Orange Crop Mineral Nutrient Accumulation and Removals Charts

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Steven Falivene, District Horticulturist, NSW Department of Primary Industries, Dareton.

Crop estimates and crop nutrient removal data can assist in developing a citrus nutrition program. You can fine tune your nutrition program by conducting a yield estimate in January and then checking if you have applied adequate nutrition to supply your crop needs.

The following crop removal charts are an approximate guide. The charts have been developed using mineral composition data of oranges (Valencia and Navel) from both local and overseas research. The mineral nutrient content of fruit can vary and an average was used to develop these charts.

The leaf removal rates have been sourced from overseas and is based on the assumption of a 30% annual leaf drop and subsequent growth amounting to a total of 15kg dry weight of leaves per tree (440 trees/ha) dropped per annum. The graphs assume that 50% of leaf nitrogen and potassium are moved from old to young leaves before the old leaves drop. The graphs do not include nutrient removal for root flushes, flowers, young fruitlets (first fruit drop) and trunk growth. The charts will be updated as more information becomes available.

Some factors to consider when using the charts:
1. The charts provide estimates and should be used as a guide only.
2. The effect of applying fertilisers to match monthly removal rates is unknown. To an extent trees are able to store the main macro nutrients (N,P,K), (within leaves and wood), and release the nutrients as required. Applying fertilisers to match monthly removal rates could have negative impacts on fruit quality and alter natural phenological processes. It is recommended to continue with traditional fertiliser application principles until more is understood.
3. Higher or lower levels of nutrient removal by leaves will depend upon the amount of vegetative growth for the season.
4. Nutrient recycling from fallen leaves may contribute to soil fertility. This needs to be taken into account when observing crop removal charts. Nutrient recycling from fallen leaves will depend upon the amount of leaves that fall and decay into the soil that is occupied by the rootzone. Further study and research is required to understand nutrient recycling in Australian orchard systems.
5. Natural soil fertility will influence a fertiliser program. For example a soil high in potassium will require less potassium fertiliser than a soil low in potassium. Replant and virgin sites may also differ in their responses to fertiliser application.
6. A proportion of the fertiliser applied will be lost by leaching, soil lock-up, or volatilisation. Fertiliser losses can vary considerably between sites and delivery methods. Soil type and irrigation practices are two of the main factors that affect

fertiliser losses. Nitrogen losses from accurately scheduled drip irrigated blocks could be 20-30% while a poorly scheduled overhead irrigation block could lose 50-60% nitrogen. Nutrient losses on very young trees can be very high for both drip and sprinkler irrigation depending upon the amount of roots that have grown into soil where mineral nutrients have been placed. More work is required in Australia to better quantify nitrogen losses.

Yield T/ha	20	30	40	50	60	70
N	32	47	62	78	94	109
P	3	4	6	7	9	10
K	33	49	66	82	98	115
Ca	11	17	22	28	33	39
Mg	3	4	6	7	8	10

Table 1. Crop nutrient removal rates kg/ha for orange fruit

Yield T/ha	20	30	40	50	60	70
N	59	75	90	106	122	133
P	7	9	10	12	13	15
K	45	61	78	94	111	127
Ca	71	77	82	88	93	99
Mg	10	11	12	14	15	17

Table 2. Nutrient removal kg/ha from fruit and leaves (assuming 50% translocation of N & K from old to new leaves)

