

SIG para AP

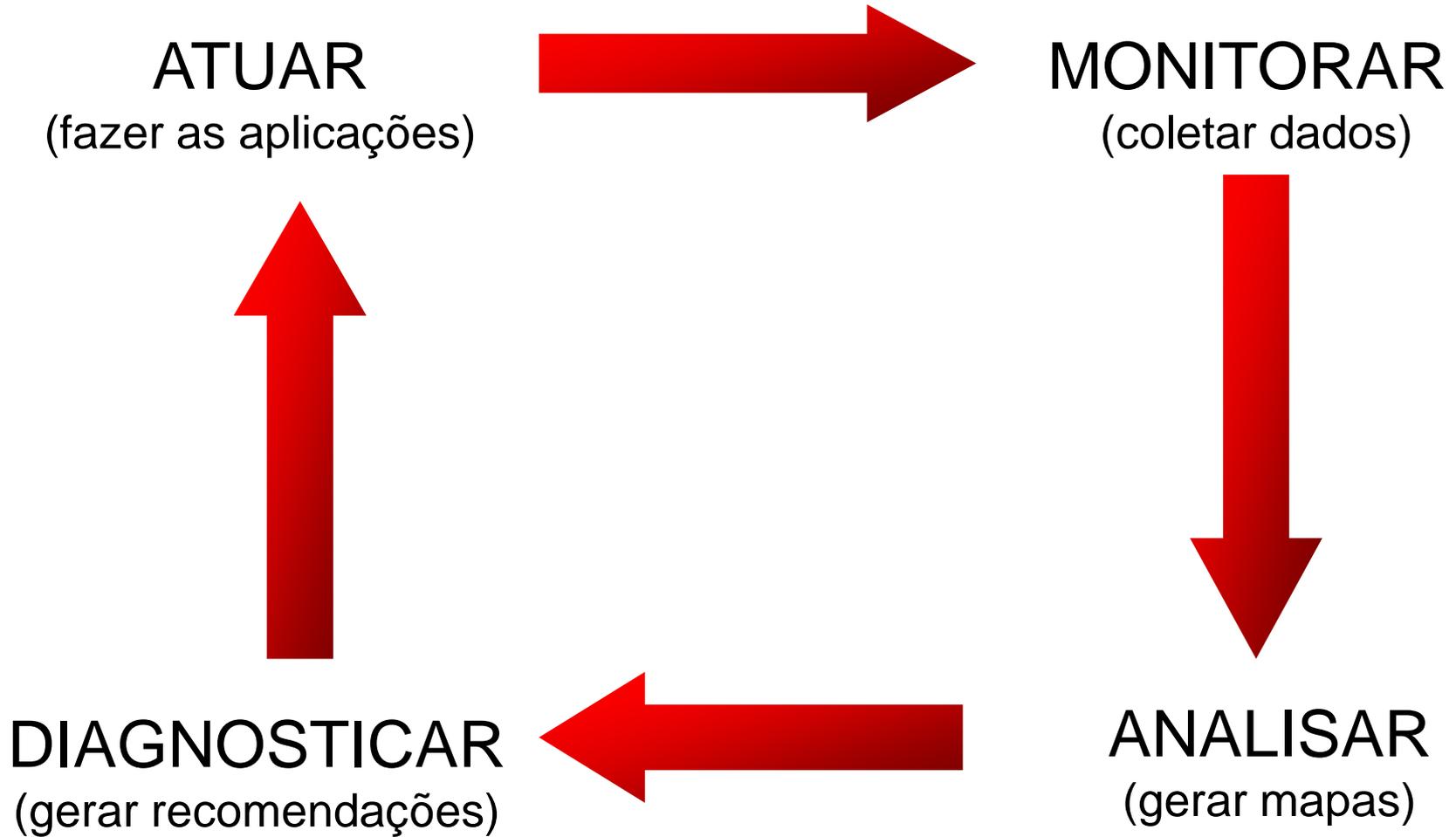
José P. Molin
ESALQ/USP
jpmolin@usp.br



Objetivo

Abordar conceitos básicos de SIG e
uma visão de mercado sobre SIG
dedicados à agricultura de precisão

Ações

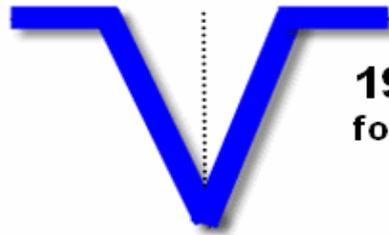




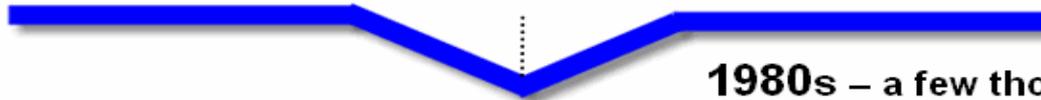
Sistema de Informação Geográfica – SIG (GIS)

- SIG é software
- Essencialmente permite trabalhar com dados georreferenciados:
 - organização
 - edição
 - análise
 - visualização
 - armazenamento

General Programmers GIS Developers System Managers Data Providers GIS Specialists General Users Public Users



1970s – a few hundred innovators establishing the foundation of geotechnology



1980s – a few thousand pacesetters applying the technology to a small set of disciplines (RS, GIS)



1990s – hundreds of thousands GIS specialists and general users (RS, GIS, GPS)

