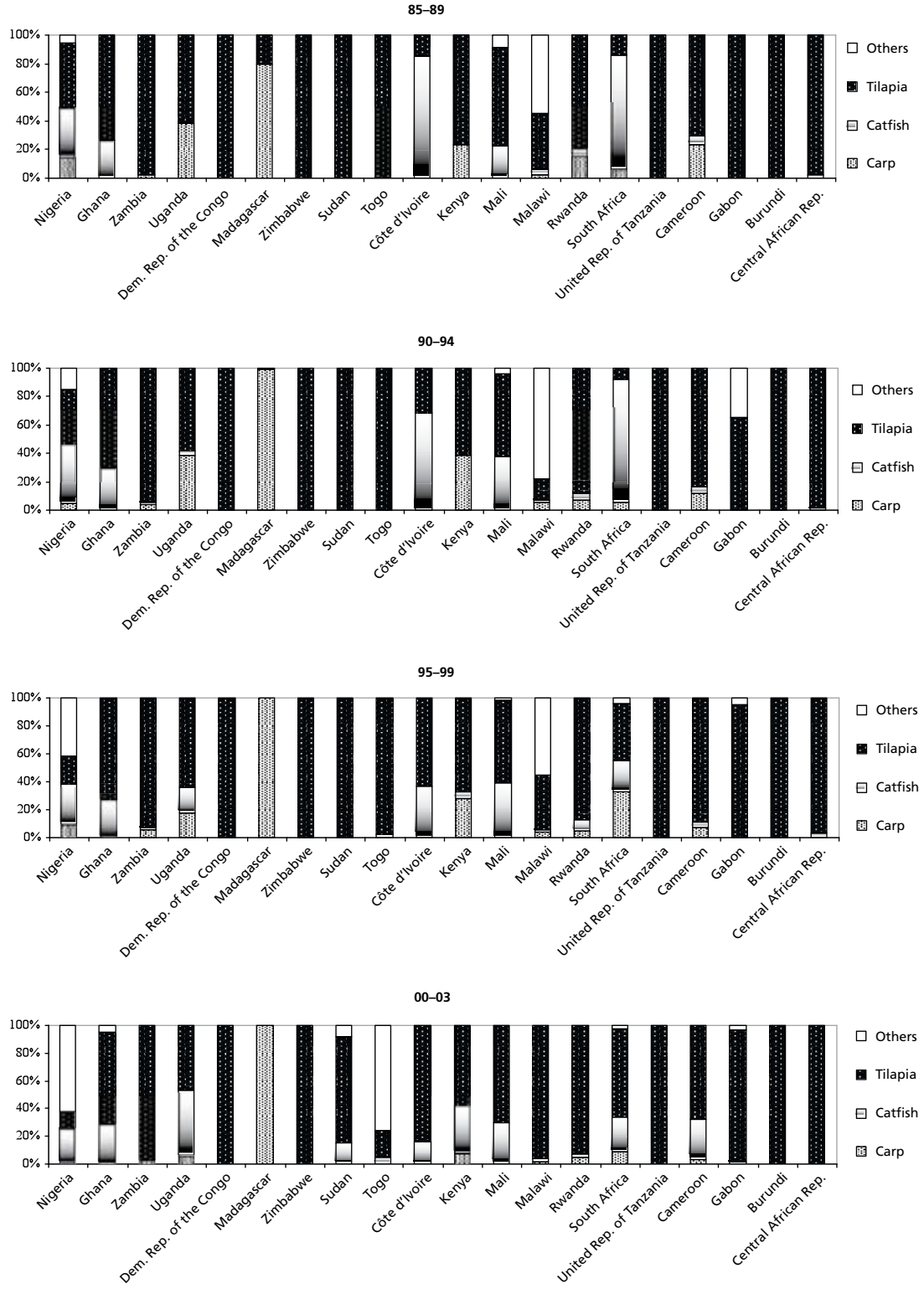
TABLE 17
**Freshwater fish farming comparative advantage (eastern SSA)**