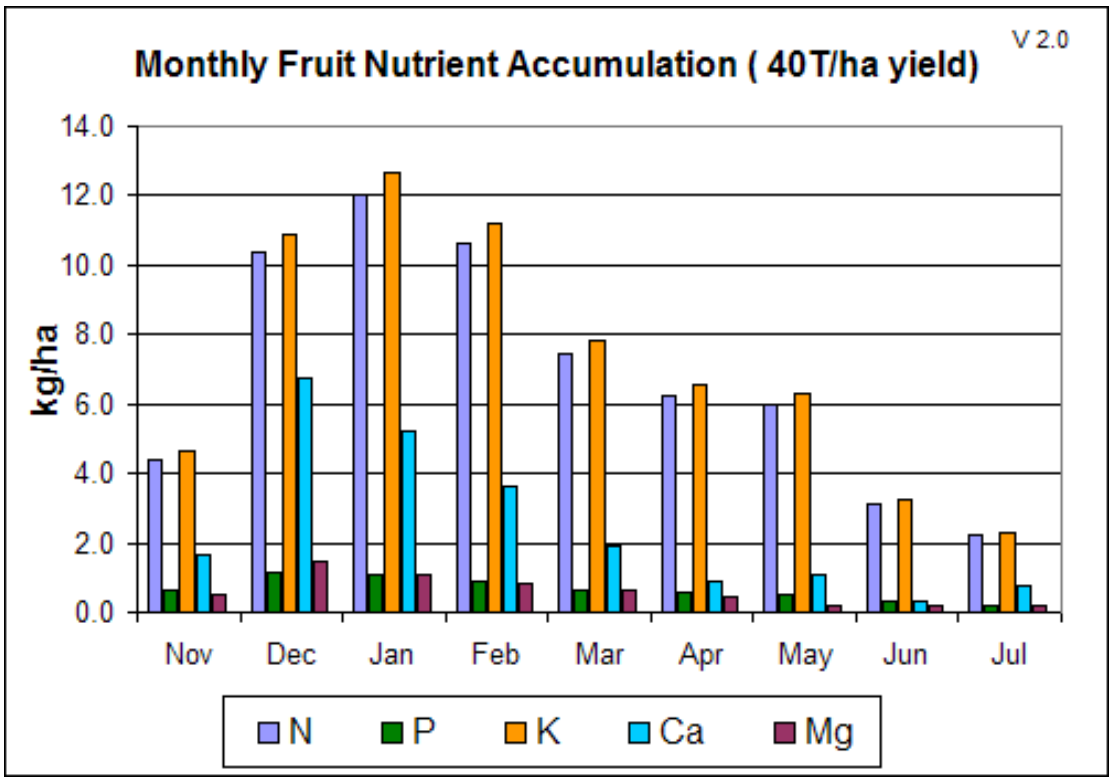

Figure 1: Monthly mineral nutrients accumulation by fruit (40T/ha yield)

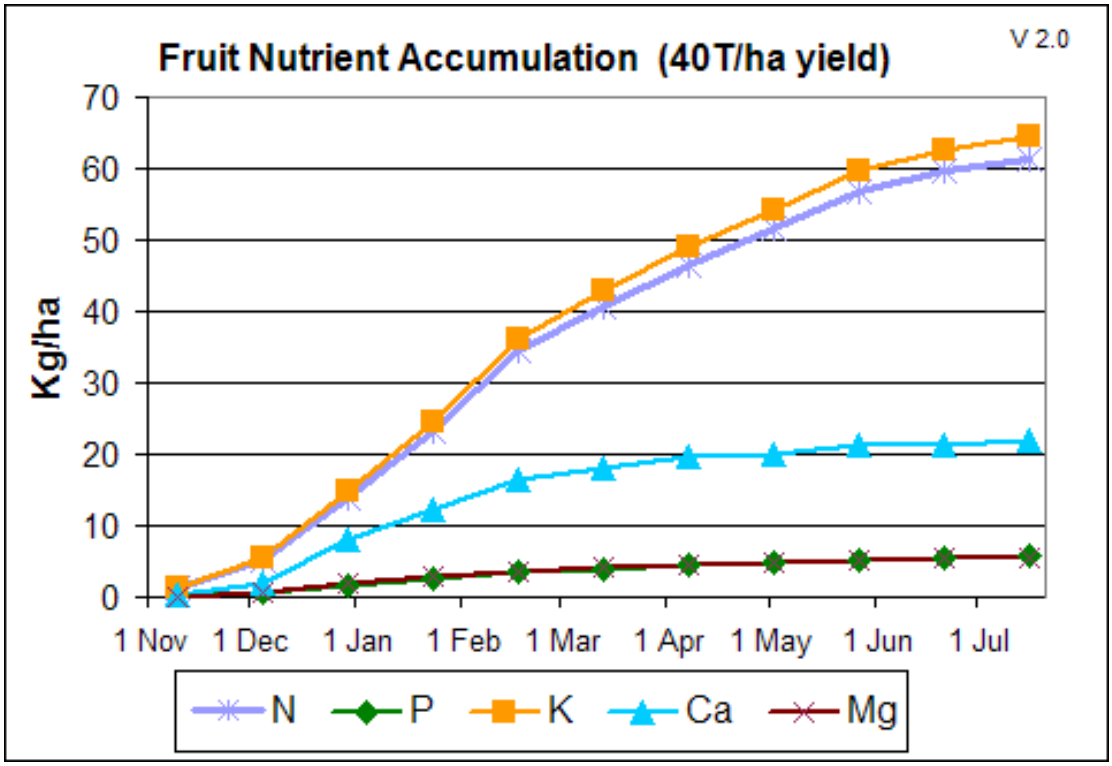

Figure 2: Cumulative monthly mineral nutrient accumulation by fruit (40T/ha yield).

