Plant Sampling Instructions

1. Introduction

Plant tissue analysis is a part of the science of plant nutrition. It has been developed by analytical chemists in laboratories working in association with agronomists and horticulturists in the field. Plant tissue analysis acts as an early warning system, to highlight any nutrients that may be lower or higher than the optimal or normal range or which may affect crop yield potential and/or quality. It can also be used to help determine reasons for poor growth. With Analysis Systems, plant tissue testing measures the concentration of the nutrients in plant tissue, for comparison with the concentrations required for optimum plant growth and yield.

The general sampling procedure is also outlined on the back of the Plant Sampling Kit. Follow the particular instructions for sampling the relevant plant species shown in this book. This will enable close comparison with the standards developed from research. Details of time of year, stage of growth, plant part to sample and quantity of material required are given for each plant, to give the most accurate and useful interpretation possible.

CAUTION - Plant tissue analysis can provide only one part of the picture in determining the cause of nutritional problems. The plant size, vigour and rate of growth should be observed or estimated. Because environmental, biological and managerial factors interfere with crop performance, Incitec Pivot shall not be liable for any lack of crop performance resulting from implementing interpretations of plant tissue analysis results.

By monitoring the plant's uptake of nutrients and attending to nutrient requirements as management tools, improved profitability and long term viability of enterprises is more likely.

2. Why Sample?

Plant tissue analysis is normally used for one of two main reasons:

a) Diagnostic - to determine the reason for poor growth - or trouble-shooting.

b) Monitoring - to assess the suitability of current fertiliser management practices.

Diagnostic Samples

Samples are taken from areas displaying poor or irregular growth. Select an area which is representative of the poor growth area. Please ensure that if a soil sample is taken to aid the interpretation, it is taken from the same area as the plant tissue sample.

To assist in determining the factors limiting plant growth, additional samples (plant and soil) are often taken from an area displaying good growth. Where there is more than one area of poor growth or symptoms vary, samples should be taken from each area showing slightly different symptoms and from a healthy area, to aid in trouble-shooting - all sites sampled need to be marked and recorded (e.g. painting tree trunk) so that they are easily identified for future reference.

Remember with diagnostic plant tissue testing, whenever possible compare good and poor areas, and ensure that these samples are taken from plants or trees of the same variety and growth stage, within the one field.

Monitoring Samples

Samples are taken from an area which is representative of the whole area of concern within the paddock. These samples may be taken from within a defined area or from a transect across the sampled area.

If monitoring is to take place in future years and the results compared between years, then the sampling sites should be clearly defined, (e.g. for pastures about 20 m diameter) and the position of the site marked on a map and in the field, so it can be located.

When monitoring tree crops, 20 to 25 typical trees should be sampled and marked as the reference for future sampling. These samples need to be from the same variety, root stock, crop age, vigour and soil type.

3. What and when to sample

This booklet provides detailed information in section 8 on the plant part and the stage of growth or time of year to sample.

Generally, sample fully-expanded, recently-matured whole leaves including the blade (lamina), midrib and the extended petiole (leaf stalk), unless otherwise specified. If petioles are being sampled, ensure the leaf blades are detached at the time of sampling, not afterwards.

Timing is a very important key to the effective use of plant tissue analysis, especially when used in monitoring situations. Ensure samples are taken at the correct growth stage or time of year. The time of day can also affect the levels of some elements in the plant. This is particularly true for nitrate nitrogen, especially where conducting tissue such as petioles (leaf stalks) are analysed, less so where the plant tissue is analysed for the total amount of the nutrients present (e.g. N). Plant tissue samples should be collected prior to 10.00 am wherever possible to ensure representative nitrate concentrations are measured.

Plant tissue should be collected from a number of plants or trees to provide a representative sample. The laboratory needs at least 30 g of oven dry plant material for analysis. The number of leaves or weight of fresh (green) material to provide this amount, after drying, is shown in the detailed instructions in section 8.

Plant tissue should be despatched to the laboratory in a paper bag. Plastic bags are unsuitable as they will cause the sample to sweat.

4. Handling samples

Samples must reach the laboratory in a good, clean condition and should be collected into a clean paper bag. The sample needs to be cooled immediately and chilled to less than 5^{o} C in a refrigerator or cold room as soon as possible (DO NOT freeze the plant material).

Washing Samples

In some cases it is necessary to wash samples. This is particularly important where iron levels are of concern and the samples are dusty, or for copper, zinc and manganese, where the plants have

recently been sprayed with fungicides. Rinse samples in deionised or distilled water to remove dust.

Where there is likely contamination by crop sprays, wash samples in water containing a non-ionic wetting agent e.g. Teepol solution, Alconox Detergent, Agral 600, BS1000, (do not use phosphate-based detergent) and then rinse three times in deionised water. Dry the leaves with paper towels and place them in the paper bag provided.

In North Queensland, the QDPI recommends the use of Acetic Acid (Vinegar) to wash banana leaves.

Drying Samples

Samples can be dried in the paper bag at temperatures between 40OC and 80OC.

In hot summer conditions, the sample can be dried on the car dash board (if dust contamination is likely, seal the bag by folding the end). Alternatively place samples in a thermal oven (set to lowest possible setting).

If using a microwave oven, set at low power for 1 - 2 minutes. Ensure samples don't burn or discolour.

The Paper Work

Filling out the field information sheet is just as important as taking the sample correctly. Details of the grower and dealer are required including address, telephone number, rainfall, crop type, sample and site details, fertiliser history, pesticide spraying program and reason for sampling.