| Country | Species | Production quantity (tonnes) | | | | RCA | | RCAV | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1985–89 | 1990–94 | 1995–99 | 2000–03 | 1985–89 | 2000–03 | Sub-period I[1] | Sub-period II | Sub-period III |
| Burundi | Carp | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| | Catfish | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| | Tilapia | 19 | 48 | 52 | 138 | 1.87 | 2.43 | 0% | 0% | 0% |
| | Others | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| Ethiopia | Carp | 6 | 4 | 3 | 0 | 2.18 | -- | -13% | -10% | -- |
| | Catfish | 0 | 0 | 0 | 0 | 0.00 | -- | 0% | 0% | -- |
| | Tilapia | 14 | 27 | 23 | 0 | 1.31 | -- | 13% | 10% | -- |
| | Others | 0 | 0 | 0 | 0 | 0.00 | -- | 0% | 0% | -- |
| Kenya | Carp | 57 | 289 | 112 | 58 | 1.70 | 1.40 | 18% | -28% | -3% |
| | Catfish | 0 | 0 | 20 | 237 | 0.00 | 1.69 | 0% | 5% | 27% |
| | Tilapia | 187 | 460 | 273 | 414 | 1.43 | 1.42 | -18% | 23% | -24% |
| | Others | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| Madagascar | Carp | 178 | 1 272 | 3 254 | 2 433 | 5.76 | 17.01 | 23% | 0% | 0% |
| | Catfish | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| | Tilapia | 46 | 8 | 0 | 0 | 0.38 | 0.00 | -23% | 0% | 0% |
| | Others | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| Malawi | Carp | 5 | 13 | 13 | 8 | 0.18 | 0.23 | 5% | 0% | 0% |
| | Catfish | 8 | 2 | 7 | 15 | 0.14 | 0.13 | -2% | 2% | 1% |
| | Tilapia | 76 | 34 | 131 | 571 | 0.73 | 2.33 | -8% | 33% | 62% |
| | Others | 106 | 171 | 187 | 0 | 11.70 | 0.00 | 5% | -35% | -62% |
| Mauritius | Carp | | 2 | 0 | 0 | 0.00 | 0.00 | 10% | -17% | 0% |
| | Catfish | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| | Tilapia | 4 | 14 | 53 | 28 | 1.87 | 2.43 | -10% | 17% | 0% |
| | Others | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| Mozambique | Carp | 0 | 0 | 0 | 10 | 0.00 | 3.42 | 0% | 0% | 20% |
| | Catfish | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| | Tilapia | 12 | 34 | 8 | 35 | 1.87 | 1.70 | 0% | 0% | -30% |
| | Others | 0 | 0 | 0 | 5 | 0.00 | 0.30 | 0% | 0% | 10% |
| Reunion | Carp | | | 9 | 3 | -- | 0.59 | -- | -- | -3% |
| | Catfish | 0 | 0 | 0 | 0 | -- | 0.00 | -- | -- | 0% |
| | Tilapia | 0 | 0 | 48 | 70 | -- | 2.34 | -- | -- | 3% |
| | Others | 0 | 0 | 0 | 0 | -- | 0.00 | -- | -- | 0% |
| Rwanda | Carp | 8 | 5 | 7 | 30 | 1.12 | 0.86 | -6% | -8% | 3% |
| | Catfish | 3 | 4 | 12 | 13 | 0.21 | 0.11 | -1% | 4% | -6% |
| | Tilapia | 41 | 68 | 126 | 544 | 1.47 | 2.25 | 8% | 4% | 3% |
| | Others | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| Tanzania | Carp | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| | Catfish | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| | Tilapia | 100 | 295 | 200 | 286 | 1.87 | 2.43 | 0% | 0% | 0% |
| | Others | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| Uganda | Carp | 14 | 35 | 56 | 225 | 2.79 | 1.13 | 4% | -37% | 0% |
| | Catfish | 0 | 3 | 57 | 1 597 | 0.00 | 2.37 | 3% | 16% | 26% |
| | Tilapia | 22 | 53 | 199 | 1 577 | 1.15 | 1.13 | -8% | 21% | -26% |
| | Others | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| Zambia | Carp | 24 | 133 | 249 | 129 | 0.20 | 0.49 | 2% | -2% | 1% |
| | Catfish | 0 | 53 | 78 | 0 | 0.00 | 0.00 | 2% | 0% | -2% |
| | Tilapia | 871 | 3 188 | 4 101 | 4 344 | 1.82 | 2.36 | -3% | 1% | 1% |
| | Others | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| Zimbabwe | Carp | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| | Catfish | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| | Tilapia | 45 | 38 | 271 | 2 255 | 1.87 | 2.43 | 0% | 0% | 0% |
| | Others | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |