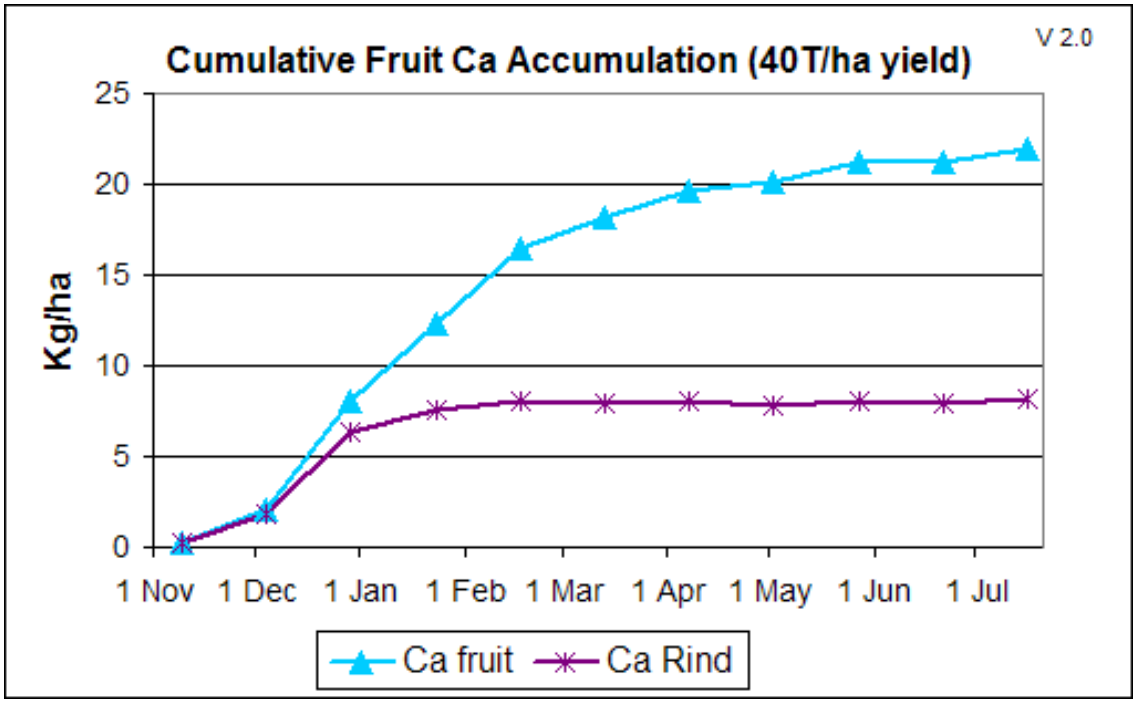

Figure 3: Cumulative monthly calcium accumulation by fruit and rind (40T/ha yield). Notice that the entire uptake of calcium into the rind occurs during November to December (cell division).