Details of fertilisers applied during the growing season, or over the past 12 months for perennial crops are particularly important, as plant tissue analysis is often used to monitor the adequacy of the existing fertiliser program.

For soil amendments such as lime, dolomite and gypsum, details of application over a longer period, e.g. 5 years, are required.

Sending Samples

Plants should be sampled early in the week and sent via the Australia Post using their Receipted Delivery Post Pack (overnight) to ensure that samples do not decompose.

Under circumstances where sampling occurs later in the week and it is unlikely that the sample will reach the Laboratory before the week- end, the sample should be dried prior to sending.

The samples must not be frozen. Freezing will burst the cell walls, resulting in loss of sap on thawing. As a result, the Laboratory will not be able to recover a representative sample.

5. Sampling Don'ts

When collecting samples:

- Avoid soiled, damaged, dead or dying plant tissue.
- Do not sample plants stressed by environmental conditions, e.g. drought, flood, extreme cold or heat wave conditions.
- Do not sample plants affected by disease, insects or other organisms.
- Do not sample soon after, e.g. within 2 months, of applying fertiliser to the soil or foliage.
- Avoid sample contamination from dust, fertilisers, chemical sprays and perspiration from hands (so wash hands before sampling).
- Avoid atypical areas of the paddock, e.g. poorly drained areas.
- Do not sample plants of different vigour, size and age.
- Do not sample from different cultivars (varieties) to make one sample.
- Don't collect samples into plastic bags as this will cause the sample to sweat and hasten its decomposition.
- Don't sample in the heat of the day, i.e. when plants are moisture stressed.
- Don't mix leaf ages.
- Don't cook samples when drying.

6. Sampling Dos

When collecting samples:

- Sample the correct plant part at the specified time or growth stage.
- Use clean plastic disposable gloves to sample, where perspiration may contaminate the sample or where there is likelihood of cross contamination between sampling sites e.g. due to different spraying practices.
- Sample early in the day.
- Sample tissue (e.g. entire leaves) from vigorously growing plants unless otherwise specified.
- Take sufficiently large sample size (number of leaves), i.e. adequately fill the paper bag provided.
- When trouble shooting, take separate samples from good and poor growth areas for comparison.
- Wash samples while fresh where necessary to remove dust and foliar sprays.
- Keep samples cool, e.g. in an esky, after collection.
- Refrigerate or dry if samples can not be despatched to the laboratory immediately, to arrive before the week-end.
- Fill out the field information/order form as completely as possible.

It is the aim of Analysis Systems to provide growers with the most accurate and efficient soil and plant analysis service in Australia. Thank you for choosing to use our service.

7. Growth Stages in Cereals

Zadoks or Decimal Growth Stages

0	**Germination**	**1**	**Seedling Growth**	**2**	**Tillering**
00	Dry Seed	10	First leaf through coleoptile	20	Main shoot only
01	Start of imbibition (water absorption)	11	First leaf emerged	21	Main shoot and 1 tiller
02		12	2 leaves emerged	22	Main shoot and 2 tillers
03	Imbibition complete	13	3 leaves emerged	23	Main shoot and 3 tillers
04		14	4 leaves emerged	24	Main shoot and 4 tillers
05	Radicle (root) emerged from caryopsis (seed)	15	5 leaves emerged	25	Main shoot and 5 tillers
06		16	6 leaves emerged	26	Main shoot and 6 tillers
07	Coleoptile (shoot) emerged from caryopsis	17	7 leaves emerged	27	Main shoot and 7 tillers
08		18	8 leaves emerged	28	Main shoot and 8 tillers
09	Leaf just at coleoptile tip	19	9 or more leaves emerged	29	Main shoot and 9 or more tillers
3	**Stem Elongation**	**4**	**Booting**	**5**	**Inflorence (ear/panicle) Emergence**
30	Pseudostem (leaf sheath) erection	40		50	
31	First node detectable	41	Flag leaf sheath extending	51	First spikelet of inflorescence just visible
32	Second node detectable	42		52	
33	Third node detectable	43	Boots just visibly swollen	53	Inflorescence quarter emerged
34	Fourth node detectable	44		54	
35	Fifth node detectable	45	Boots swollen	55	Inflorescence half emerged
36	Sixth node detectable	46		56	
37	Flag leaf just visible	47	Flag leaf sheath opening	57	Inflorescence three quarter emerged
38		48		58	
39	Flag leaf ligule just visible	49	First awns visible	59	Emergence of inflorescence completed
6	**Anthesis (flowering)**	**7**	**Milk Development**	**8**	**Dough Development**
60		70		80	
61	Beginning of anthesis	71	Caryopsis (kernel) water ripe	81	
62		72		82	
63		73	Early milk	83	Early dough
64		74		84	
65	Anthesis half way	75	Medium milk	85	Soft dough
66		76		86	
67		77	Late milk	87	Hard dough
68		78		88	
69	Anthesis complete	79		89	

9	**Ripening**
90	
91	Caryopsis hard (difficult to divide)
92	Caryopsis hard (not dented by thumbnail)
93	Caryopsis loosening in daytime
94	Over-ripe, straw dead and collapsing
95	Seed dormant
96	Viable seed giving 50% germination
97	Seed not dormant
98	Secondary dormancy induced
99	Secondary dormancy lost

Acknowledgement
This table is from a Farmnote by M.W.Perry
Published by the Western Australian Department of Agriculture

Reference
Zadoks J.C., Chang T.T., Konzak C.F. (1974)
A decimal code for the growth of cereals
Weed Research 14: 415-421