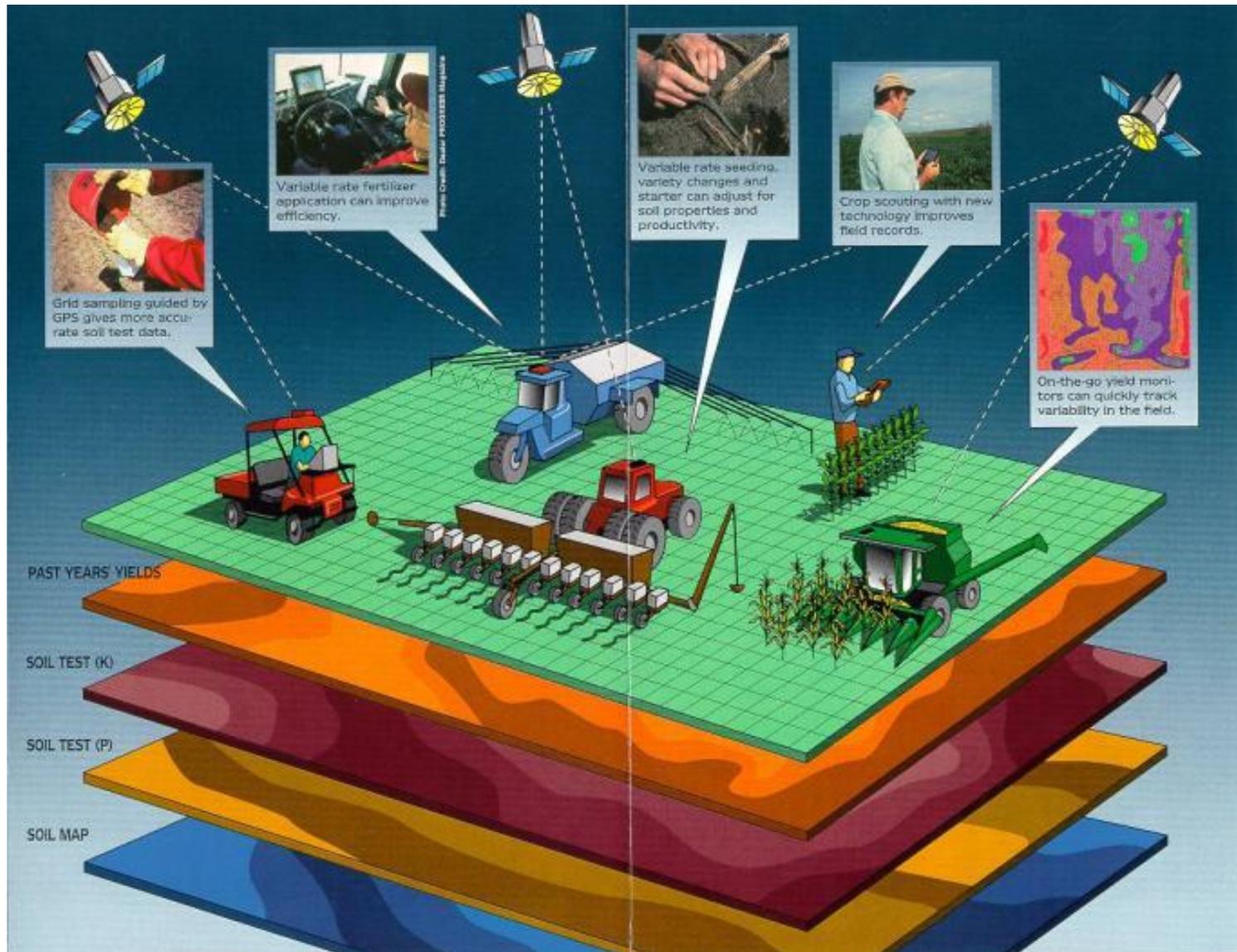


2000s – millions of general and public users (RS, GIS, GPS, MMM)

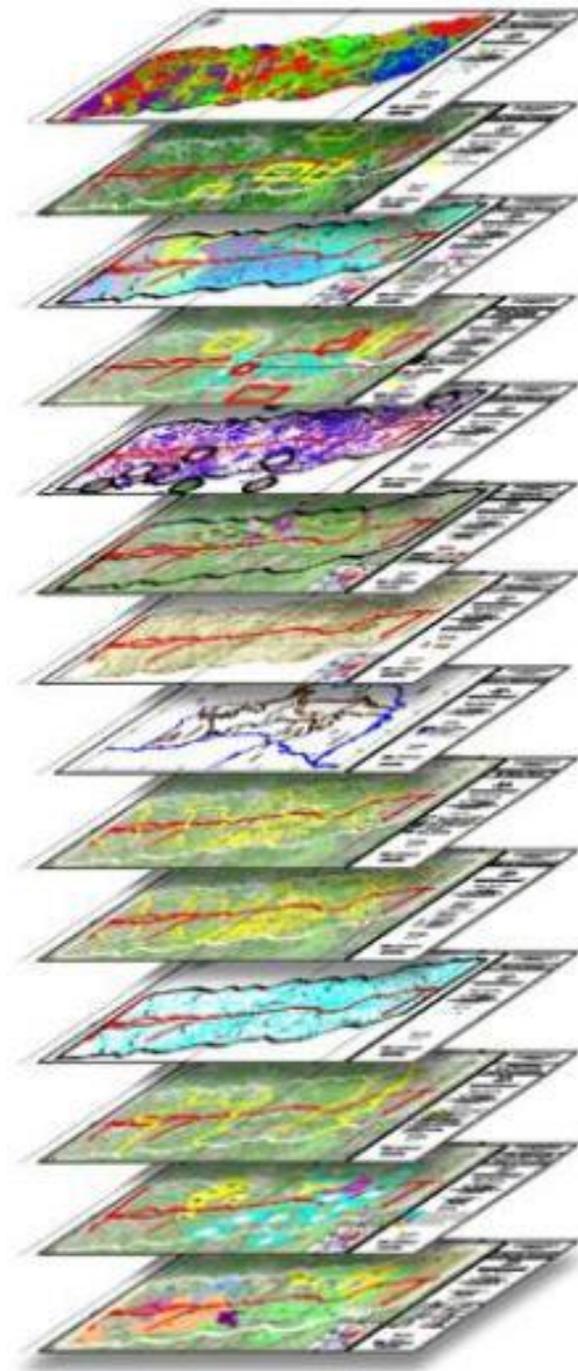
Figure 41.1. The evolution of the Geotechnology Community has broadened its membership in numbers, interests, backgrounds and depth of understanding.

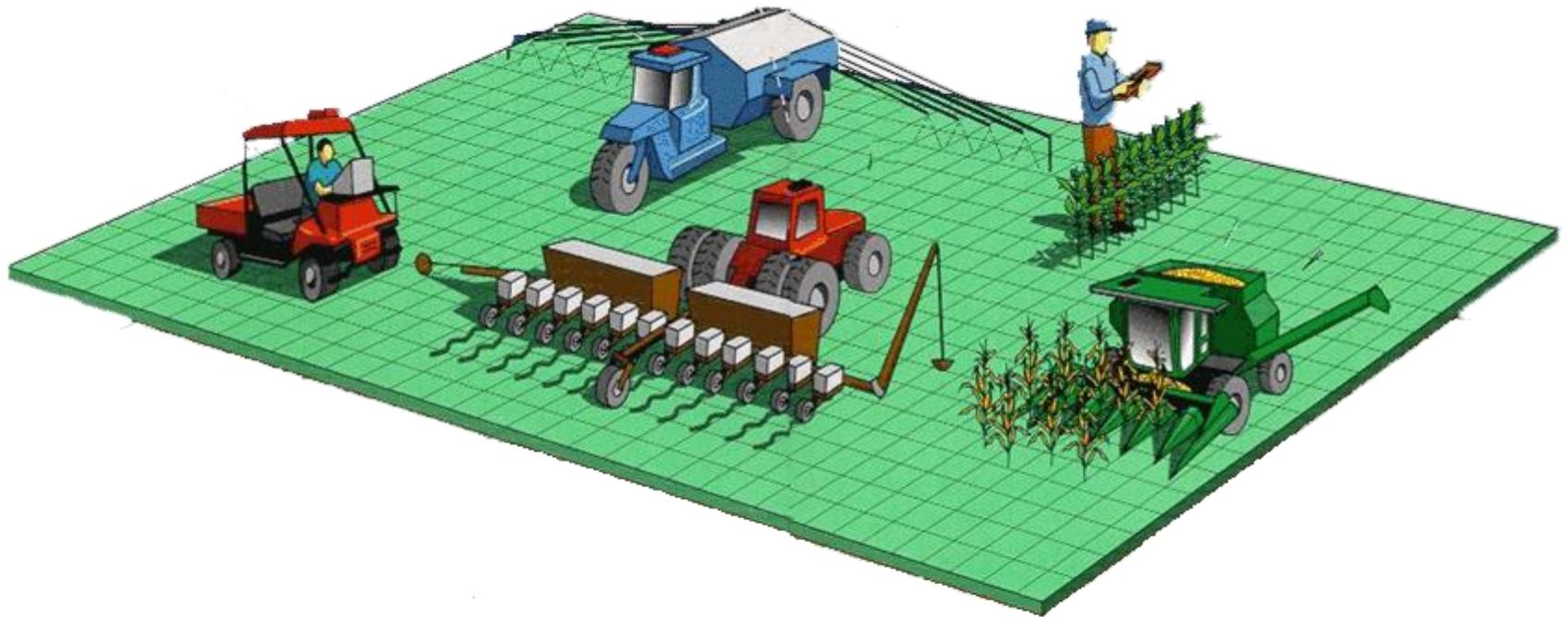
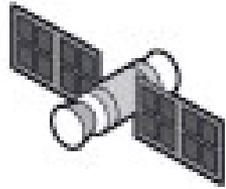
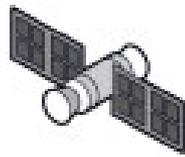
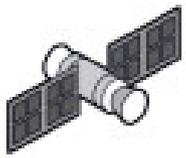
© 2007, Joseph K. Berry—permission to copy granted