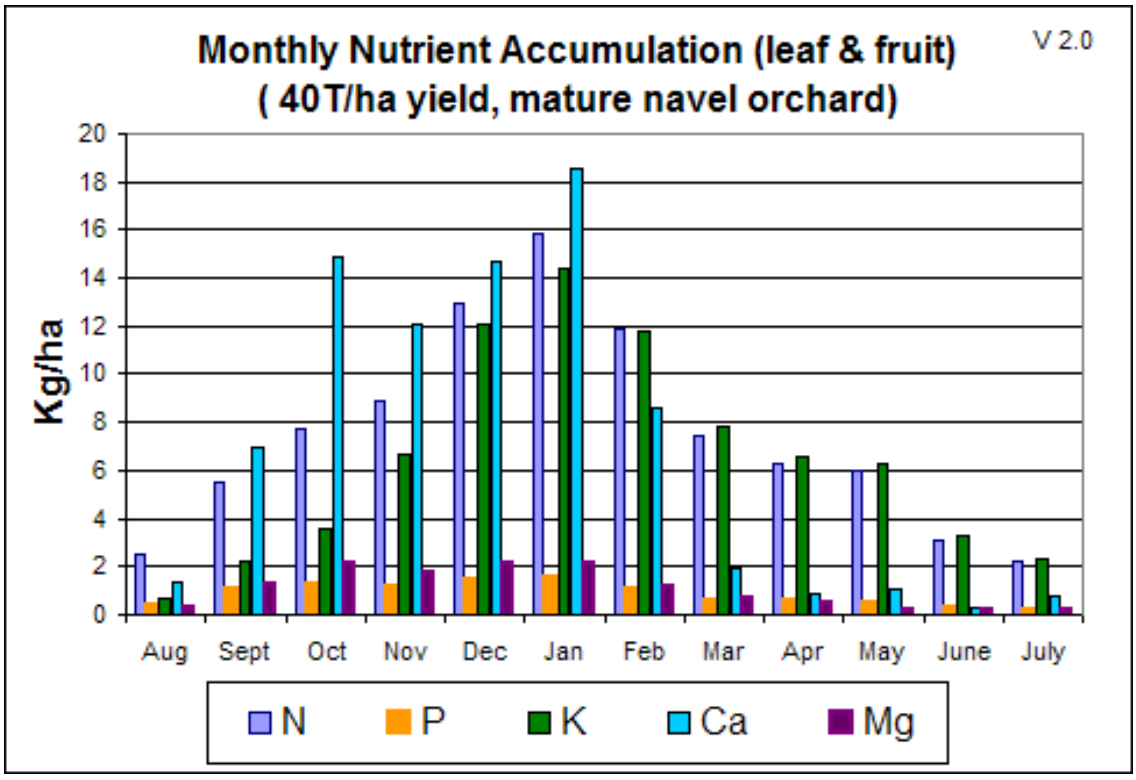

Figure 4: Monthly mineral nutrients accumulation by fruit and leaf (40T/ha yield).

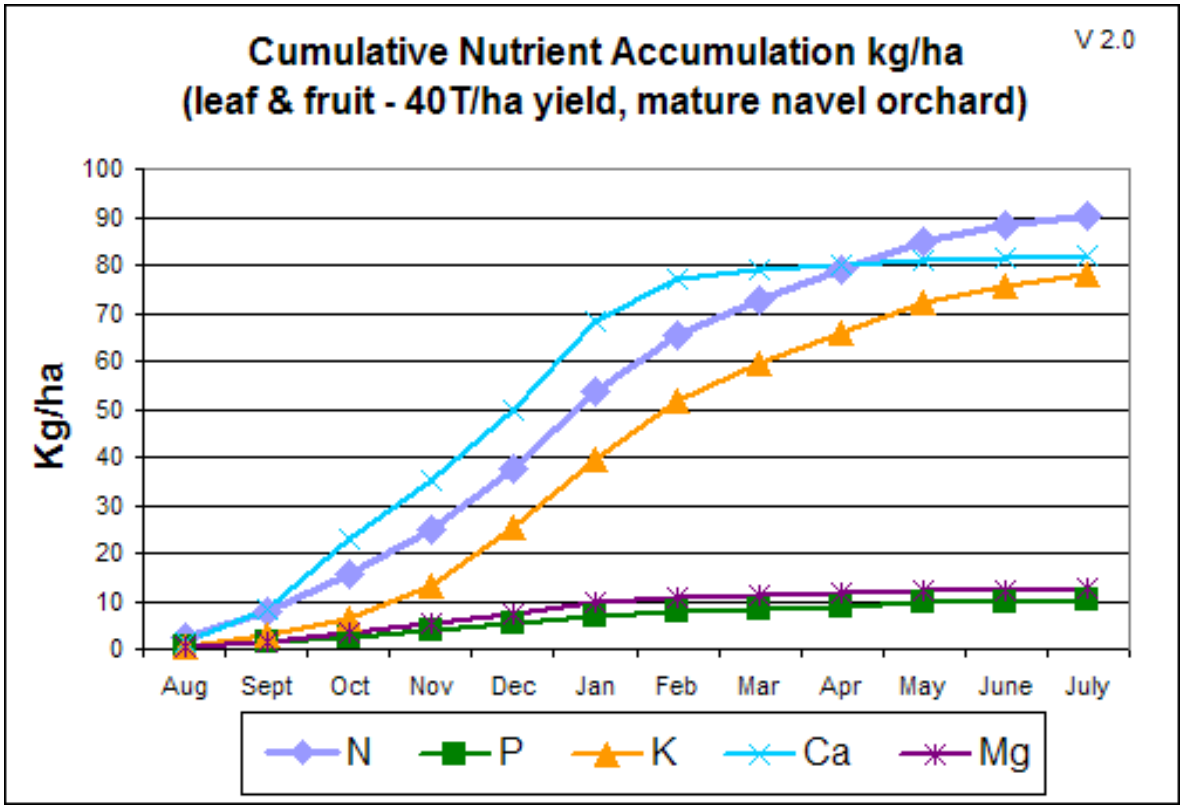

Figure 5: Cumulative monthly mineral nutrient accumulation by fruit and leaf (40T/ha yield).

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