Version date:
20/01/2005

Feekes Growth Stages

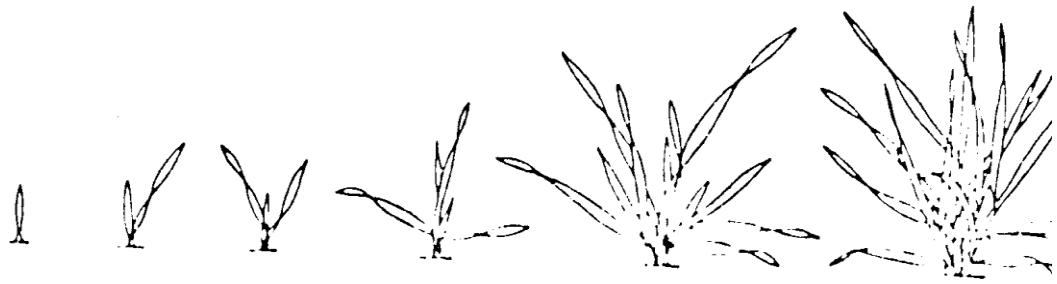
1	One shoot (number of leaves can be added) = “brairding”			
2	Beginning of tillering			
3	Tillers formed, leaves often twisted spirally. In some varieties of winter cereals, plants may be “creeping” or prostrate			Tillering
4	Beginning of the erection of the pseudo stem, leaf sheaths beginning to lengthen			
5	Pseudo stem (formed by sheaths of leaves) strongly erect			
6	First node of stem visible at base of shoot			
7	Second node of stem formed, next-to-last leaf just visible			
8	Last leaf visible, but still rolled up, ear beginning to swell			Stem
9	Ligule of last leaf just visible			Extension
10	Sheath of last leaf completely grown out, ear swollen but not yet visible			
	10.1	First ears just visible (awns just showing in the barley, ear escaping through split of sheath in wheat, oats)		
	10.2	Quarter of heading process completed		
	10.3	Half of heading process completed		Heading
	10.4	Three-quarters of heading process completed		
	10.5	All ears out of sheath		
		10.5.1	Beginning of flowering (wheat)	
		10.5.2	Flowering complete to top of ear	Flowering
		10.5.3	Flowering over at base of ear	
		10.5.4	Flowering over, kernel watery ripe	
11	11.1	Milky ripe		
	11.2	Mealy ripe, contents of kernel soft but dry		Ripening
	11.3	Kernel hard (difficult to divide by thumb-nail)		
	11.4	Ripe for cutting. Straw dead		

Ref FEEKES, W. (1941) De Tarwe en haar miliew. *Vers. XVII Tech. Tarwe Comm. Groningen, 560-1.*

KELLER, C. and BAGGIOLINI, M. (1954) Les Stades Reperes dans la Vegetation du Ble. *Revue Romande, Lausanne, 10, 17-20. [For other illustrations of the Feekes scale.]*

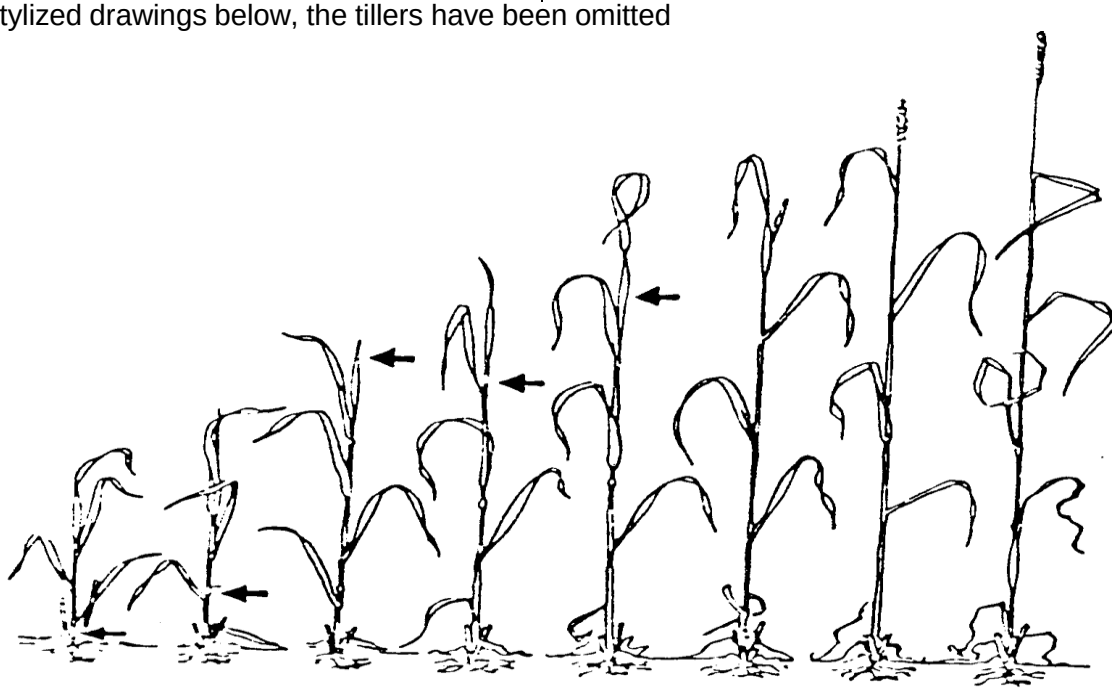
Zadoks and Feekes Comparison

	Seedling Growth			Tillering		
	First leaf through coleoptile	First leaf unfolded	Two leaves unfolded	Three leaves unfolded, main shoot and 1 tiller	Five leaves unfolded, main shoot and 3 tillers	Leaf sheath (pseudostem) erect
Zadoks	10	11	12	13,21	15, 23	30
Feekes	1	1	1	2	3	5