SIG para AP

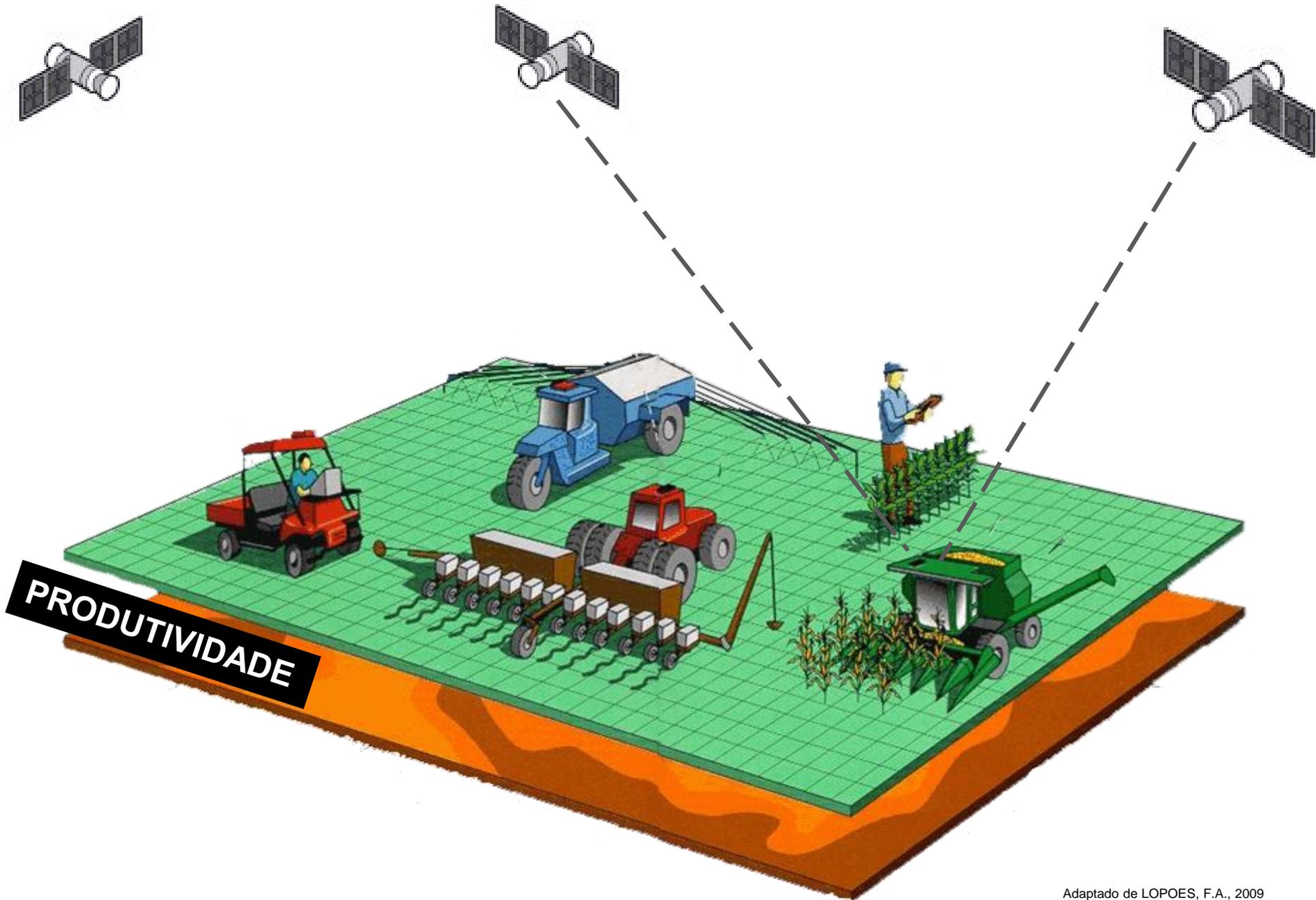


As informações
virtualmente
podem ser
organizadas em
camadas para
análises e
operações
matemáticas