[1] Sub-period I goes from the second half of the 1980s (1985–89) to the first half of the 1990s (1990–1994); sub-period II goes from the first half of the 1990s (1990–94) to the second half of the 1990s; and sub-period III goes from the second half of the 1990s (1995–99) to the early 2000s (2000–03).

FIGURE 12
**Freshwater fish farming specialization patterns of sub-Saharan Africa countries**




Countries are placed in descending order from left to right according to their levels of freshwater fish farming production during 2000–2003.

TABLE 18
**Freshwater fish farming comparative advantage (western sub-Saharan Africa)**

| Country | Species | Production quantity (tonnes) | | | | RCA | | RCAV | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1985–89 | 1990–94 | 1995–99 | 2000–03 | 1985–89 | 2000–03 | Sub-period I[1] | Sub-period II | Sub-period III |
| Benin | Carp | 0 | 0 | 0 | 0 | 0.00 | 0.00 | -- | -- | -- |
| | Catfish | 58 | 0 | 0 | 0 | 2.81 | 0.00 | -- | -- | -- |
| | Tilapia | 16 | 0 | 0 | 0 | 0.39 | 0.00 | -- | -- | -- |
| | Others | 0 | 0 | 0 | 7 | 0.00 | 3.02 | -- | -- | -- |
| Burkina Faso | Carp | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| | Catfish | 3 | 2 | 0 | 0 | 0.47 | 0.00 | 42% | -52% | 0% |
| | Tilapia | 20 | 1 | 28 | 5 | 1.63 | 2.43 | -42% | 52% | 0% |
| | Others | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| Côte d'Ivoire | Carp | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| | Catfish | 143 | 154 | 281 | 157 | 3.03 | 0.81 | -18% | -28% | -21% |
| | Tilapia | 25 | 71 | 485 | 817 | 0.28 | 2.04 | 18% | 28% | 21% |
| | Others | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| Gambia | Carp | 0 | 0 | 0 | 0 | -- | -- | -- | -- | -- |
| | Catfish | 0 | 0 | 2 | 0 | -- | -- | -- | -- | -- |
| | Tilapia | 0 | 0 | 0 | 0 | -- | -- | -- | -- | -- |
| | Others | 0 | 0 | 2 | 0 | -- | -- | -- | -- | -- |
| Ghana | Carp | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| | Catfish | 99 | 131 | 335 | 1 407 | 0.95 | 1.47 | 2% | 0% | 2% |
| | Tilapia | 273 | 302 | 905 | 3 199 | 1.37 | 1.61 | -2% | 0% | -6% |
| | Others | 0 | 0 | 0 | 230 | 0.00 | 0.14 | 0% | 0% | 5% |
| Guinea | Carp | 0 | 0 | 0 | 0 | 0.00 | -- | 0% | 0% | -- |
| | Catfish | 1 | 3 | 2 | 0 | 1.98 | -- | 43% | 0% | -- |
| | Tilapia | 1 | 0 | 0 | 0 | 0.83 | -- | -43% | 0% | -- |
| | Others | 0 | 0 | 0 | 0 | 0.00 | -- | 0% | 0% | -- |
| Liberia | Carp | 0 | 0 | 0 | 0 | 0.00 | 0.00 | -- | -- | -- |
| | Catfish | 0 | 0 | 0 | 2 | 0.00 | 0.71 | -- | -- | -- |
| | Tilapia | 4 | 0 | 0 | 14 | 1.87 | 2.09 | -- | -- | -- |
| | Others | 0 | 0 | 0 | 0 | 0.00 | 0.00 | -- | -- | -- |
| Mali | Carp | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| | Catfish | 3 | 18 | 28 | 190 | 0.80 | 1.51 | 16% | 9% | -10% |
| | Tilapia | 9 | 28 | 43 | 446 | 1.28 | 1.70 | -3% | 2% | 12% |
| | Others | 1 | 2 | 1 | 0 | 1.92 | 0.00 | -14% | -11% | -2% |
| Niger | Carp | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| | Catfish | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| | Tilapia | 14 | 18 | 17 | 29 | 1.87 | 2.43 | 0% | 0% | 0% |
| | Others | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| Nigeria | Carp | 1 637 | 584 | 2 010 | 205 | 1.09 | 0.13 | -7% | 3% | -2% |
| | Catfish | 3 727 | 5 583 | 5 716 | 6 985 | 1.22 | 1.26 | 7% | 2% | -2% |
| | Tilapia | 4 944 | 5 256 | 4 063 | 3 444 | 0.85 | 0.30 | -4% | -10% | -7% |
| | Others | 556 | 1 950 | 8 504 | 17 231 | 1.10 | 1.87 | 4% | 5% | 11% |
| Senegal | Carp | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| | Catfish | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| | Tilapia | 5 | 13 | 51 | 14 | 1.87 | 2.43 | 0% | 0% | 0% |
| | Others | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| Sierra Leone | Carp | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| | Catfish | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| | Tilapia | 16 | 20 | 29 | 30 | 1.87 | 2.43 | 0% | 0% | 0% |
| | Others | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| Togo | Carp | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| | Catfish | 0 | 0 | 1 | 52 | 0.00 | 0.26 | 0% | 2% | 3% |
| | Tilapia | 17 | 99 | 47 | 192 | 1.87 | 0.47 | 0% | -2% | -79% |
| | Others | 0 | 0 | 0 | 748 | 0.00 | 2.28 | 0% | 0% | 75% |

