

2. H. Christian Schuh

## Removal of Nutrients by Selected Crops \*)

| C R O P  | Sou<br>rce | Unit  | Grain/Fruit **) |      |     |     |     | Straw/Foliage |      |     |     |     | Grain<br>to<br>Straw<br>Rat.<br>1% |      |
|--|------------|-------|-----------------|------|-----|-----|-----|---------------|------|-----|-----|-----|------------------------------------|------|
|  |            |       | N               | P2O5 | K2O | CaO | MgO | N             | P2O5 | K2O | CaO | MgO |                                    |      |
|  |            |       | in kg           |      |     |     |     |               |      |     |     |     |                                    |      |
| <b>Cereals:</b>  |            |       |                 |      |     |     |     |               |      |     |     |     |                                    |      |
| Barley ( <i>Hordeum</i> spp.)                              |            |       |                 |      |     |     |     |               |      |     |     |     |                                    |      |
| winter barley  | (1)        | 10 dt | 15              | 8    | 5   | -   | 2   | 5             | 3    | 12  | -   | 1   | 1.0                                |      |
| winter barley  | (8)        | 10 dt | 16              | 7    | 6   | -   | -   | 5             | 3    | 11  | -   | -   | 1.0                                |      |
| summer barley  | (8)        | 10 dt | 14              | 8    | 5   | -   | -   | 6             | 4    | 15  | -   | -   | 0.9                                |      |
| Bulrush millet ( <i>Pennisetum typhoides</i> ); as Sorghum | (9)        | 10 dt | 18              | 5    | 4   | -   | S=1 | 10            | 3    | 20  | -   | S=1 | 3.0                                |      |
| Maize ( <i>Zea mays</i> )                                  |            |       |                 |      |     |     |     |               |      |     |     |     |                                    |      |
| hybrid   | (1)        | 10 dt | 13              | 8    | 6   | -   | 2   | 8             | 5    | 22  | -   | 4   | 0.9                                |      |
| hybrid   | (8)        | 10 dt | 15              | 7    | 5   | -   | -   | 12            | 5    | 19  | -   | -   | 1.3                                |      |
| Kenya Hybrid maize   | (11)       | 10 dt | 16              | 3    | 2   | -   | -   | 7             | 1    | 13  | -   | -   | 1.4                                |      |
| local variety, grain + straw                               | (7)        | 10 dt | 25              | 12   | 32  | 8   | 8   | -             | -    | -   | -   | -   | 1.8                                |      |
| Local variety, grain + straw                               | (4)        | 10 dt | 29              | 11   | 32  | -   | -   | -             | -    | -   | -   | -   | 1.7                                |      |
| Oats ( <i>Avena sativa</i> )                               |            |       |                 |      |     |     |     |               |      |     |     |     |                                    |      |
| oats   | (1)        | 10 dt | 18              | 8    | 5   | -   | 2   | 6             | 3    | 17  | -   | 1   | 1.5                                |      |
| oats   | (8)        | 10 dt | 17              | 9    | 5   | -   | -   | 5             | 3    | 23  | -   | -   | 1.1                                |      |
| Rice ( <i>Oryza sativa</i> )                               |            |       |                 |      |     |     |     |               |      |     |     |     |                                    |      |
| rice   | (6)        | 10 dt | 22              | 2    | 3   | 1   | -   | 4             | 1    | 9   | 1   | 1   | 1.7                                |      |
| rice   | (4)        | 10 dt | 22              | 5    | 4   | 1   | -   | 4             | 1    | 11  | 2   | 2   | 1.7                                |      |
| lowland rice, straw adapted 1)                             | (5)        | 10 dt | 12              | 7    | 3   | -   | -   | 4             | 1    | 11  | -   | -   | 1.0                                |      |