Adaptado de LOPOES, F.A., 2009

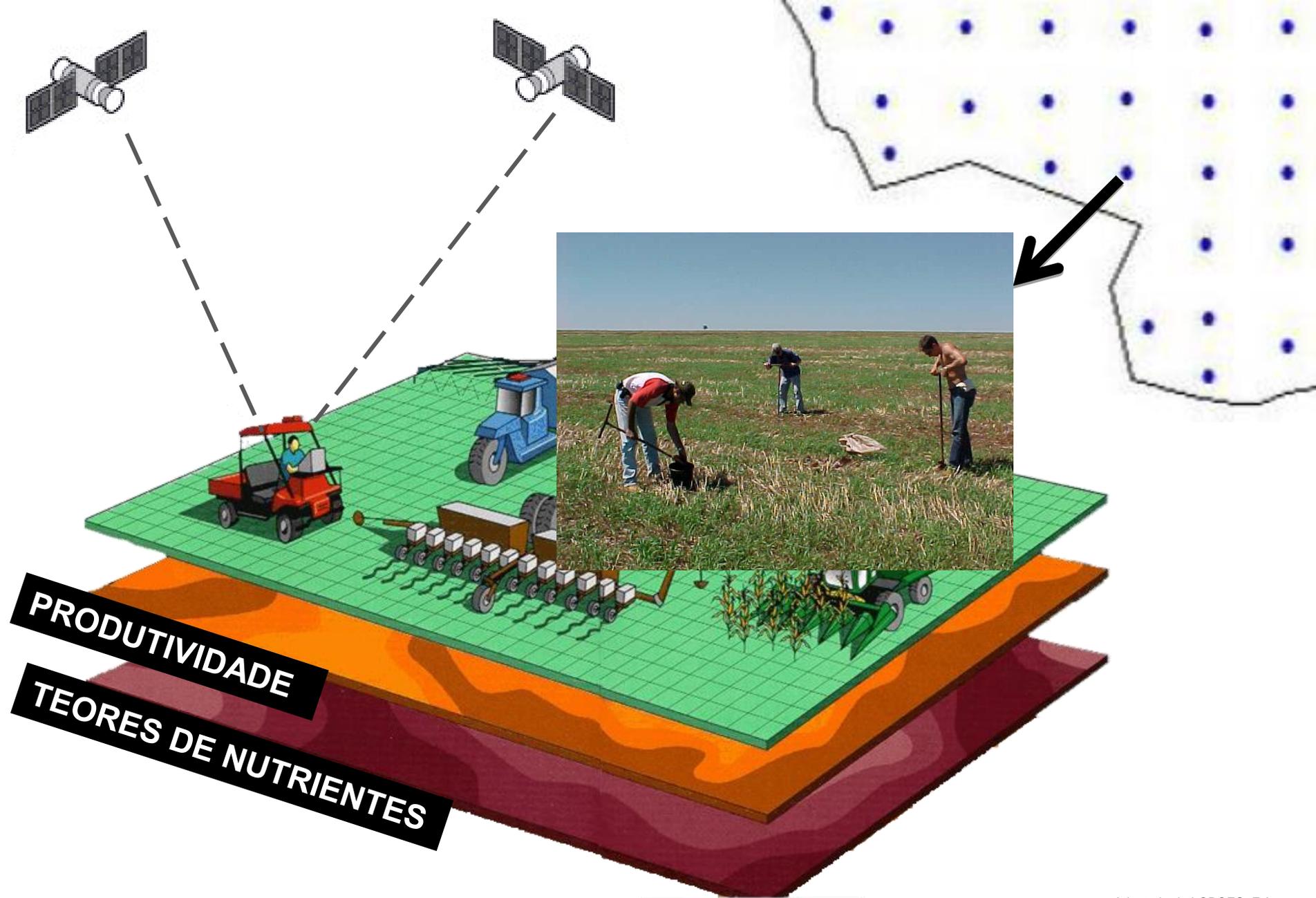


PRODUTIVIDADE

Adaptado de LOPOES, F.A., 2009



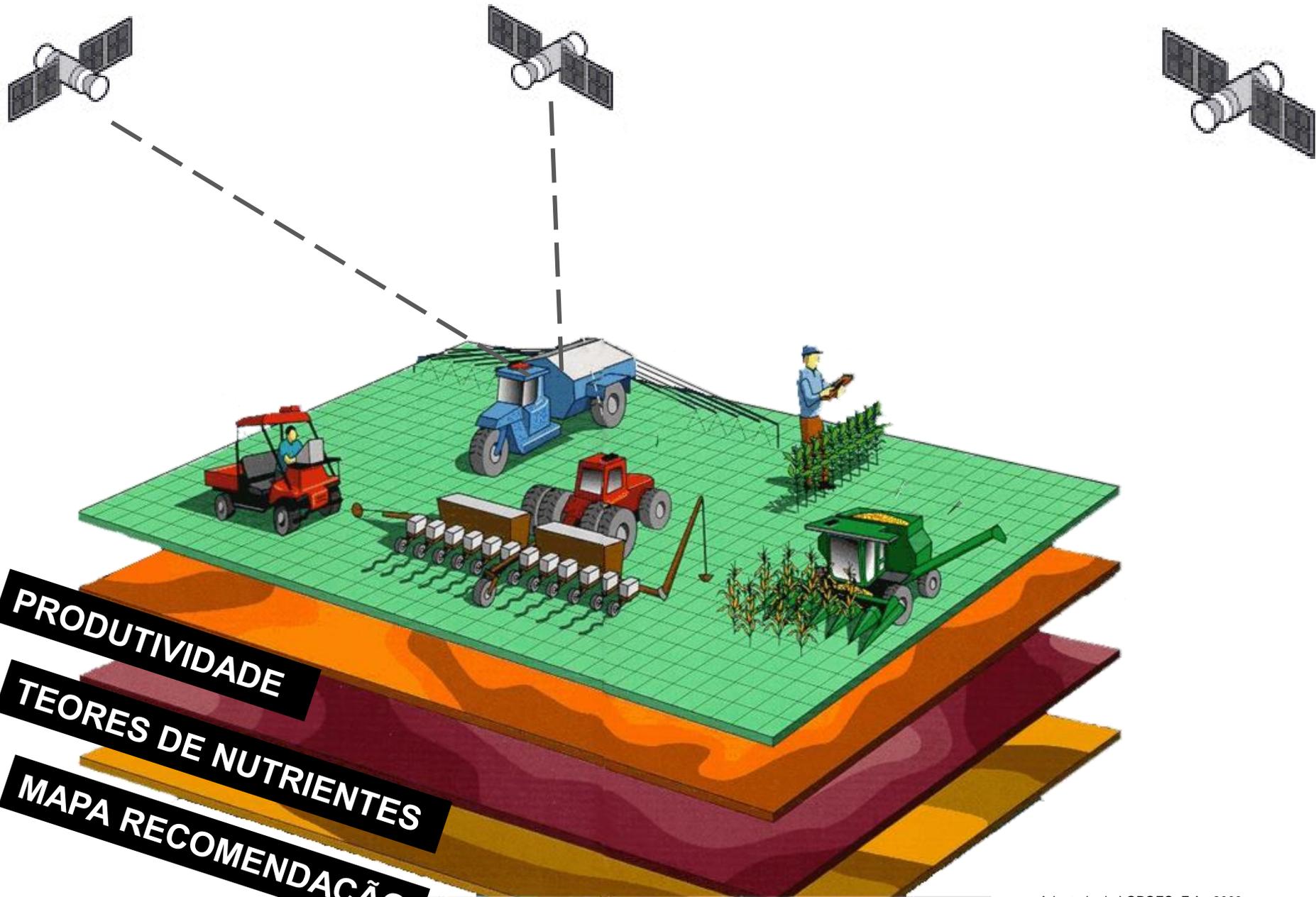
Prof. J. P. Molin



PRODUTIVIDADE

TEORES DE NUTRIENTES

Adaptado de LOPOES, F.A., 2009

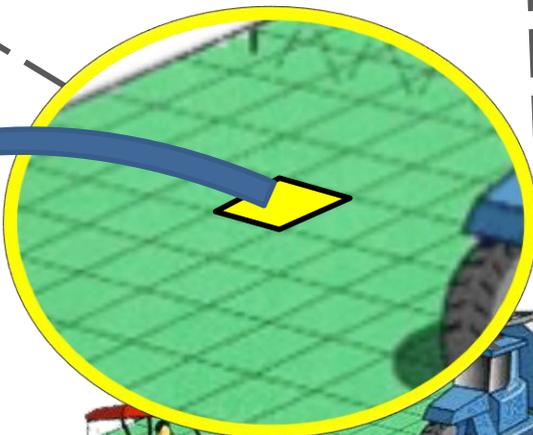
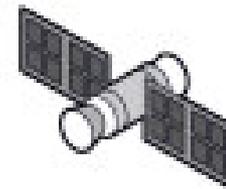
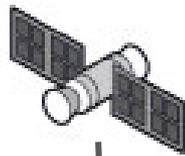
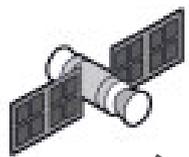