[1] Sub-period I goes from the second half of the 1980s (1985–89) to the first half of the 1990s (1990–1994); sub-period II goes from the first half of the 1990s (1990–94) to the second half of the 1990s; and sub-period III goes from the second half of the 1990s (1995–99) to the early 2000s (2000–03).

Zambia and Zimbabwe have relatively large freshwater fish farming production volumes, mostly concentrated on tilapia (Table 17). Other countries with relatively small aquaculture production (e.g. Burundi, Malawi, Mauritius, Mozambique, Réunion, Rwanda and Tanzania) also had strong comparative advantage in tilapia farming exclusively by the early 2000s.

*Western SSA*

Table 18 lists 13 western SSA countries that engaged in freshwater fish farming during the study period. In 1985 tilapia was the most important species in western SSA, accounting for 60 percent of the region's freshwater fish farming. Catfish was in second place, accounting for another 30 percent. By 1996, carp had become the most important species with a specialization ratio of 35 percent; catfish held on to the second position with a specialization ratio of 34 percent; in contrast, tilapia declined to only 22 percent. By 2003, catfish had become the number-one species with a specialization ratio of 33 percent; tilapia came in second place (18 percent) while the ratio for carp was only 10 percent. The remaining 40 percent was accounted for by miscellaneous other species (Figure 11).

Tilapia is a traditional and popular species in western SSA. Nigeria and Togo were the only two countries that had weak comparative advantage in tilapia farming in the early 2000s; both countries reduced their comparative advantage during the study period (Table 18). Côte d'Ivoire and Mali were the only two western SSA countries with comparative advantage gains in tilapia farming during the sub-period III.

Catfish farming in western SSA has been concentrated in Ghana, Mali, and Nigeria; the RCA indices revealed that these three countries had strong comparative advantage in catfish farming in the early 2000s (Table 18). However, only Ghana among these three countries had gained comparative advantage in catfish during the sub-period III. It must be noted that Togo also gained comparative advantage during the study period.

Despite a temporary farming boom in Nigeria in 1996, none of the 13 Western SSA countries had a strong comparative advantage in carp farming in the early 2000s.