| Rye ( <i>Secale cereale</i> )                              |            |       |                 |      |     |     |     |               |      |     |     |     |                                    |      |
| winter rye   | (1)        | 10 dt | 20              | 8    | 6   | -   | 1   | 3             | 2    | 8   | -   | -   | 1.4                                |      |
| winter rye   | (8)        | 10 dt | 15              | 9    | 6   | -   | -   | 4             | 2    | 11  | -   | -   | 1.4                                |      |
| Sorghum ( <i>S. bicolor</i> )                              |            |       |                 |      |     |     |     |               |      |     |     |     |                                    |      |
| hybrid, 3t/ha  | (2)        | 10 dt | 18              | 5    | 4   | -   | S=1 | 10            | 3    | 20  | -   | S=1 | 1.0                                |      |
| sorghum, grain + straw                                     | (6)        | 10 dt | 50              | 9    | 45  | -   | -   | -             | -    | -   | -   | -   | -                                  |      |
| Triticale  |            | n.a.  |                 |      |     |     |     |               |      |     |     |     |                                    |      |
| Wheat ( <i>Triticum</i> spp.)                              |            |       |                 |      |     |     |     |               |      |     |     |     |                                    |      |
| winter wheat   | (1)        | 10 dt | 20              | 8    | 5   | -   | 2   | 4             | 3    | 10  | -   | 2   | 1.3                                |      |
| winter wheat   | (8)        | 10 dt | 18              | 8    | 5   | -   | -   | 4             | 4    | 12  | -   | -   | 1.3                                |      |
| summer wheat   | (8)        | 10 dt | 21              | 8    | 5   | -   | -   | 5             | 4    | 12  | -   | -   | 1.1                                |      |
| <b>Pulses:</b>   |            |       |                 |      |     |     |     |               |      |     |     |     |                                    |      |
| Cowpea ( <i>Vigna unguiculata</i> )                        |            | n.a.  |                 |      |     |     |     |               |      |     |     |     |                                    |      |
| Broad bean ( <i>vicia faba</i> )                           |            |       |                 |      |     |     |     |               |      |     |     |     |                                    |      |
| broad bean   | 2)         | (8)   | 10 dt           | (43) | 8   | 11  | -   | -             | (12) | 7   | 18  | -   | -                                  | 1.5  |
| brd.bean, grain + straw                                    | 2)         | (7)   | 10 dt           | (43) | 8   | 11  | 10  | 3             | (13) | 6   | 23  | 10  | 3                                  | 1.5  |
| Bean ( <i>Phaseolus</i> spp.);                             |            |       |                 |      |     |     |     |               |      |     |     |     |                                    |      |
| bean, grain + straw  | 2)         | (4)   | 10 dt           | (43) | 8   | 11  | -   | -             | (11) | 5   | 21  | -   | -                                  | 1.7  |
| Lentil ( <i>Lens esculenta</i> )                           |            | n.a.  |                 |      |     |     |     |               |      |     |     |     |                                    |      |
| Pea ( <i>Pisum sativum</i> )                               |            |       |                 |      |     |     |     |               |      |     |     |     |                                    |      |
| pea, grain + straw   | 2)         | (4)   | 10 dt           | (52) | 8   | 20  | -   | -             | (11) | 7   | 13  | -   | -                                  | 1.75 |
| Soyabean ( <i>Glycine max.</i> )                           |            |       |                 |      |     |     |     |               |      |     |     |     |                                    |      |