	Stem elongation				Booting - Ripening			
	First Node detectable	Second Node detectable	Flag leaf just visible	Flag leaf ligule just visible	Boots swollen	Three quarters of ear emerged	Emergence of ear complete	Grain hard
Zadoks	31	32	37	39	45	57	59	91
Feekes	6	7	8	9	10	10.4	10.5	11.4

Note: In the stylized drawings below, the tillers have been omitted



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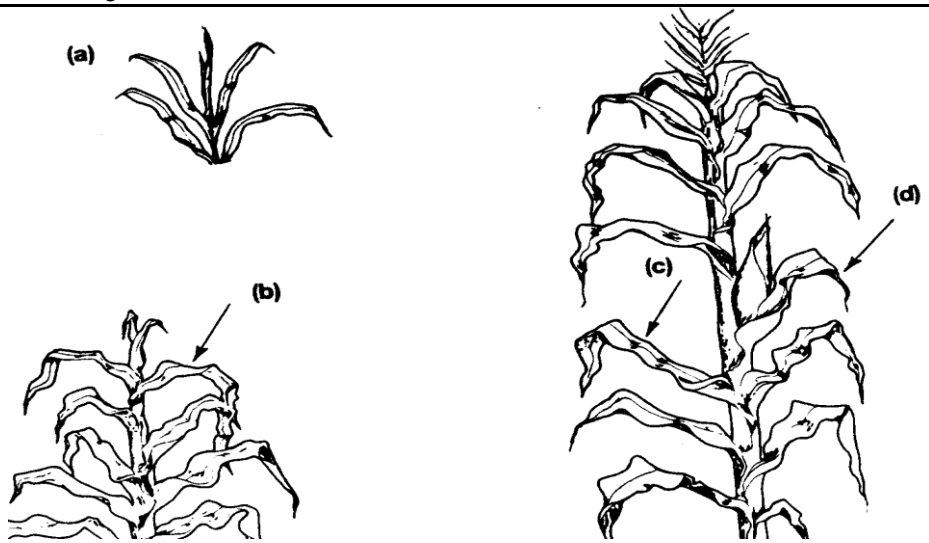
8. Detailed Instructions for Specific Crops and Plants

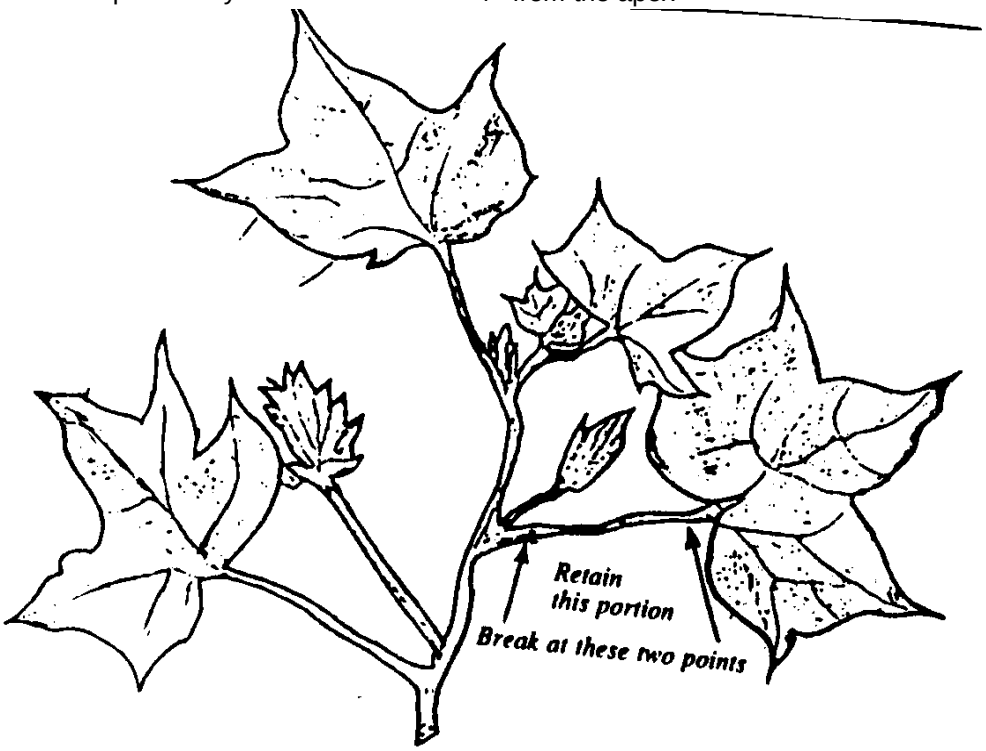
Note: Details on Interpretation chart numbers are provided for reference by accredited Incitec Pivot Agents and Dealers. These charts are not available for wider distribution

Cereals

Crop	Time of year or growth stage	Plant part	No. or weight of leaves	chart
Barley, Oats, Wheat	Before head emergence (stages 3-5 - Feekes scale; stages 15-30 Zadoks scale).	3 leaf blades to be sampled per plant; youngest fully expanded leaf blade, plus next two leaf blades below the youngest mature leaf blades at mid to late tillering.	60 plants or 200 leaves	201
Maize	10-30 cm (3-4 leaf stage)	Whole plant.Cut stalk off about 1cm above ground level.	20 plants	202 a
	Over 50 cm but prior tasselling	First fully developed leaf from top (first leaf below whorl). Cut leaf at its base where it joins sheath.	25 leaves	202 b
	Silking	6th leaf from base - leaf below and opposite ear. Cut leaf at its base where it joins sheath.	25 leaves	202 c
	From initial silk emergence but prior to silks turning brown.	Leaf subtending the ear (ear leaf). Cut leaf at its base where it joins sheath.	25 leaves	202 d
				