PRODUTIVIDADE
TEORES DE NUTRIENTES
MAPA RECOMENDAÇÃO

Adaptado de LOPOES, F.A., 2009



Prof. J. P. Molin



	A	B	C	D	E	F	G	H	I	J	K	L
1				Produtividade		Folha	Solo					
2	ID	Longitude	Latitude	Real (t/ha)	Esperada (t/ha)	N (g/kg)	P (mg/dm ³)	K (mmol/dm ³)	K% CTC	V (%)	CTC (mmolc/dm ³)	NC (t/ha)
3	43	-48.64712778	-22.94836277	20.35	16.3	22.8	4.9007	0.8	2.19	40.46	36.6	1.08
4	44	-48.64703022	-22.94836277	19.84	15.9	22.8	4.8331	0.8	2.19	40.52	36.5	1.08
5	114	-48.64722533	-22.94827293	20.74	16.6	22.7	5.0204	0.8	2.17	40.80	36.9	1.08
6	115	-48.64712778	-22.94827293	19.96	16.0	22.7	4.9039	0.8	2.19	40.39	36.6	1.08
7	116	-48.64703022	-22.94827293	17.18	13.7	22.8	4.8528	0.8	2.19	40.74	36.6	1.07
8	185	-48.64732288	-22.94818310	21.68	17.3	22.7	5.1326	0.9	2.37	43.12	37.9	1.02
9	186	-48.64722533	-22.94818310	21.58	17.3	22.7	5.0086	0.8	2.17	40.56	36.9	1.09
10	187	-48.64712778	-22.94818310	20.85	16.7	22.7	4.9041	0.8	2.18	40.61	36.7	1.08
11	188	-48.64703022	-22.94818310	15.78	12.6	22.8	4.8718	0.8	2.17	41.37	36.8	1.05
12	189	-48.64693267	-22.94818310	15.53	12.4	22.8	4.9254	0.8	2.17	42.02	36.9	1.03
13	256	-48.64742044	-22.94809327	22.54	18.0	22.6	5.2514	0.9	2.27	47.99	39.7	0.87
14	257	-48.64732288	-22.94809327	22.23	17.8	22.6	5.0074	0.9	2.33	45.11	38.6	0.96
15	258	-48.64722533	-22.94809327	22.39	17.9	22.7	4.9284	0.8	2.13	42.24	37.5	1.04
16	259	-48.64712778	-22.94809327	21.15	16.9	22.7	4.8703	0.8	2.14	42.14	37.3	1.04
17	260	-48.64703022	-22.94809327	22.80	18.2	22.8	4.8871	0.8	2.14	42.74	37.3	1.02
18	261	-48.64693267	-22.94809327	20.91	16.7	22.8	4.9894	0.8	2.14	43.24	37.3	1.00