| soyabean, grain  | (3)        | 10 dt | (63)            | 15   | 20  | -   | -   | -             | -    | -   | -   | -   | -                                  | 1.0  |
| soyabean, grain  | (4)        | 10 dt | (60)            | 15   | 19  | -   | -   | -             | -    | -   | -   | -   | -                                  | 1.0  |
| soyabean, grain + straw                                    | (9)        | 10 dt | (80)            | 12   | 40  | -   | -   | -             | -    | -   | -   | -   | -                                  | 1.0  |
| Vetch ( <i>Vicia</i> spp.)                                 |            |       |                 |      |     |     |     |               |      |     |     |     |                                    |      |
| vetch, grain + straw                                       | 2)         | (9)   | 10 dt           | (46) | 8   | 13  | 15  | 15            | (14) | 4   | 17  | 15  | 15                                 | 1.7  |
| <b>Oil crops:</b>  |            |       |                 |      |     |     |     |               |      |     |     |     |                                    |      |
| Groundnuts ( <i>Arachis hypogea</i> )                      |            |       |                 |      |     |     |     |               |      |     |     |     |                                    |      |
| groundnuts, pods + straw                                   | (4)        | 10 dt | (70)            | 10   | 28  | 18  | 12  | -             | -    | -   | -   | -   | -                                  | -    |
| groundnuts (straw adapted)                                 | (6)        | 10 dt | (70)            | 10   | 28  | 18  | 12  | -             | 2    | 13  | 4   | -   | -                                  | -    |
| Sunflower ( <i>Helianthus annuus</i> )                     |            |       |                 |      |     |     |     |               |      |     |     |     |                                    |      |
| sunflower, seed  | (6)        | 10 dt | 30              | 3    | 60  | 10  | -   | -             | -    | -   | -   | -   | -                                  | -    |
| Sesame ( <i>Sesamum indicum</i> )                          |            |       |                 |      |     |     |     |               |      |     |     |     |                                    |      |
| sesame, seed + straw                                       | (2)        | 10 dt | 55              | 15   | 62  | 3   | -   | -             | -    | -   | -   | -   | -                                  | -    |
| sesame, seed + straw                                       | 2)         | (3)   | 10 dt           | 30   | 30  | 7   | 3   | -             | -    | -   | -   | -   | -                                  | -    |
| Castor bean ( <i>Ricinus communis</i> )                    |            |       |                 |      |     |     |     |               |      |     |     |     |                                    |      |
| c. bean, seed + hulls                                      | (2)        | 10 dt | 40              | 9    | 16  | 6   | 5   | -             | -    | -   | -   | -   | -                                  | -    |
| castor bean, seed  | (4)        | 10 dt | 30              | 12   | 13  | -   | -   | -             | -    | -   | -   | -   | -                                  | -    |
| castor bean, seed  | (9)        | 10 dt | 40              | 3    | 15  | 3   | -   | -             | -    | -   | -   | -   | -                                  | -    |
| Coconut ( <i>Cocos nucifera</i> )                          |            |       |                 |      |     |     |     |               |      |     |     |     |                                    |      |
| coconut, 1300 husked nuts                                  | (4)        | 10 dt | 15              | 6    | 28  | -   | -   | -             | -    | -   | -   | -   | -                                  | -    |
| coconut, 1500 husked nuts                                  | (5)        | 10 dt | 13              | 4    | 18  | -   | -   | -             | -    | -   | -   | -   | -                                  | -    |