Rice		"Y' leaf ie. Most recently matured leaf blade at mid-tillering (40-50 days old)	200 leaves or 50 plants	203
Rye	Mid-spring	Whole tops	50 plants	204
Grain Sorghum	23-39 days after planting. During early to late flowering.	Seedling plant tops (<30 cm high)	40 plants	205 a
	60-90 days after planting. During early to late flowering.	3rd leaf below head	30 leaves	205 b

Fibre and Oilseed

Crop	Time of year or growth stage	Plant part	No. or weight of leaves	chart
Canola	Pre-flowering	Recently matured leaf	150 leaves	209
(Rapeseed)	Flowering	Entire plant ie. Whole tops	5 to 10 plants	210
Chickpea	Vegetative	Whole shoot or tops	10 plants	211
Coconut PNG and NthQld		14th frond. Six leaflets taken fro ו mid-section of the frond	30 leaflets	212
Cotton	Prior to or at first bloom, or when first squares appear.	Upper mature leaves on vegetative stems	150 leaves from 25 to 30 plants	213 a
	Petioles (for nitrate) commence sampling 1 week before 1st bloom then sample weekly for 8-9 weeks	Petioles from youngest fully expanded leaves, usually 3rd or 4th from the apex	200 petioles	213 b
Kenaf	18 weeks after sowing	Top 60 cm of stem plus all leaves on plant	10 plants	215
Navy Bean	Around 40 days after planting	Young fully expanded leaves, with petioles, from top 15 cm of plant, at initial flowering or just prior to pod set.	40 leaves	217
Oil Palm	August	Frond 17	1 frond	218
Peanut	Prior to or at bloom stage	Upper mature leaves	50 leaves	219



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Soybean	Early flowering	Upper most mature trifoliate leaves (petioles discarded). 3rd and 4th leaf blade below apex.	50 leaves	221
Sunflower	6 weeks post plant	Lamina of youngest fully expanded leaf at growth stage RI	40 laminae	222 a
	Early bud formation (bud up to 2 cm in diameter).	3rd and 4th leaf blade below flower bud	10 plants	222 b

Pasture – Grasses, Legumes

Crop	Time of year or growth stage	Plant part	No. or weight of leaves	Chart
Ryegrass	During active growing season, when soil moisture adequate for 2-3 weeks.	40-50 tillers at random over the field. All growth cut 3-5cm about ground level on 2-5 weeks – old regrowth	200 g	226
Kikuyu	Late spring – early summer when soil moisture adequate for 2-3 weeks.	Green leaf and stem growth above 5 cm tall – clipped with shears or blade, sampling above trash layer.	200 g	229
Lucerne	During period of active growth, before flowering.	Top 15cm of whole plant.	200 g	230
Temperate Legumes (incl. White and sub clovers)	Spring – early summer.	For White and Strawberry clovers – green leaves with petioles at immediate pre-flowering stage. For others – green leaves and stems 5-7 cm above ground at immediate pre-flowering. Sample youngest open leaf blade where critical Cu and Zn results are needed.	200 g	231 a
White Clover (New Zealand)	During active growing season.	Leaves with petioles at immediate pre-flowering.	200 g	231 b

Sugarcane

Crop	Time of year or growth stage	Plant part	No. or weight of leaves	Chart
Sugar cane	During active growing season.	Top visible dewlap leaf – 20cm cross section of leaf (minus midrib) – measured from true centre to base, from the healthy growing, thickest stool of a plant.	30 portions of lamina	241

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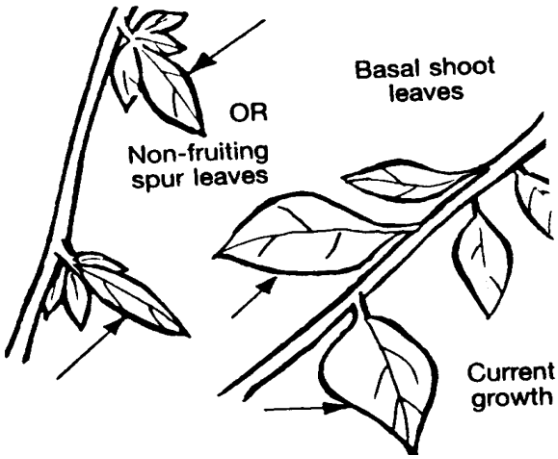
Fruit Crops

Crop	Time of year or growth stage	Plant part	No. or weight of leaves	Chart
Almond	Mid to late January	Normal sized leaves, shoulder-high from non-fruiting spurs on spur bearing cultivars or mid shoot on current season's extension growth on non-spur varieties.	150 leaves	242



Almond, Apricot, Apple, Cherry, Fig, Pear, Plum, Prune

Crop	Time of year or growth stage	Plant part	No. or weight of leaves	Chart
Apple	Late January to mid February.	Entire leaf (including petiole) from mid-shoot position on current season's extension growth. Take at lease 4 leaves form the periphery of each of 20-40 trees.	150 leaves	243
Apricot	Mid-summer (mid-Jan to mid-Feb)	Leaves (mid-shoot) fully expanded 1st main flush of growth of current season's extension growth.	150 leaves	244
Avocado	Late April-May	Leaves (recently expanded, mature and healthy). Non-fruiting terminals of recent summer flush.	80 leaves	245
Banana (Sth qld, nsw)	Medium sized, actively growing suckers.	Strips 20cm wide from each side of midrib from the centre section of the third fully emerged leaf. Sample suckers where leaf can be reached from ground.	12 plants to obtain 24 pieces of lamina.	246 a
(Nth Qld	Before bunching	LEAF: Third fully expanded leaf of unbunched plants at least half grown. LEAF PART: Strips of lamina 20 cm wide from each side of midrib to the margins. Wash samples in standard acetic acid/wetting agent mix to remove fungicide residues. eg.Cu, if trace element determinations are	12 plants to obtain 24 pieces of lamina	246 b

important.