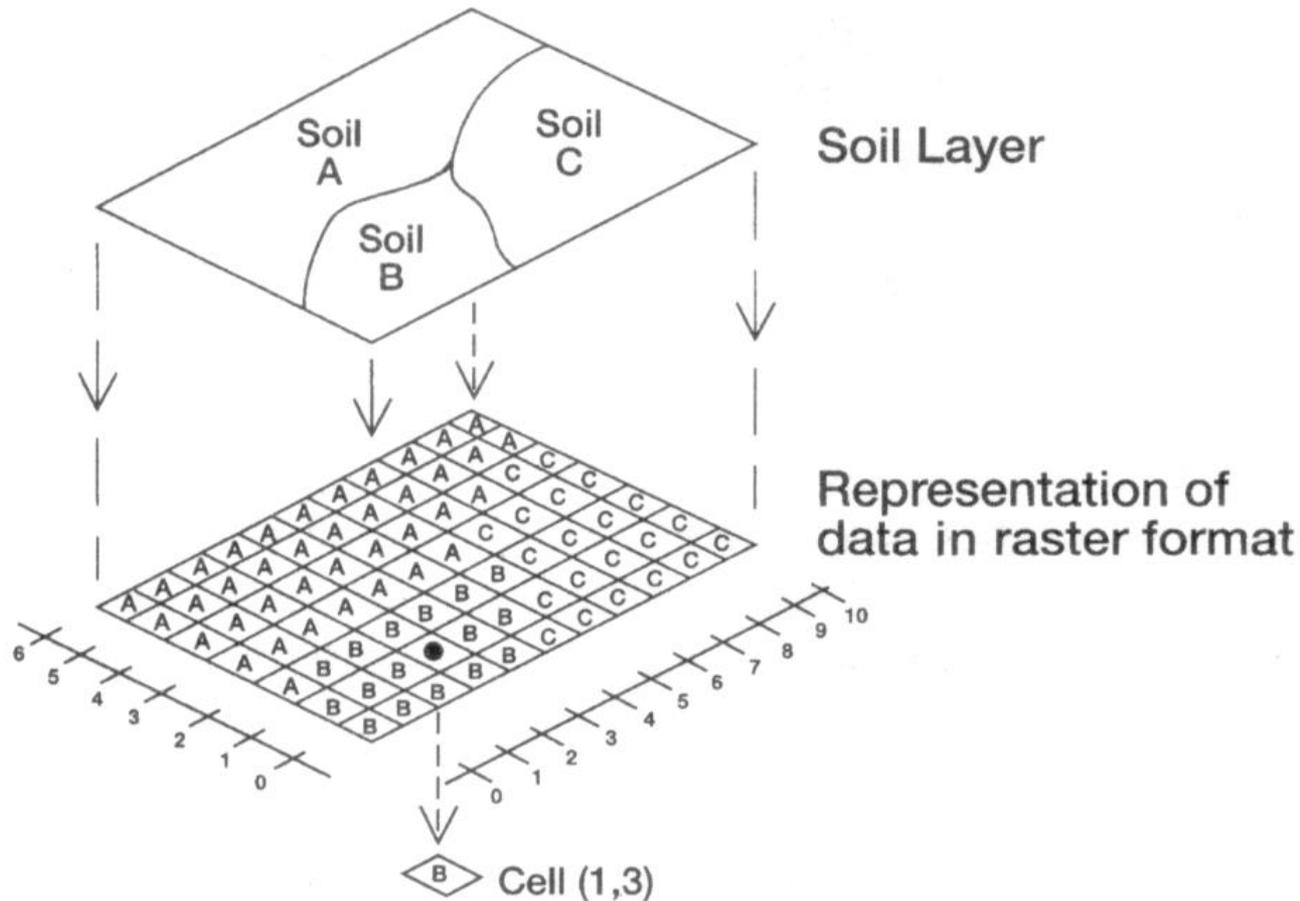
PRODUTIVIDADE

TEORES DE

MAPA REC

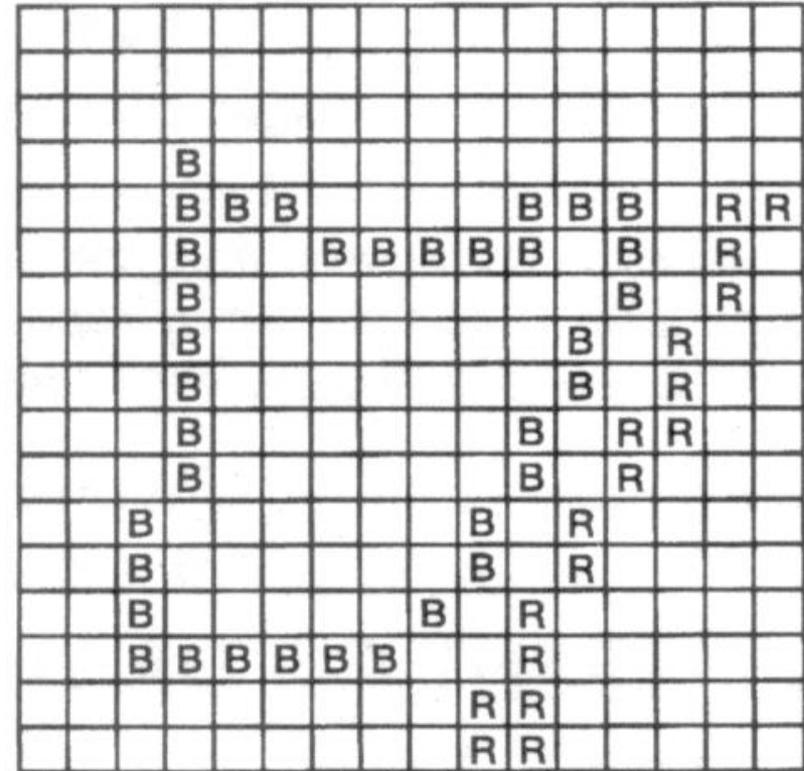
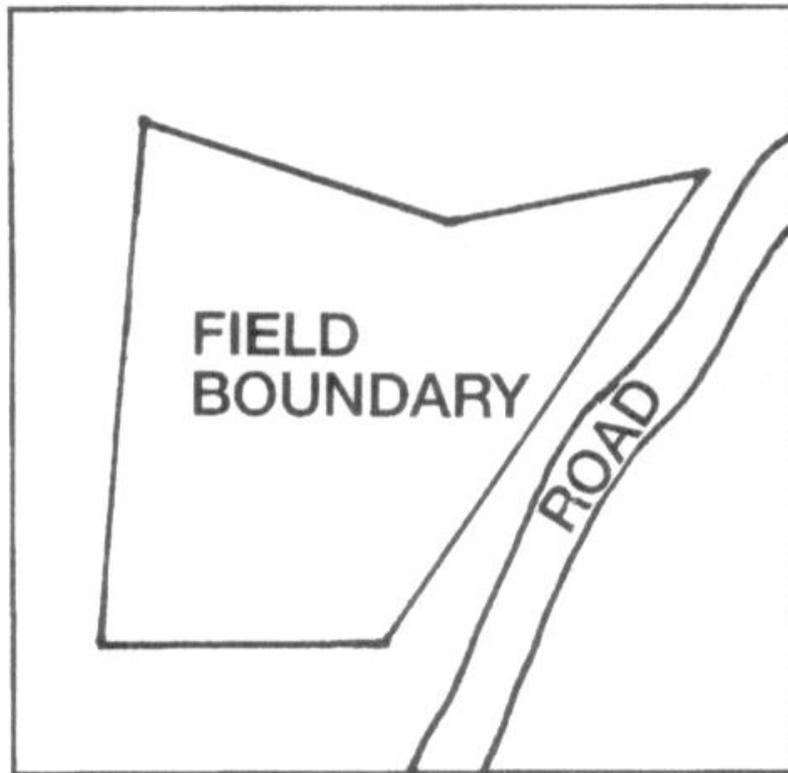


SIG – Sistema de Informação Geográfica



No formato RASTER o espaço é dividido em células, cada célula tem um valor e este valor define a forma da apresentação visual.

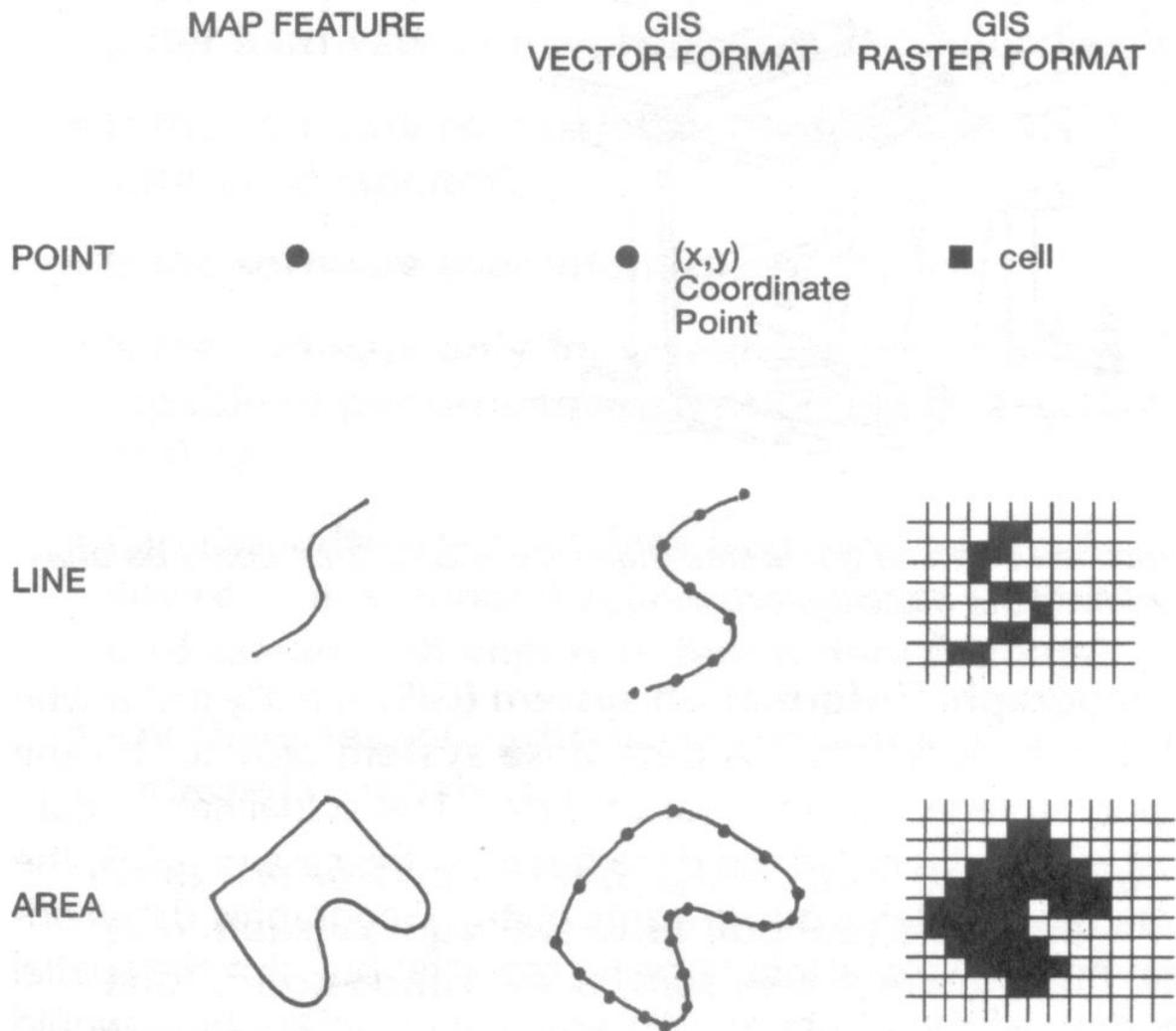
SIG – Sistema de Informação Geográfica



RASTER REPRESENTATION OF
FIELD BOUNDARY & ROAD

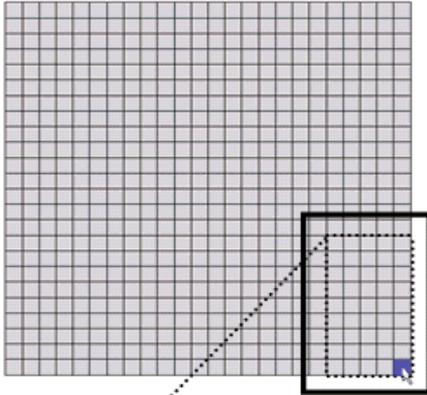
No formato VECTOR (ou Lattice), a unidade básica são pontos ou linhas com coordenadas x e y (latitude e longitude).