\*) Source: Draft Compilation by B. Krämer, Eschborn 1986.

\*\*) Data refer in some cases to grain and straw, e.g., 10 dt seed and 10 dt straw.

n.a. = Data not available

1) Values for straw are derived from source 4.

2) Values for straw are estimated, based on broad beans (sources 1 and 8).

## Removal of Nutrients by Selected Crops (continued from Page M 6.2)

| C R O P   | Sou<br>rce | Unit   | Grain/Fruit (**) |      |     |     |     | Straw/Foliage |      |     |     |     | Grain<br>to<br>Straw<br>Rel.<br>1: |     |
|---|------------|--------|------------------|------|-----|-----|-----|---------------|------|-----|-----|-----|------------------------------------|-----|
|   |            |        | N                | P2O5 | K2O | CaO | MgO | N             | P2O5 | K2O | CaO | MgO |                                    |     |
|   |            |        | in kg            |      |     |     |     |               |      |     |     |     |                                    |     |
| Oil palm ( <i>Elaeis guineensis</i> )<br>palm oil, 310 bunches  | (4)        | 10 dt  | 58               | 25   | 94  | -   | -   | -             | -    | -   | -   | -   | -                                  |     |
| Olive ( <i>Olea europaea</i> )<br>olive, fruits                 | (4)        | 10 dt  | 10               | 3    | 12  | -   | -   | -             | -    | -   | -   | -   | -                                  |     |
| <b>Sugar crops:</b>   |            |        |                  |      |     |     |     |               |      |     |     |     |                                    |     |
| Sugarcane ( <i>Saccharum officina.</i> )<br>cane, tops + trash  | 3)         | (2)    | 100 dt           | 10   | 9   | 20  | -   | -             | 10   | 5   | 22  | -   | -                                  | 0.5 |
| cane, millable  | (3)        | 100 dt | 9                | 7    | 20  | -   | -   | -             | -    | -   | -   | -   | -                                  | -   |
| cane millable   | (4)        | 100 dt | 7                | 5    | 14  | -   | -   | 17            | 12   | 49  | -   | -   | -                                  | -   |
| cane, tops + trash  | (4)        | 100 dt | 24               | 17   | 53  | -   | -   | 17            | -    | -   | -   | -   | -                                  | -   |
| cane, tops + trash  | (5)        | 100 dt | 14               | 8    | 41  | -   | -   | -             | -    | -   | -   | -   | -                                  | -   |
| Sugar beet ( <i>beta vulgaris</i> )<br>sugar beet               | (1)        | 100 dt | 18               | 10   | 23  | 16  | 8   | 44            | 16   | 94  | -   | 14  | 0.5                                |     |
| sugar beet  | (8)        | 100 dt | 22               | 10   | 23  | -   | -   | 35            | 10   | 57  | -   | -   | 0.5                                |     |
| sugar beet  | (9)        | 100 dt | 18               | 4    | 18  | 5   | 5   | 30            | 5    | 60  | 15  | 2   | 0.8                                |     |
| <b>Root crops:</b>  |            |        |                  |      |     |     |     |               |      |     |     |     |                                    |     |
| White potato ( <i>Solanum tuberos.</i> )<br>tubers + foliage    | (1)        | 100 dt | 35               | 17   | 60  | -   | 4   | 28            | 12   | 40  | -   | 32  | 0.25                               |     |
| tubers + foliage  | (8)        | 100 dt | 33               | 17   | 62  | -   | -   | 37            | 11   | 33  | -   | -   | 0.25                               |     |
| Sweet potato ( <i>Ipomea batatas</i> )<br>tubers                | (4)        | 100 dt | 47               | 13   | 73  | -   | -   | -             | -    | -   | -   | -   | -                                  |     |
| Cassava ( <i>Manihot esculenta</i> )<br>tubers, 34t/ha          | (4)        | 100 dt | 18               | 15   | 76  | -   | -   | -             | -    | -   | -   | -   | -                                  |     |
| young alluvial soil   | (4)        | 100 dt | 36               | 9    | 53  | 6   | 1   | 24            | 6    | 19  | 4   | 5   | -                                  |     |
| lateritic clay soils  | (4)        | 100 dt | 68               | 18   | 42  | 10  | 1   | 41            | 14   | 14  | 12  | 3   | -                                  |     |
| later., high in P, low in K                                     | (4)        | 100 dt | 173              | 51   | 36  | 59  | 8   | 135           | 69   | 18  | 53  | 38  | -                                  |     |
| tubers, 25t/ha  | (3)        | 100 dt | 50               | 12   | 60  | -   | -   | -             | -    | -   | -   | -   | -                                  |     |
| Yams ( <i>Dioscorea spp.</i> )                                  |            |        | n. a.            |      |     |     |     |               |      |     |     |     |                                    |     |
| Arrowroot ( <i>Maranta arundinacea</i> )                        |            |        | n. a.            |      |     |     |     |               |      |     |     |     |                                    |     |