Crop	Time of year or growth stage	Plant part	No. or weight of leaves	Chart
Black Currant	Fruit ripening stage.	L aves from mid third of extension shoots	100 leaves	247
Blueberry (Rabbit-eye)	During last 2 weeks of harvest or 2 weeks after harvest.	Current season's growth. 4th, 5th and 6th leaves form apex.	120 leaves	248 a
(High-bush)	Early January.	Youngest fully expanded leaf from fruiting shoots (4th-6th nodes from fruit tip).	120 leaves	248 b
Cherry	Mid-summer.	Fully expanded mid-shoot leaves. First main flush of growth of current season.	200 leaves	249
Citrus	February-March in Qld	Healthy, mature leaves from middle of non-fruiting terminals of previous spring flush 5-7 months old. Take leaves at shoulder height at various positions around the trees. Avoid sampling spring flush terminals, which have flushed again.	200 leaves	250
	January-February in South Australia, Victoria and Riverina (when leaves are 3-6 months old).	When leaves are 3-6 months old, otherwise as above.		
Custard Apple	Late February to early March after 2nd major flush.	Youngest mature leaf (4th or 5th leaf back from growing point), from non-fruiting shoots only.	40 leaves	251
Grape (Petiole)	(i) October - November (ii) December-January	(i) Petioles form leaves opposite bunch at base of shoot at full bloom. (70% cap fall). (ii) Petioles form leaves opposite bunch at base of shoot, at veraison or colour change of berries.	150 petioles	252 a
(Leaf Blade)	(i) October - November (ii) December-January	(i) Leaf blades from leaves opposite bunch at base of shoot at full bloom. (70% cap fall). (ii) Leaf blades from leaves opposite bunch at base of shoot, at veraison or colour change of berries.	100 leaf blades	252 b

Citrus

Non-fruiting terminal

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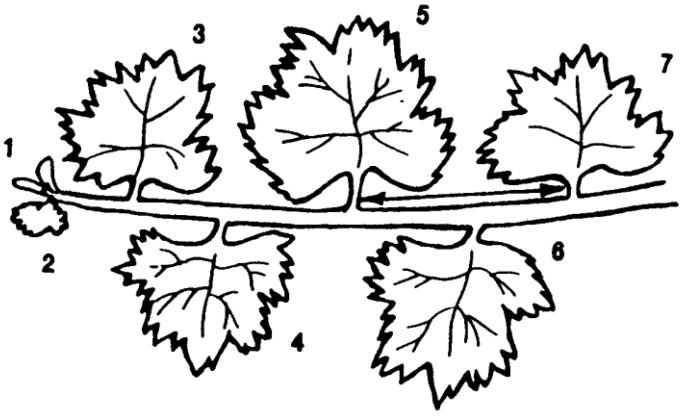
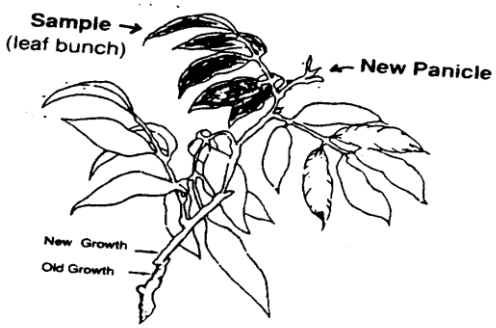


Grape

Petiole generally between 5th - 7th node from growing tip

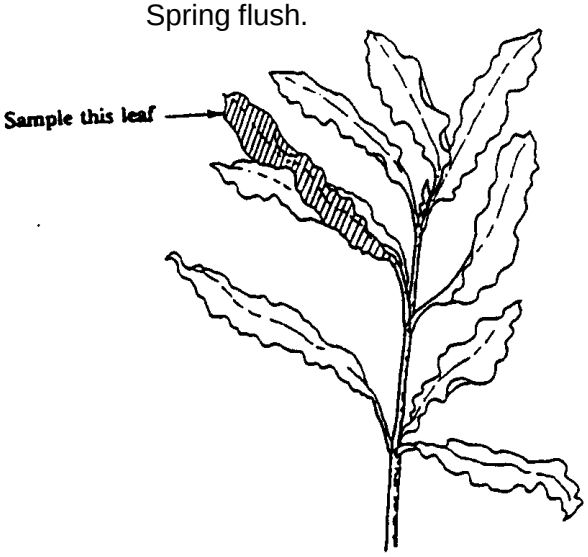
Crop	Time of year or growth stage	Plant part	No. or weight of leaves	Chart
Guava	November to December	3rd pair of open leaves back from fruiting terminals.	70 leaves	253
Kiwi Fruit	Late February	Select 24 leaves from over each growing unit. Take youngest mature leaf above a cluster of 3-6 average sized fruit, on a spur containing at least 6 leaves beyond the leaf selected.	70 leaves	254
Lychee	1-2 weeks after flower panicle initiation (May-August).	Select first healthy leaf bunch under the panicle from each of 8 branches distributed uniformly around the tree. Sample 20 trees.	160 leaves	255