SIG – Sistema de Informação Geográfica

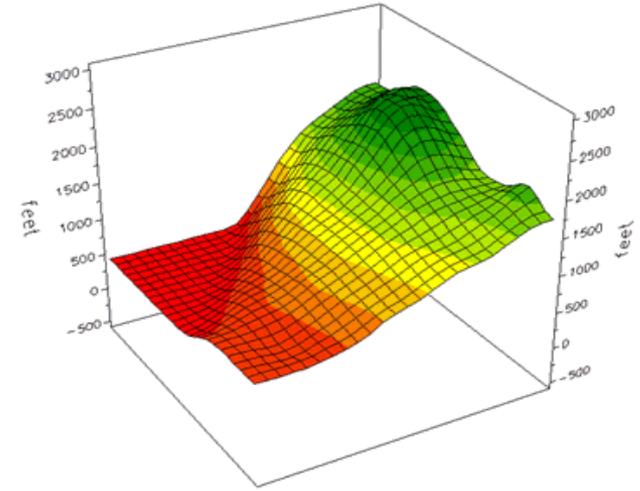
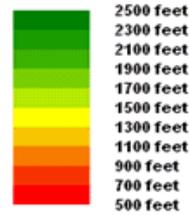
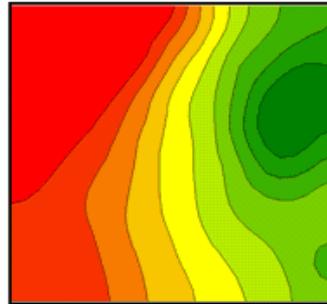


Representações gráficas de Vector (Lattice) e Raster.

Reference Frame



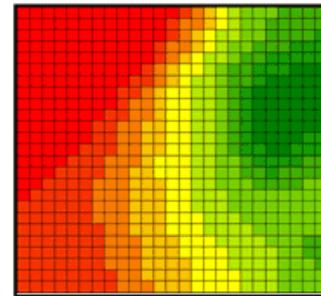
2D Lattice



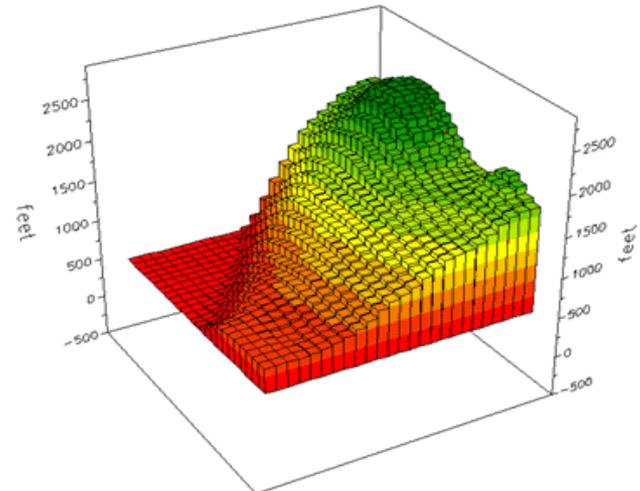
3D Lattice

Data					
	21	22	23	24	25
9	1,879	1,877	1,846	1,817	1,802
8	1,814	1,818	1,812	1,804	1,805
7	1,781	1,794	1,801	1,816	1,823
6	1,756	1,784	1,814	1,863	1,894
5	1,725	1,770	1,841	1,927	1,990
4	1,693	1,754	1,847	1,944	2,016
3	1,664	1,737	1,826	1,896	1,943
2	1,636	1,718	1,784	1,826	1,843
1	1,623	1,709	1,768	1,795	1,800

Data Values



2D Grid

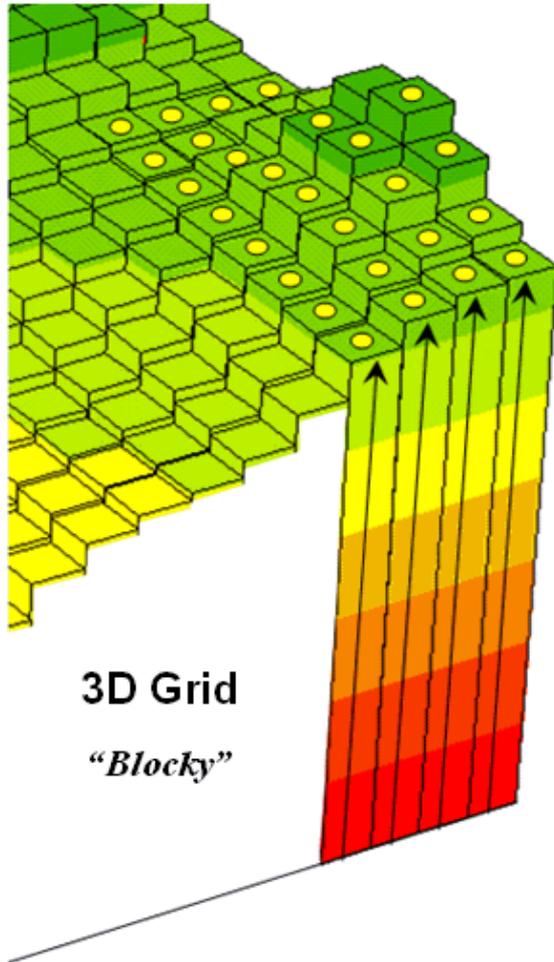


3D Grid

Figure 1.1. Grid-based data can be displayed in 2-D/3-D lattice or grid forms.