| <b>Fibre crops:</b>   |            |        |                  |      |     |     |     |               |      |     |     |     |                                    |     |
| Cotton ( <i>Gossypium spp.</i> )<br>seed cotton                 | (4)        | 10 dt  | 65               | 26   | 67  | -   | -   | -             | -    | -   | -   | -   | -                                  |     |
| seed cotton   | (4)        | 10 dt  | 55               | 22   | 45  | -   | -   | -             | -    | -   | -   | -   | -                                  |     |
| seed cotton   | (3)        | 10 dt  | 45               | 30   | 68  | -   | -   | -             | -    | -   | -   | -   | -                                  |     |
| Soft fibre crops:<br>Jute ( <i>Corchorus spp.</i> )             | (4)        | 100 dt | 59               | 46   | 167 | -   | -   | -             | -    | -   | -   | -   | -                                  |     |
| Kenaf ( <i>Hibiscus cannabinus</i> )                            |            |        | n. a.            |      |     |     |     |               |      |     |     |     |                                    |     |
| Roselle ( <i>Hibiscus sabdariffa</i> )                          |            |        | n. a.            |      |     |     |     |               |      |     |     |     |                                    |     |
| Ramie ( <i>Boehmeria nivea</i> )<br>stalks + leaves, green      | (2)        | 100 dt | 39               | 15   | 55  | -   | -   | -             | -    | -   | -   | -   | -                                  |     |
| Hemp ( <i>Cannabis sativa</i> )<br>seed + straw                 | (4)        | 10 dt  | 88               | 44   | 88  | 183 | -   | -             | -    | -   | -   | -   | (7.3)                              |     |
| seed + straw  | (7)        | 10 dt  | 85               | 32   | 70  | 130 | 14  | -             | -    | -   | -   | -   | -                                  |     |
| Linseed ( <i>Linum usitatissimum</i> )<br>seed + straw          | (4)        | 10 dt  | 59               | 44   | 113 | 63  | -   | -             | -    | -   | -   | -   | (6.3)                              |     |
| seed + straw  | (7)        | 10 dt  | 88               | 44   | 100 | 81  | 16  | -             | -    | -   | -   | -   | -                                  |     |
| Hard fibre crops:<br>Sisal ( <i>Agave sisalana</i> )<br>fibre   | (4)        | 10 dt  | 53               | 12   | 87  | -   | -   | -             | -    | -   | -   | -   | -                                  |     |
| leaves, 30t/ha  | (4)        | 100 dt | 43               | 15   | 63  | 150 | 25  | -             | -    | -   | -   | -   | -                                  |     |
| <b>Stimulants:</b>  |            |        |                  |      |     |     |     |               |      |     |     |     |                                    |     |
| Cacao ( <i>Theobroma cacao</i> )<br>dry beans, 1000kg/ha        | (4)        | 10 dt  | 20               | 10   | 13  | -   | -   | -             | -    | -   | -   | -   | -                                  |     |
| Pods, 1000 kg/ha  | (4)        | 10 dt  | 13               | 7    | 11  | -   | -   | -             | -    | -   | -   | -   | -                                  |     |
| Coffee ( <i>Coffea spp.</i> )<br>cherries (clean coffee = 20 %) | (4)        | 10 dt  | 30               | 6    | 45  | -   | -   | -             | -    | -   | -   | -   | -                                  |     |
| Tea ( <i>Camellia sinensis</i> )<br>tea, young shoots           | (4)        | 10 dt  | 40               | 9    | 16  | -   | -   | -             | -    | -   | -   | -   | -                                  |     |
| wood + foliage  |            | 10 dt  | 24               | 7    | 19  | -   | -   | 27            | 5    | 13  | -   | -   | -                                  |     |
| permanent loss, shoots + wood                                   |            | 10 dt  | 64               | 16   | 35  | -   | -   | -             | -    | -   | -   | -   | -                                  |     |
| made tea, 450 kg/ha   | (4)        | 10 dt  | 77               | 10   | 32  | -   | -   | -             | -    | -   | -   | -   | -                                  |     |
| Tobacco ( <i>Nicotina tabacum</i> )<br>leaves and stems         | (4)        | 10 dt  | 45               | 10   | 60  | 33  | 8   | -             | -    | -   | -   | -   | (0.7)                              |     |
| leaves, barn, dried, good crop                                  | (4)        | 10 dt  | 21               | 6    | 50  | 44  | -   | -             | -    | -   | -   | -   | -                                  |     |
| <b>Fruit crops:</b>   |            |        |                  |      |     |     |     |               |      |     |     |     |                                    |     |
| Passion fruit ( <i>Passiflora<br/>edulis</i> )                  |            |        | n. a.            |      |     |     |     |               |      |     |     |     |                                    |     |

