On the face of it gearing seems pretty simple. As CCs increase, the gear ratios become higher (lower number), i.e. 4th gear ratios: LI125 = 5.65, LI150 = 5.22, TV175 = 4.82, TV200 = 4.46. Unfortunately, this rule seldom works with tuned engines and commonly leads to people making the wrong choice of gearing for their machine, resulting in disappointing performance.

Gearing application is closely related to the rev range that a specific set-up produces power at. If the 4th gear ratio is too high (low number) then the scooter will struggle up hills, or into a headwind, and frequently need changing down into 3rd gear to gain the extra revs that it needs to get back into the 'power band'. If the 4th gear ratio is too low (high number) then it will limit the speed the scooter can achieve. Like all aspects of tuning, gearing must be in harmony with the rest of the tuning components and suit the application for which the scooter is being used.

Cylinder porting and exhaust characteristics greatly effect the power/rev range relationship and in doing so greatly effect the gearing required to work in harmony with them. If you change either of these elements then you can throw the earlier rule out of the window! e.g. a highly tuned TS1 225 with a 'revvy' expansion pipe may require the same 4th gear ratio as an LI125. This example shows that although the tuned TS1 may be capable of producing 4 times the bhp of the standard LI125, they both need the same gear ratio to get into the rev range that will produce power to compliment the tuning employed. Please note, the TS1 will also be capable of much higher speeds because of its ability to 'rev on'.

Innocenti provide us with wonderful examples of how gearing ratios need changing to suit differing set-up for the same CC. Taking the 200cc models as an example, although the 150cc models illustrate the same trend, it is easy to see that Innocenti altered gear ratios to compliment other changes within their engines. The first 200cc model, the TV (GT) 200, had a gearbox specifically designed for it and so can be thought of as the initial 200cc gearbox. The SX200 differed from the GT by adopting the same gearbox as previous 175cc models. The GP200 continued the trend of lowering the 4th gear ratio, whilst maintaining the same CC, but also increasing the power output of the engine, The GP200 adopted the overall ratio of the earlier LI150 model. Like the earlier TS1/LI125 example, the GP200 and LI150 may be using the same gear ratio but the GP has the ability to 'rev on' and produces its peak power of 11.7bhp @ 6200rpm, whereas the LI150 produces only 6.6bhp @ 5300rpm. To compare like for like, the GT200 produces 10.7bhp @ 5700 which when compared with the GP200 figures (11.7bhp @ 6200) show how different the power characteristics of the engines are. If you were to simply swap the gear ratios between the two models then the GT would 'rev out' on the GP's lower ratio and the GP would not be capable of 'pulling' the GT's higher ratio in anything other than favorable conditions, both bikes would probably suffer performance loss in 4th gear.

So to recap, if you simply increase cc you are likely to need to raise your gearing to suit. If, however, you fit any tuning components which push the 'power band' further up the rev range then you are likely to need to lower your gearing to suit. If you are really lucky, or fairly clever, you can tune you scooter without needing to change your gearing at all! A perfect example of this is that AF Rayspeed (originator of the TS1 kit) suggest that if you fit a TS1 225 cylinder, 34mm carb, and NK expansion exhaust to a GP then the 4th gear ratio that you require to get the whole thing working in harmony is... yes, you guessed it... GP200 5.22.

As illustrated, hopefully, there are a number of factors effecting what gearing will compliment an engine's power/rev range specifications. It is very easy to get the required ratio wrong. Don't simply pick up the phone and buy any tuning 'goodie', from a kit to an exhaust, without asking the supplier of choice to give you advice on how fitting the component may effect other aspects of the engine's performance, including gearing.

All gearboxes between series one, two and three Lambretta machines are interchangeable, they should be changed as complete units though, even in most cases down to the endplate that holds them in place. You cannot unfortunately change one gear at a time (except in some rare cases), i.e. if you want a higher forth gear you cannot just take that from a different set up to gain more speed. Even though many gears may share the same number of teeth, they (again rarely) are not interchangeable one at a time, for example a GT 2nd gear has the same amount of teeth as the SX150 3rd gear, but the actual gears are not the same.

