household, village, district, province from which the first heavy duty tractor is hired

The location is either 1) another household in the village 2) another village in Nang Rong, 3) another district in Buriram, 4) another province, or 5) abroad.

X676T3H2 and X676T3H3 are the locations for hiring the second and third large tractor

Once the location is identified, each kind of equipment and arrangement will be added to the count of equipment that the household used from that location. The value of the tie from household  $i$  to location  $j$  should be incremented by 1 for each type of equipment and arrangement from location  $j$ .

## Coding locations

### *a. Another household in the village*

If the location is another household in the village then the tie is recorded in the household by household sociomatrix.

$j$  = the position of the household in an ordered list of households in the village

$$x_{ij}^v = x_{ij}^v + 1$$

(comment: household  $i$  says that it got equipment from household  $j$  in the village, so the tie is incremented by 1 in the household by household sociomatrix)

### *b. Unknown location in the village*

If the location is unknown but it is inside the village then 1 is added to the total in the extra column in the household by household matrix

$$x_{i(n+1)}^v = x_{i(n+1)}^v + 1$$

(comment: the additional column in the household by household sociomatrix will count the number of equipment arrangements from within the village but with unknown household id)

### *c. Another village in Nang Rong*

If the location is another village in Nang Rong district then the tie is recorded in the household by village sociomatrix.

$j$  = the position of the village in an ordered list of villages

$$y_{ij}^v = y_{ij}^v + 1$$

(comment: household  $i$  says that it got equipment from village  $j$  so the tie from  $i$  to  $j$  is incremented by 1)

### *d. Another district in Buriram*

If the location is in another district then the tie is recorded in the household by district sociomatrix

$j$  = the position of the district in an ordered list of districts

$$z_{ij}^v = z_{ij}^v + 1$$

(comment: household i says it got equipment from district j so the tie from i to j is incremented by 1)

*e. Another province.*

If the location is another province then the tie is recorded in the household by province matrix

j = the position of the province in an ordered list of provinces

$$w_{ij}^v = w_{ij}^v + 1$$

(comment: household i it got equipment from province j so the tie from i to j is incremented by 1)

*f. Abroad*

If the location is abroad then 1 is added to the total in the 1st extra column in the household by province matrix.

$$w_{i(q+1)}^v = w_{i(q+1)}^v + 1$$

*g. Unknown location outside the village*

If the location is outside the village but the location is unknown 1 is added to the total in the 2<sup>nd</sup> extra column in the household by province matrix

$$w_{i(q+2)}^v = w_{i(q+2)}^v + 1$$

*h. Unknown location (impossible to find a location)*

If the equipment is from an unknown location that could be either inside or outside the village (in other words, it was impossible to find a location), then 1 is added to the total in the 3<sup>rd</sup> extra column in the household by province matrix.

$$w_{i(q+3)}^v = w_{i(q+3)}^v + 1$$

## **2. Other arrangements and kinds of equipment:**

After coding hiring a large tractor, arrangements for renting and borrowing a large tractor will be added to the count, as will arrangements for hiring, renting and borrowing a small tractor or rice thresher.

For each village the ties for three kinds of equipment and three kinds of arrangements are aggregated into the set of matrices:  $\mathbf{X}^v$ ,  $\mathbf{Y}^v$ ,  $\mathbf{Z}^v$ , and  $\mathbf{W}^v$ . Additional ties will be added

to the count of ties, across all kinds of equipment and kinds of arrangements. The instructions above can be adapted to code all hiring, renting, and borrowing of agricultural equipment by substituting the appropriate variables.

**Hire a large tractor:**

X6\_76T3 hire large tractor or not  
X676T3H1 1st place hire large tractor  
X676T3H2 2nd place hire large tractor  
X676T3H3 3rd place hire large tractor

**Rent a large tractor:**

X6\_76T4 rent large tractor or not  
X676T4H1 1st place rent large tractor  
X676T4H2 2nd place rent large tractor  
X676T4H3 3rd place rent large tractor

**Borrow a large tractor:**

X6\_76T5 borrow large tractor or not  
X676T5H1 1st place borrow large tractor  
X676T5H2 2nd place borrow large tractor  
X676T5H3 3rd place borrow large tractor

**Hire, rent and borrow an iron buffalo:**

X6\_76B1 uses an iron buffalo

X6\_76B3 hire iron buffalo or not  
X676B3H1 1st place hire iron buffalo  
X676B3H2 2nd place hire iron buffalo  
X676B3H3 3rd place hire iron buffalo

X6\_76B4 rent an iron buffalo or not  
X676B4H1 1st place rent iron buffalo  
X676B4H2 2nd place rent iron buffalo  
X676B4H3 3rd place rent iron buffalo

X6\_76B5 borrow an iron buffalo or not  
X676B5H1 1st place borrow iron buffalo  
X676B5H2 2nd place borrow iron buffalo  
X676B5H3 3rd place borrow iron buffalo

**Hire, rent and borrow a rice thresher:**

X6\_76R1 uses a rice thresher

X6\_76R3 hire rice thresher or not

X676R3H1 1st place hire rice thresher

X676R3H2 2nd place hire rice thresher

X676R3H3 3rd place hire rice thresher

X6\_76R4 rent a rice thresher or not

X676R4H1 1st place rent rice thresher

X676R4H2 2nd place rent rice thresher

X676R4H3 3rd place rent rice thresher

X6\_76R5 borrow a rice thresher or not

X676R5H1 1st place borrow rice thresher

X676R5H2 2nd place borrow rice thresher

X676R5H3 3rd place borrow rice thresher