Lychee

(leaf bunch)

Crop	Time of year or growth stage	Plant part	No. or weight of leaves	Chart
Macadamia	September-November, just before peak of Spring flush.	6-7 month old mature leaves from 2nd whorl of current season's growth, from non-flushing terminals.	80 leaves	256
Mango (Nth Qld)	May – July	Latest mature leaves, when tree is quiescent prior to flowering.	50 leaves	257
(Sth East Qld)	August - September	Latest mature leaves just prior to flowering		
Papaw	Spring	Petiole of youngest fully expanded leaf subtending the most recently opened flower.	1 petiole from each of 10 or more plants	258
Passion-Fruit	July- August	Youngest fully expanded mature leaf behind a recent flush of growth.	100 Leaves	259
Peach and Nectarine	Mid-summer, or for low-chill varieties, within 2 weeks after harvest.	Mature leaves form mid-portion of shoot, current season's terminal growth.	200 leaves	260



Sampling Macadamia leaves for analysis

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Note. These sampling procedures apply to many other tree crops

Crop	Time of year or growth stage	Plant part	No. or weight of leaves	Chart
Pear	Late January to mid. February	Mid shoot leaves of current season's growth at about shoulder height.	200 leaves	261
Pecan	Shell hardening to early kernel development (February in NSW)	Pairs of leaflets from midway along youngest fully expanded leaf on fruiting wood. Select leaflets from branches up to 2 m above the ground.	100 leaves	262
Persimmon	Approximately 2 months prior to harvest (mid February- early March).	Youngest fully expanded mature leaves form non-fruiting shoots.	100 leaves	263
Pineapple	For summer plant crop – December, February and April. For ratoon crop – April and August. For May- June plant crop – December, February, April, and September. For ratoon crop – October, December and March.	D leaf (most recent fully expanded leaf) during vegetative growth before initiation.	20 leaves	264
Plum and Prune	Mid January – mid February in NSW	Mid-shoot fully expanded leaves of first main flush of current season's extension growth.	200 leaves	265
Rambutan		Last fully mature leaflets on branch tips	150 leaves	266
Strawberry	Sample twice in May-October, period - at onset of flowering and - at peak of flowering.	Leaf blade with petiole. The highest most recently matured healthy leaf, ie. youngest fully expanded leaf.	80 leaves	267

Vegetables

Crop	Time of year or growth stage	Plant part	No. or weight of leaves	Chart
Asparagus	February-March	Top 30 cm of mature male fern at mid-growth	30 ferns	269
Bean	End October – mid November (for spring-planted crops in Qld)	Youngest fully expanded leaf (minus petiole), between early flowering and when pods are 10 cm long. Stages of growth may occur at different times in other States compared to that for Qld	40 laminae	270
Beetroot (for processing) and Silverbeet	Late September – early November (for winter planted crops in Qld).	4-5 young mature leaves/plant when roots are 4-7.5cm diameter	50 plants	271
Broccoli	Early heading stage. July – August (in Qld)	Wrapper leaf.	50 leaves	272
Brussells sprout	Heading	Upper leaves when heart is about 7 cm in diameter (heading)	100 leaves	273
Cabbage	Head maturity – early. Harvest	Wrapper leaves	15 leaves	274
Capsicum (peppers)	Early fruiting	Midgrowth. Young mature leaf with petiole	50 leaves	275
Carrot	Mid July – late August (for late autumn planted crops in Qld)	Youngest fully expanded leaf (remove extended main petiole) or whole tops, when roots are 1-3cm in diameter	50 plants	276
Cauliflower	Buttoning	Youngest fully expanded leaf blade	15 leaves	277
Celery (Leaves)	Half-grown plants	Young mature leaf	50 leaves	278a
(Petiole)	Close to maturity	Whole petiole (cut close to mainstem and at base of leaf blade)	50 petioles	278b
Cucurbits (General cucurbits)	Early flowering	Youngest fully expanded leaf with petiole	25 leaves	279a
(Cucumber)	Fruit set	Youngest fully expanded leaf with petiole	25 leaves	279b
(Pumpkin)	Fruit set	Youngest fully expanded leaf with petiole. 9th node	25 leaves	279c
(Rock-Melon)	Harvest	Youngest fully expanded leaf with petiole	25 leaves	279d
(Water-Melon)	Mid-growth	Youngest fully expanded leaf with petiole	25 leaves	279e
(Zucchini)	Early fruit set	Youngest fully expanded leaf	25 leaves	279f
Ginger	2-3 months. (January - March)	3rd fully expanded leaf from top of plant. Green or part green leaf at top	50 leaves	280
Lettuce	When heads are half size	Wrapper leaf.	100 leaves	282

Crop	Time of year or growth stage	Plant part	No. or weight of leaves	Chart
Onion	Mid-growth period.	Young mature leaf blades.	80-100 leaves	283
Pea	Flowering.	Youngest mature compound leaf.	200 leaves	284
Potato	Commencement of flowering.	Young fully expanded compound leaf (usually 4th from tip). Sample petiole and leaf blades.	30 leaves	285a
	One month after commencement of flowering.	Young fully expanded compound leaf.	30 leaves	285b
	Petioles when length of longest tuber is 5-10mm	Petiole of youngest fully expanded leaves.	75 petioles	285c
	 **Commencement of Flowering** (early bloom stage) Sample petiole and leaf blades of the fourth leaf from the growing tip			
Spinach	30-50 days.	Young mature leaf.	20 leaves	286
Sweet Corn	Start of tasselling.	5th leaf from tip (omit unfurled leaf).	25 leaves	287
Tomato	Seedling – 13th leaf stage when 7 leaves greater than 1 cm long.	Whole plant 1cm above ground.	25 seedlings	288a
	6 weeks from transplanting.	Youngest fully expanded leaf; flowering of 2nd hand.	25 leaves	288b
	First mature fruit	Youngest fully expanded leaf.	25 leaves	288c