\*\* Data refer in some cases to grain and straw, e.g., 10 dt seed and 10 dt straw.

n.a. = Data not available.

3) Values for tops and trash are estimated based on sources 4 and 5

Removal of Nutrients by Selected Crops (continued from Page M 6.3)

| C R O P   | Sou<br>rce | Unit   | Grain/Fruit **) |      |     |     |     | Straw/Foliage |      |     |     |     | Grain<br>to<br>Straw<br>Rati<br>o |
|---|------------|--------|-----------------|------|-----|-----|-----|---------------|------|-----|-----|-----|-----------------------------------|
|   |            |        | N               | P2O5 | K2O | CaO | MgO | N             | P2O5 | K2O | CaO | MgO |                                   |
|   |            |        | in kg           |      |     |     |     |               |      |     |     |     |                                   |
| <b>Banana (Musa spp.)</b>                         |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| fruits  | (4)        | 100 dt | 21              | 6    | 55  | 3   | -   | -             | -    | -   | -   | -   |                                   |
| leaves+stems for 100 dt fruits                    | (4)        | 100 dt | -               | -    | -   | -   | 73  | 18            | 156  | 56  | -   | -   |                                   |
| fruits, 30t/ha                                    | (3)        | 100 dt | 20              | 5    | 67  | -   | -   | -             | -    | -   | -   | -   |                                   |
| <b>Pineapple (Ananas comosus)</b>                 |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| fruits, 40t/ha                                    | (4)        | 100 dt | 22              | 8    | 69  | -   | -   | -             | -    | -   | -   | -   |                                   |
| <b>Grape vines</b>                                |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| fruits+wood for 100 dt fruits                     | (4)        | 100 dt | 80              | 20   | 90  | -   | -   | -             | -    | -   | -   | -   |                                   |
| fruits  | (4)        | 100 dt | 60              | 15   | 70  | 60  | 20  | -             | -    | -   | -   | -   |                                   |
| wood removed by pruning                           | (4)        |        | -               | -    | -   | -   | -   | 20            | 6    | 20  | 37  | 12  |                                   |
| <b>Pawpaw (Carica papaya)</b>                     |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| n.a.  |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| <b>Melon (Cucumis melon)</b>                      |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| n.a.  |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| <b>Watermelon (Citrullus lanatus)</b>             |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| n.a.  |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| <b>Citrus (Citrus spp.)</b>                       |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| fruits, 15t/ha                                    | (4)        | 100 dt | 70              | 15   | 96  | -   | -   | -             | -    | -   | -   | -   |                                   |
| fruits, oranges, 20t/ha                           | (4)        | 100 dt | 85              | 20   | 73  | 150 | -   | -             | -    | -   | -   | -   |                                   |
| fruits, 15t/ha                                    | (3)        | 100 dt | 67              | 17   | 97  | -   | -   | -             | -    | -   | -   | -   |                                   |
| <b>Avocado (Persea americana)</b>                 |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| fruits, 10t/ha                                    | (4)        | 100 dt | 38              | 92   | 120 | -   | -   | -             | -    | -   | -   | -   |                                   |
| <b>Guava (Psidium quajava)</b>                    |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| fruits, 50t/ha                                    |            | n.a.   | -               | -    | -   | -   | -   | -             | -    | -   | -   | -   |                                   |
| <b>Tamarind (Tamarindus indica)</b>               |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| fruits, 6t/ha                                     |            | n.a.   | -               | -    | -   | -   | -   | -             | -    | -   | -   | -   |                                   |
| <b>Mango (Magnifera indica)</b>                   |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| fruits, 5t/ha                                     |            | n.a.   | -               | -    | -   | -   | -   | -             | -    | -   | -   | -   |                                   |
| <b>Date palm (Phoenix dactylifera)</b>            |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| fruits, 7t/ha                                     | (4)        | 100 dt | 59              | 29   | 71  | -   | -   | -             | -    | -   | -   | -   |                                   |
| <b>Nut crops:</b>                                 |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| <b>Cashew (Anacardium occidentale)</b>            |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| nuts, 2t/ha                                       |            | n.a.   | -               | -    | -   | -   | -   | -             | -    | -   | -   | -   |                                   |