By changing the front sprocket to a higher number of teeth, you will raise the gearing. This generally increases the final ratios by a big set. By changing the rear sprocket to one with a higher amount of teeth, the final ratio is lowered. The rear sprocket is less of a big jump and can be used to fine tune ratios. One problem when changing front and rear sprockets is getting the right size chain to fit. Chain lengths generally come in 80, 81, 82, 83 and 84 pitches, this is the amount of links in the chain. Then to add to the confusion, as chains wear they tend to stretch, so this then can add to the combinations of sprockets that can be used. With old stretched chains, you should never throw them away, as long as they are in good condition and serviceable, you will never know when you or a friend will need it!

80 Pitch chain can be used with	15/46	14/47		
Stretched 80 also works on	16/46	15/47	14/48	
81 Pitch chain can be used on	17/46	16/47	15/48	14/49
Stretched 81 also works on	18/46	17/47	16/48	15/49
82 Pitch chain can be used on	19/46	18/47	17/48	16/49
Stretched 82 also works on	20/46	19/47	18/48	17/49
83 Pitch chain can be used on	21/46	20/47	19/48	18/49
Stretched 83 also works on	21/47	20/48	19/49	
84 Pitch chain can be used on	21/48	20/49		
Stretched 84 also works on	21/49			

The following guide below sets out standard gearbox types, so by using one of these and adjusting the sprockets from or rear, the amount of ratios you can have is very large.

Li125 series 1,2 and early series 3 gearbox
All of these gearboxes use the primary drive ratio of 15/46 as standard.

Gear	Group	Loose	Overall

no.	teeth	gear	ratio
1	9	51	17.40
2	12	42	10.71
3	16	39	7.47
4	19	35	5.65

TV175 series 1, 2 and 3, SX200 gearbox
These gearboxes use the primary drive ratio of 15/46.

Gear no.	Group teeth	Loose gear	Overall ratio
1	12	49	12.52
2	14	40	8.76
3	18	37	6.30
4	21	33	4.82

GP125 and Li125 special gearbox
These gearboxes use the primary drive ratio of 15/46.

Gear no.	Group teeth	Loose gear	Overall ratio
1	10	50	15.33
2	12	42	10.71
3	15	39	7.97
4	18	36	6.32

Late 150 Special, SX150 and GP150 gearbox
These gearboxes use the primary drive ratio of 15/46.

Gear no.	Group teeth	Loose gear	Overall ratio
1	10	50	15.33
2	12	42	10.71
3	15	39	7.97
4	19	35	5.65

GP200 gearbox info
This gearbox uses the primary drive ratio of 18/47.

Gear no.	Group teeth	Loose gear	Overall ratio
1	10	50	13.05
2	12	42	9.13
3	15	39	6.79
4	18	36	5.22

Li150 special (pacemaker) and late series 3 gearbox

All of these gearboxes use the primary drive ratio of 15/46.

gear no.	Group teeth	Loose gear	Overall ratio
1	11	50	13.95
2	13	41	9.67
3	17	39	7.04
4	19	35	5.65

TV/GT200 gearbox
This gearbox uses the primary drive ratio of 15/46.

Gear no.	Group teeth	Loose gear	Overall ratio
1	13	47	11.09
2	15	39	7.97
3	19	36	5.81
4	22	32	4.46

Li 150 series 1,2 and 3 gearbox
These gearboxes uses the primary drive ratio of 15/46.

Gear no.	Group teeth	Loose gear	Overall ratio
1	11	50	13.95
2	14	41	9.00
3	17	37	6.67
4	20	34	5.22

Optional gearbox on Rallymaster This gearboxes uses the primary drive ratio of 15/46.

Gear no.	Group teeth	Loose gear	Overall ratio
1	9	51	17.40
2	12	42	10.71
3	17	37	6.67
4	20	34	5.22