*Southern, Northern and Central SSA*

Results of the analyses for southern, northern and central SSA are reported in Tables 19, 20 and 21, respectively. The RCA indices suggested that South Africa in southern SSA had strong comparative advantage in all three species in the early 2000s, yet the RCAV analysis indicated that comparative advantage was shifting towards tilapia farming from the other species (Table 19). Sudan (a northern SSA country) had completely specialized in tilapia farming until the early 2000s when it began conducting some catfish farming (Table 20).

All of the five Central SSA countries (i.e. Cameroon, Central African Republic, Congo, Democratic Republic of the Congo and Gabon) had strong comparative advantage in tilapia farming during the study period (Table 21). Cameroon has shifted its advantage in tilapia towards both carp and catfish farming during the sub-period III.

## 4.5 DISCUSSION

Countries tend to have different freshwater fish farming specialization patterns. The RCA approach provides a convenient tool for systematically examining these patterns. We have used this approach to examine the farming of three freshwater species (carp, catfish and tilapia) in 111 countries in Asia, LAC and SSA (see Tables 9–21). In this section we summarize some insights provided by the results of the analysis, which may be useful for private decision-makers regarding species selection or for public policy with respect to the development of freshwater fish farming industries.

TABLE 19
**Freshwater fish farming comparative advantage (southern sub-Saharan Africa)**

| Country | Species | Production quantity (tonnes) | | | | RCA | | RCAV | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1985–89 | 1990–94 | 1995–99 | 2000–03 | 1985–89 | 2000–03 | Sub-period I[1] | Sub-period II | Sub-period III |
| Lesotho | Carp | 22 | 11 | 7 | 8 | 6.64 | 17.01 | -8% | -6% | 35% |
| | Catfish | 2 | 3 | 1 | 0 | 0.30 | 0.00 | 8% | 6% | -35% |
| | Tilapia | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| | Others | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| Mayotte | Carp | 0 | 0 | 0 | 0 | -- | 0.00 | -- | -- | 0% |
| | Catfish | 0 | 0 | 0 | 0 | -- | 0.00 | -- | -- | 0% |
| | Tilapia | 0 | 0 | 1 | 3 | -- | 2.43 | -- | -- | 0% |
| | Others | 0 | 0 | 0 | 0 | -- | 0.00 | -- | -- | 0% |
| Namibia | Carp | 0 | 0 | 0 | 0 | -- | 0.00 | -- | 0% | 0% |
| | Catfish | 0 | 0 | 0 | 0 | -- | 0.00 | -- | 0% | 0% |
| | Tilapia | 0 | 0 | 0 | 0 | -- | 0.00 | -- | 0% | 0% |
| | Others | | 4 | 5 | 13 | -- | 3.02 | -- | 0% | 0% |
| South Africa | Carp | 6 | 34 | 34 | 26 | 0.47 | 1.49 | 1% | 20% | -5% |
| | Catfish | 70 | 510 | 24 | 76 | 2.81 | 1.29 | 5% | -56% | -3% |
| | Tilapia | 13 | 49 | 43 | 188 | 0.27 | 1.53 | -6% | 32% | 12% |
| | Others | | 0 | 4 | 8 | 0.00 | 0.08 | 0% | 4% | -4% |
| Swaziland | Carp | 0 | 0 | 20 | 20 | 0.00 | 5.23 | 0% | 13% | 27% |
| | Catfish | 0 | 0 | 13 | 6 | 0.00 | 0.47 | 0% | 8% | 2% |
| | Tilapia | 0 | 0 | 38 | 39 | 0.00 | 1.46 | 0% | 24% | 37% |
| | Others | 22 | 46 | 88 | 0 | 21.45 | 0.00 | 0% | -45% | -66% |

[1] Sub-period I goes from the second half of the 1980s (1985–89) to the first half of the 1990s (1990–1994); sub-period II goes from the first half of the 1990s (1990–94) to the second half of the 1990s; and sub-period III goes from the second half of the 1990s (1995–99) to the early 2000s (2000–03).