| <b>Macadamia (M. integrifolia)</b>                |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| nuts, 6t/ha                                       |            | n.a.   | -               | -    | -   | -   | -   | -             | -    | -   | -   | -   |                                   |
| <b>Arecanut (Areneca catechu)</b>                 |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| prepared nuts, 1t/ha                              |            | n.a.   | -               | -    | -   | -   | -   | -             | -    | -   | -   | -   |                                   |
| <b>Various crops:</b>                             |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| <b>Rubber (Hevea brasiliensis)</b>                |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| dry rubber, 1.5/ha                                | (3)        | 10 dt  | 27              | 7    | 17  | -   | 12  | -             | -    | -   | -   | -   |                                   |
| <b>Pepper (Piper nigrum)</b>                      |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| dry pepper, 1750 vines, 5t/ha                     | (2)        | 10 dt  | 50              | 6    | 45  | 13  | 4   | -             | -    | -   | -   | -   |                                   |
| <b>Pyrethrum (Chrysanthemum cinerariaefolium)</b> |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| dried flowers, 0.6t/ha                            |            | n.a.   | -               | -    | -   | -   | -   | -             | -    | -   | -   | -   |                                   |
| <b>Ginger (Zingiber officin.)</b>                 |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| green rhizomes                                    |            | n.a.   | -               | -    | -   | -   | -   | -             | -    | -   | -   | -   |                                   |
| <b>Cardamon (Elettaria cardamomum)</b>            |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| dried fruits                                      |            | n.a.   | -               | -    | -   | -   | -   | -             | -    | -   | -   | -   |                                   |
| <b>Vegetables:</b>                                |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| <b>Tomato (Solanum lycopersicum)</b>              |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| fruits, 40 t/ha                                   | (4)        | 100 dt | 27              | 8    | 40  | -   | -   | -             | -    | -   | -   | -   |                                   |
| <b>Garlic (Allium sativum)</b>                    |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| all   | (4)        | 100 dt | 27              | 13   | 40  | -   | -   | -             | -    | -   | -   | -   |                                   |
| <b>Onion (allium epa)</b>                         |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| all, 30 t/ha                                      | (4)        | 100 dt | 27              | 13   | 40  | -   | -   | -             | -    | -   | -   | -   |                                   |
| <b>Leek (A. ampeloprasum)</b>                     |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| all, 30t/ha                                       | (4)        | 100 dt | 30              | 20   | 40  | -   | -   | -             | -    | -   | -   | -   |                                   |
| <b>White cabbage (Brassica spp.)</b>              |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| all, 69t/ha                                       | (4)        | 100 dt | 36              | 13   | 43  | -   | -   | -             | -    | -   | -   | -   |                                   |
| <b>Cucumber (Cucumis sativus)</b>                 |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| all, 30t/ha                                       | (4)        | 100 dt | 17              | 13   | 27  | -   | -   | -             | -    | -   | -   | -   |                                   |
| <b>Cauliflowers (Brassica Oleracea)</b>           |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| all, 50t/ha                                       | (4)        | 100 dt | 40              | 16   | 50  | -   | -   | -             | -    | -   | -   | -   |                                   |
| <b>Spinach (Spinacia olerac.)</b>                 |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| all, 20t/ha                                       | (4)        | 100 dt | 48              | 17   | 50  | -   | -   | -             | -    | -   | -   | -   |                                   |
| <b>Paprika (Capsicum annuum)</b>                  |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| n.a.  |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| <b>Asparagus (A. officinalis)</b>                 |            |        |                 |      |     |     |     |               |      |     |     |     |                                   |
| all, 4t/ha  | (4)        | 10 dt  | 22              | 7    | 22  | -   | -   | -             | -    | -   | -   | -   |                                   |