Stimulants

Crop	Time of year or growth stage	Plant part	No. or weight of leaves	Chart
Cocoa (cacao)		3rd leaf from recent hardened flush, when petioles are partly brown and partly green.	80 leaves	293
Coffee (Arabica - unshaded, Papua New Guinea)	February – April or September – October.	3rd and 4th leaf pairs from actively growing shoots, non-bearing branches.	40 leaves	294
(Robusta)		3rd and 4th leaf pairs from active shoots, at about 2 months of age.	40 leaves	295
Duboisia		Youngest fully expanded leaf.	100 leaves	296
Tea (Nth Qld)	At time of maximum growth (no definite time established).	Mature leaves – usually 3rd and 4th – from top of plucking table	200 leaves	298a
(Papua New Guinea)	At time of maximum growth (no definite time established).	Mature leaves – usually 3rd and 4th – from top of plucking table.	200 leaves	298b
Tobacco	Blooming stage of untipped plants.	Uppermost fully developed fresh leaf (including midrib)	20 leaves	299

Ornamentals

Crop	Time of year or growth stage	Plant part	No. or weight of leaves	Chart
Azalia	Flowering	Youngest fully expanded leaf on flowering shoot.	100 leaves	301
Banksia (Coast)	10 weeks of age.	Whole shoot	100 g	302
Boston Fern	5-10 months after planting.	Pinnae from whole fronds on 10-12 cm mid-section.	150 g	303
Carnation	No visible flower bud.	4th or 5th leaf below stem tip on which there is no visible flower bud.	200 leaves	304a
	If monitoring take first sample 6-8 weeks after planting, then sample every 2 months for life of crop.	Unpinched plants - remove entire 4th or 5th leaf pairs counting from base of plant. Pinched plants - sample as above except when buds form, then sample 5th and 6th leaf pairs from the terminal end of lateral buds. When flower buds form, shift to secondary lateral shoots for samples	200 leaves	304b

Crop	Time of year or growth stage	Plant part	No. or weight of leaves	Chart
Chrysan-themum	During vegetative growth phase	Whole tops (10 weeks growth).	15 plants	305a
	Before flower bud is 1.5 cm diameter.	Upper leaf of flowering stems	70 leaves	305b
Cyclamen	50 days after transplanting.	Whole shoot.	10 plants	306
Dieffenbachia		Youngest fully expanded blade leaf.	10 leaves	307
Freesia	At end of flowering	Whole plant	10 plants	308
Geranium		Newest fully expanded leaf on flowering shoot.	100 leaves	309
Gladiolus	Heading stage.	4th fully expanded true leaf.	15 leaves	310
Grevillia	70 days after emergence.	Whole shoots.	200 g	311
Maidenhair Fern	50-120 days.	Fronds.	200 g	312
Orchid (Cattleya)		Break off 5 cm segments of leaf tip from youngest mature growth.	40 segments	313a
(Phalaenopsis)		Collect 5 cm leaf tips from youngest fully expanded leaves.	40 tips	313b
(Cypripedium)		Collect 5 cm tips from youngest fully expanded leaves.	40 tips	313c
(Cymbidium)		Tear off leaf tips approximately 15 cm long from mature leaf on mature growth.	200 g; about 40 tips	313d
Poinsettia	Before flowering.	Youngest fully expanded leaf.	70 leaves	314
Protea (Cynaroides).	August. Flower - bud initiation.	Youngest fully expanded blade on any shoot - 2-3 years old	100 leaves	315a
(Repens)	August. Flower - bud initiation.	Youngest fully expanded blade on stem with flower buds	100 leaves	315b
(Magnifica)	After flowering.	Young leaves	100 leaves	315c
Rose	When flower bud size is the size of a pea to first colour.	1st and 2nd five leaflet leaves counting from top of flowering shoot.	100 leaves	316
Schefflera (Umbrella Tree)		Central leaflet from youngest mature leaf.	20 leaflets	317
Swan River Pea Bush	10 weeks.	Whole shoots	200 g	318
Tea Tree	70 days after transplanting cuttings.	Whole shoots.	200 g	319
Turf Grass (Green Couch)	Active growing season.	Clippings from area.	100 g	320a

Crop	Time of year or growth stage	Plant part	No. or weight of leaves	Chart
(Tifgreen, Dwarf)	Active growing season.	Clippings from area.	200 g	320b
(Kikuyu)	Late spring - early summer.	Green leaf and stem growth above 5 cm tall - clipped with shear or blade.	200 g	320c
(Creeping Bent)	Active growing season.	Clippings from area.	200 g	320d
Waratah	2nd year during dormancy. (August)	Youngest fully expanded blade below flower bud	100 leaves	321
Foliage Plants		Recently matured leaves of plants with good growth, yield and appearance.	200 g	323

TREES - FORESTRY - INDUSTRIAL

Crop	Time of year or growth stage	Plant part	No. or weight of leaves	Chart
Cassava	Young plants (2 to 5 months old) or when growing vigorously after prolonged dry or cold period.	Youngest fully expanded leaf blades	200 g	326
Rubber		Leaves from terminal whorls from lower branches.	10 leaves	328