TABLE 20
**Freshwater fish farming comparative advantage (northern SSA)**

| Country | Species | Production quantity (tonnes) | | | | RCA | | RCAV | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1985–89 | 1990–94 | 1995–99 | 2000–03 | 1985–89 | 2000–03 | Sub-period I[1] | Sub-period II | Sub-period III |
| Libyan Arab Jamahiriya | Carp | 37 | 78 | 100 | 100 | 7.25 | 17.01 | 0% | 0% | 0% |
| | Catfish | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| | Tilapia | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| | Others | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| Sudan | Carp | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| | Catfish | 0 | 0 | 0 | 200 | 0.00 | 0.78 | 0% | 0% | 15% |
| | Tilapia | 52 | 207 | 1,000 | 1,000 | 1.87 | 1.87 | 0% | 0% | -23% |
| | Others | 0 | 0 | 0 | 100 | 0.00 | 0.23 | 0% | 0% | 8% |

[1] Sub-period I goes from the second half of the 1980s (1985–89) to the first half of the 1990s (1990–1994); sub-period II goes from the first half of the 1990s (1990–94) to the second half of the 1990s; and sub-period III goes from the second half of the 1990s (1995–99) to the early 2000s (2000–03).

We find that neighbouring countries may have similar comparative advantage patterns. Examples include:

- Former USSR Asian members' strong comparative advantage in carp.
- Iran (Islamic Republic of), Iraq and Turkey's strong comparative advantage in carp.
- Nepal and Pakistan's strong comparative advantage in carp.

TABLE 21
**Freshwater fish farming comparative advantage (central sub-Saharan Africa)**

| Country | Species | Production quantity (tonnes) | | | | RCA | | RCAV | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1985–89 | 1990–94 | 1995–99 | 2000–03 | 1985–89 | 2000–03 | Sub-period I[1] | Sub-period II | Sub-period III |
| Cameroon | Carp | 33 | 8 | 4 | 7 | 1.70 | 0.55 | -8% | -15% | 1% |
| | Catfish | 9 | 3 | 3 | 62 | 0.22 | 1.45 | -2% | 1% | 24% |
| | Tilapia | 98 | 56 | 56 | 147 | 1.32 | 1.65 | 10% | 14% | -25% |
| | Others | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| Central African Republic | Carp | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| | Catfish | 3 | 3 | 4 | 0 | 0.07 | 0.00 | -1% | 2% | -3% |
| | Tilapia | 143 | 217 | 123 | 123 | 1.83 | 2.43 | 1% | -2% | 3% |
| | Others | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| Democratic Republic of the Congo | Carp | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| | Catfish | 0 | 0 | 0 | 5 | 0.00 | 0.01 | 0% | 0% | 0% |
| | Tilapia | 622 | 696 | 1 205 | 2 682 | 1.87 | 2.42 | 0% | 0% | 0% |
| | Others | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| Congo | Carp | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| | Catfish | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| | Tilapia | 139 | 206 | 135 | 26 | 1.87 | 2.43 | 0% | 0% | 0% |
| | Others | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| Gabon | Carp | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0% | 0% | 0% |
| | Catfish | 0 | 0 | 0 | 3 | 0.00 | 0.08 | 0% | 0% | 2% |
| | Tilapia | 2 | 8 | 166 | 200 | 1.87 | 2.30 | -34% | 59% | 1% |
| | Others | | 4 | 9 | 8 | 0.00 | 0.11 | 34% | -59% | -3% |

[1] Sub-period I goes from the second half of the 1980s (1985–89) to the first half of the 1990s (1990–1994); sub-period II goes from the first half of the 1990s (1990–94) to the second half of the 1990s; and sub-period III goes from the second half of the 1990s (1995–99) to the early 2000s (2000–03).

- The Philippines and Taiwan, Province of China's strong comparative advantage in tilapia.
- Thailand, Cambodia, Indonesia and Malaysia's strong comparative advantage in catfish.
- Caribbean countries' (except Cuba) strong comparative advantage in tilapia.
- Central American countries' (except Mexico) strong comparative advantage in tilapia.
- Tanzania, Mozambique and Zimbabwe's strong comparative advantage in tilapia.