\*\*\*) Data refer in some cases to fruits and stems.

n.a. = Data not available

## Removal of Nutrients by Selected Crops (continued from Page M 6.4)

| C R O P                                  | Sou<br>rce | Unit   | Grain/Fruit |      |     |     |     | Straw/Foliage |      |     |     |     | Grain<br>to<br>Straw<br>Rat.<br>1: |
|--|------------|--------|-------------|------|-----|-----|-----|---------------|------|-----|-----|-----|------------------------------------|
|  |            |        | N           | P2O5 | K2O | CaO | MgO | N             | P2O5 | K2O | CaO | MgO |                                    |
|  |            |        | In kg       |      |     |     |     |               |      |     |     |     |                                    |
| <b>Forage:</b>                           |            |        |             |      |     |     |     |               |      |     |     |     |                                    |
| Lucerne ( <i>Medicago sativa</i> )       |            |        |             |      |     |     |     |               |      |     |     |     |                                    |
| hay, 80dt/ha                             | (4)        | 10 dt  | (27)        | 7    | 19  | -   | -   | -             | -    | -   | -   | -   |                                    |
| hay, 100dt/ha                            | (7)        | 10 dt  | (28)        | 8    | 17  | 31  | -   | -             | -    | -   | -   | -   |                                    |
| green matter, 800dt/ha                   | (3)        | 100 dt | (40)        | 8    | 23  | -   | -   | -             | -    | -   | -   | -   |                                    |
| hay, 50 - 150dt/ha                       | (9)        | 10 dt  | (27)        | 3    | 15  | 20  | 2   | -             | -    | -   | -   | -   |                                    |
| Red clover ( <i>Trifolium pratense</i> ) |            |        |             |      |     |     |     |               |      |     |     |     |                                    |
| hay, 60dt/ha                             | (4)        | 10 dt  | (25)        | 7    | 20  | -   | -   | -             | -    | -   | -   | -   |                                    |
| hay, 80dt/ha                             | (7)        | 10 dt  | (24)        | 6    | 21  | 25  | 6   | -             | -    | -   | -   | -   |                                    |
| Maedow, pasture                          |            |        |             |      |     |     |     |               |      |     |     |     |                                    |
| hay (2 cutting), 100dt/ha                | (7)        | 10 dt  | 16          | 7    | 20  | 10  | -   | -             | -    | -   | -   | -   |                                    |
| intensive grazing, 400dt/ha              | (7)        | 100 dt | 63          | 25   | 75  | 38  | 15  | -             | -    | -   | -   | -   |                                    |
| medium paddocks, 200dt/ha                | (7)        | 100 dt | 63          | 25   | 75  | 38  | 15  | -             | -    | -   | -   | -   |                                    |
| large paddock, 809dt/ha                  | (7)        | 100 dt | 63          | 25   | 75  | 38  | 15  | -             | -    | -   | -   | -   |                                    |
| Grass/clover<br>forage in DM             | (1)        | 100 dt | 55          | 80   | 300 | 37  | -   | -             | -    | -   | -   | -   |                                    |
| Sudangrass, green, 250dt/ha              | (7)        | 100 dt | 34          | 12   | 32  | 20  | 3   | -             | -    | -   | -   | -   |                                    |
| Vetch/rye, green, 220dt/ha               | (7)        | 100 dt | 50          | 25   | 64  | 36  | 8   | -             | -    | -   | -   | -   |                                    |
| Fodder maize, green, 40dt/ha             | (7)        | 100 dt | 21          | 10   | 31  | 12  | 4   | -             | -    | -   | -   | -   |                                    |
| Bean/vetch, green, 180dt/ha              | (7)        | 100 dt | (53)        | 17   | 40  | 28  | 6   | -             | -    | -   | -   | -   |                                    |
| Fodder rye, green, 160dt/ha              | (7)        | 100 dt | 56          | 16   | 66  | 13  | 5   | -             | -    | -   | -   | -   |                                    |
| Fodder rape, green, 180dt/ha             | (7)        | 100 dt | 56          | 22   | 61  | 67  | 7   | -             | -    | -   | -   | -   |                                    |

- 1) BAYERISCHE LANDESANSTALT FÜR BODENKULTUR UND PFLANZENBAU (1984), Die Düngung von Acker- und Grünland nach Ergebnissen der Bodenuntersuchung. Weihenstephan: TU München.
  - 2) de GEUS, J.G. (1973), Fertilizer Guide. Zürich: Centre d'Etude de l'Azote.
  - 3) ILACO, B. V. (1985), Agricultural Compendium. Amsterdam: Elsevier.
  - 4) JAKOB, A., und H. v. ÜCKMILL (1963), Fertilizer Use. Hannover: Verlagsgesellschaft f. Ackerbau.
  - 5) PURSEGLOVE, J. W. (1968), Tropical Crops, Dicotyledons and Monocotyledons. London: Longman.
  - 6) REHM, S., und G. ESPIG (1975), Die Kulturpflanzen der Tropen und Subtropen. Stuttgart: Ulmer.
  - 7) RUHRSTICKSTOFF A. G. (1957), Faustzahlen für die Landwirtschaft. Hiltrup: Landwirtschaftsverlag.
  - 8) SCHWARZ, G. (1982), Deckungsbeiträge, Variable Kosten, AKh-Bedarf. Regierungsbezirk Mittelfranken.
  - 9) Values adapted or from other not identifiable sources.
  - 10) BASF, Fruchtfolge-Düngung. Ludwigshafen: BASF, A. G.
  - 11) Drysdale, V.M. (1965), Nutrient removal by maize. Kenya Farmer, Feb. 1965.
- ( ) Data in brackets refer to legumes; removal of nutrients from the soil is lower due to Nitrogen fixation.