We also find that countries in spatial proximity can nevertheless have very distinct specialization patterns. Examples include:

- In East Asia during the early 2000s, Japan's strong comparative advantage in carp vs. South Korea's advantage in catfish.
- In the Middle East, Saudi Arabia's strong comparative advantage in tilapia vs. Iran (Islamic Republic of) and Iraq's advantage in carp.
- In South Asia, Sri Lanka's complete specialization in tilapia farming vs. the region's high concentration on carp.
- In Southeast Asia, Cambodia's strong comparative advantage in carp farming vs. the region's general weak advantage in that species.
- In the Caribbean during the early 2000s, Cuba's extremely weak comparative advantage in tilapia farming vs. the region's strong advantage in that species.
- In Central America during the early 2000s, Mexico's weak comparative advantage in tilapia farming vs. the region's strong advantage in that species.

- In South America during the early 2000s, Brazil's strong comparative advantage in carp and catfish together with weak advantage in tilapia vs. Colombia and Ecuador's weak advantage in carp and catfish mixed with a strong advantage in tilapia.
- In eastern SSA, Madagascar's complete specialization in carp farming vs. the region's focus on tilapia.
- In western SSA, Nigeria's weak comparative advantage in tilapia vs. the region's strong comparative advantage in that species.

We find that in some cases countries in spatial proximity converge to similar comparative advantage patterns (e.g. Thailand, Indonesia and Malaysia; the Philippines and Taiwan, Province of China, Kenya and Uganda) while in other cases they maintain distinct patterns (e.g. Sri Lanka in South Asia; Madagascar in eastern SSA) or even diverge (e.g. Cuba in the Caribbean; Mexico in Central America; Uganda and Zambia; Nigeria and Côte d'Ivoire).

The interesting question now is how to extract useful information from these comparative advantage patterns and apply it to aid public and private decision-making processes. It would be very convenient if a straightforward mathematical formula could be developed for this purpose, yet we think the process may have to depend on a great deal of discretion. We illustrate this point with several examples in the following paragraphs.

- Cambodia, whose RCA index of 0.47 in the early 2000s is much lower than that of neighboring countries such as Thailand (5.64) and Malaysia (7.52), may want to find out whether its weak revealed comparative advantage in tilapia farming reflects its inherent characteristics that make it more suitable for culturing other species (e.g. carp) or its unexploited potential for farming of that species.
- Sri Lanka, as a tilapia-farming country in a carp-farming region, should inquire why its freshwater fish farming industry is so different from its neighbours'. Likewise, other countries in the region (e.g. India and Bangladesh) need to make sure that the absence of tilapia development does not represent a missed opportunity.
- Caribbean countries may want to examine Cuba's freshwater fish farming industry to understand why its annual carp farming production increased from 1 000 tonnes in 1985–89 to 14 000 tonnes in the early 2000s while its annual tilapia production has nevertheless declined from 3 000 tonnes to only 600 tonnes. If this structural change reflects Cuba's success in culturing carp as a high-quality exotic species, then other Caribbean countries should consider whether they can achieve similar success by fostering their comparative advantage in carp farming.
- Similarly, Central and South American countries should study Mexico and Brazil's comparative advantage in carp and catfish farming. Certainly it is not proper for countries to blindly follow the specialization patterns of the region's leading fish farming nations, yet these patterns can provide valuable lessons and experience.
- For countries in a region (e.g. SSA) where fish farming is underdeveloped, fish farming experience of countries in other regions can also help. It is not without reasons that carp remains the number-one freshwater aquaculture species. Yet fish farming tradition and technology as well as local culture and taste may make carp a disadvantageous species in a foreign region such as SSA. However, the successful carp farming experiences in Brazil and Mexico should provide grounds for encouragement. In addition, SSA countries need to examine why Madagascar has complete specialization in carp farming.

A country's comparative advantage pattern depends on many factors, some of which (e.g. geographic position, climate, natural resources) are inherent and invariant while others (e.g. farming technology, human resources, and even local tastes) can be altered or developed. Therefore, the key is not really to "pick" the winners. Rather, policy decision-making should help avoid "loser species" that are inherently inappropriate and then assist other species to become "winner species".