© 2007, Joseph K. Berry—permission to copy granted

... 3D Grid display pushes each cell up to the level of the stored value



... 3D Lattice display pushes the nodes of the wireframe up to the value

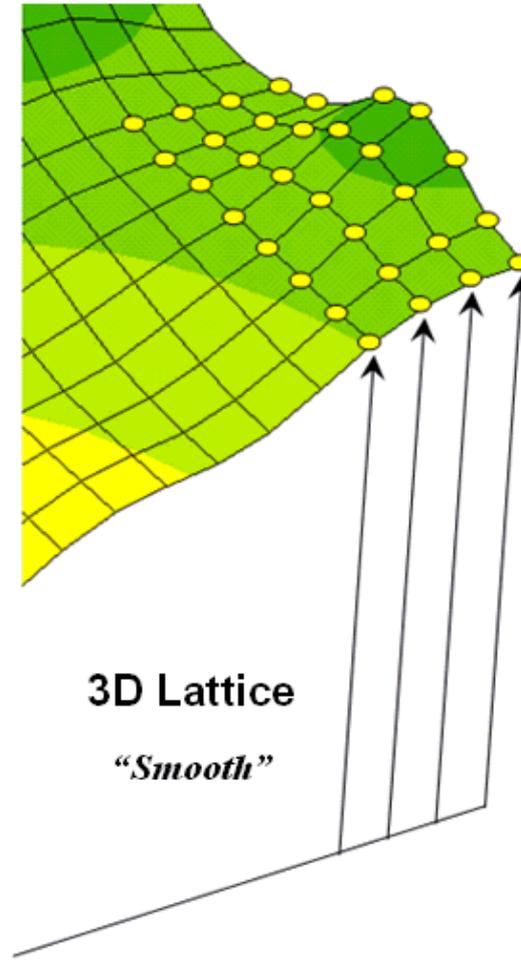
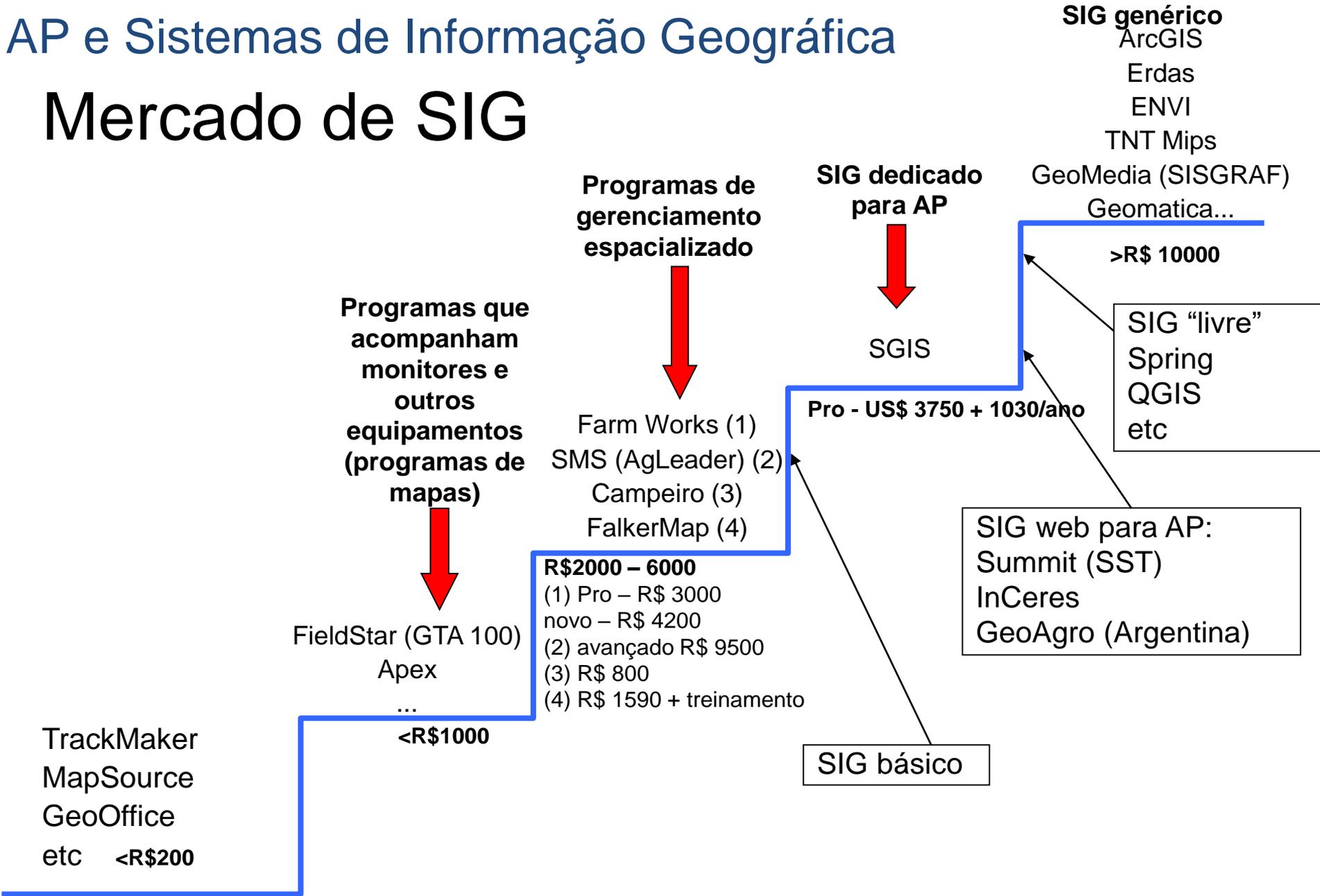


Figure 1.3. 3-D display "pushes-up" the grid or lattice reference frame to the relative height of the stored map values.

© 2007, Joseph K. Berry—permission to copy granted

Mercado de SIG



Exemplos de Softwares para PDA (de campo)

SMS Mobile[®] (<http://sms.agleader.com/products.php?Product=smsmobile>)

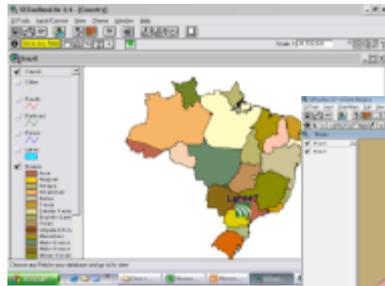
Farm Site Mate[®] (<http://www.farmworks.com.br/farms.html>)

HGIS[®] (<http://www.starpal.com/>)

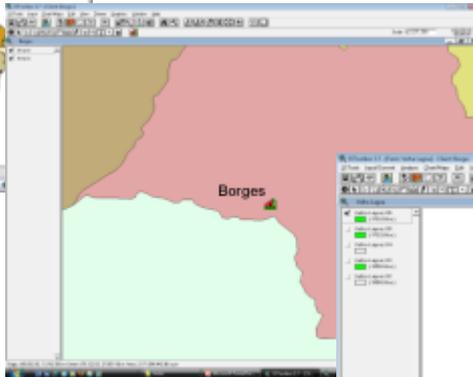
Sistema de campo CR Campeiro 7 (<http://rural.ccr.ufsm.br/>)

SST Stratus[®] (<http://www.sstsoftware.com/stratus.htm>)

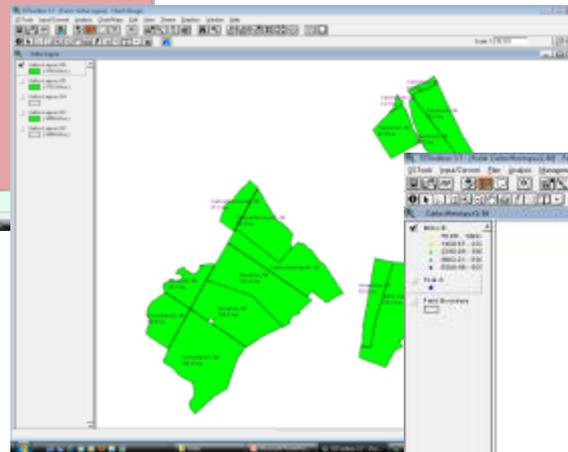
Organização hierárquica dos dados facilita a geração de informação para o gerenciamento



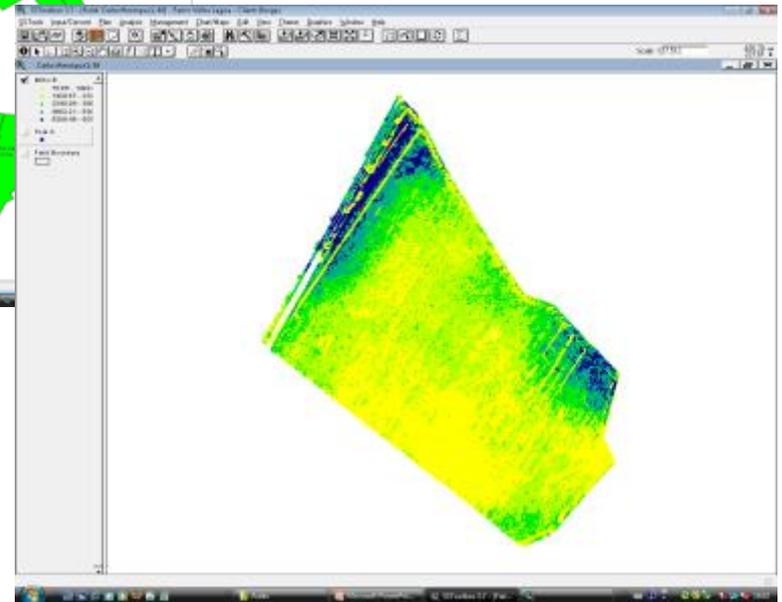
País



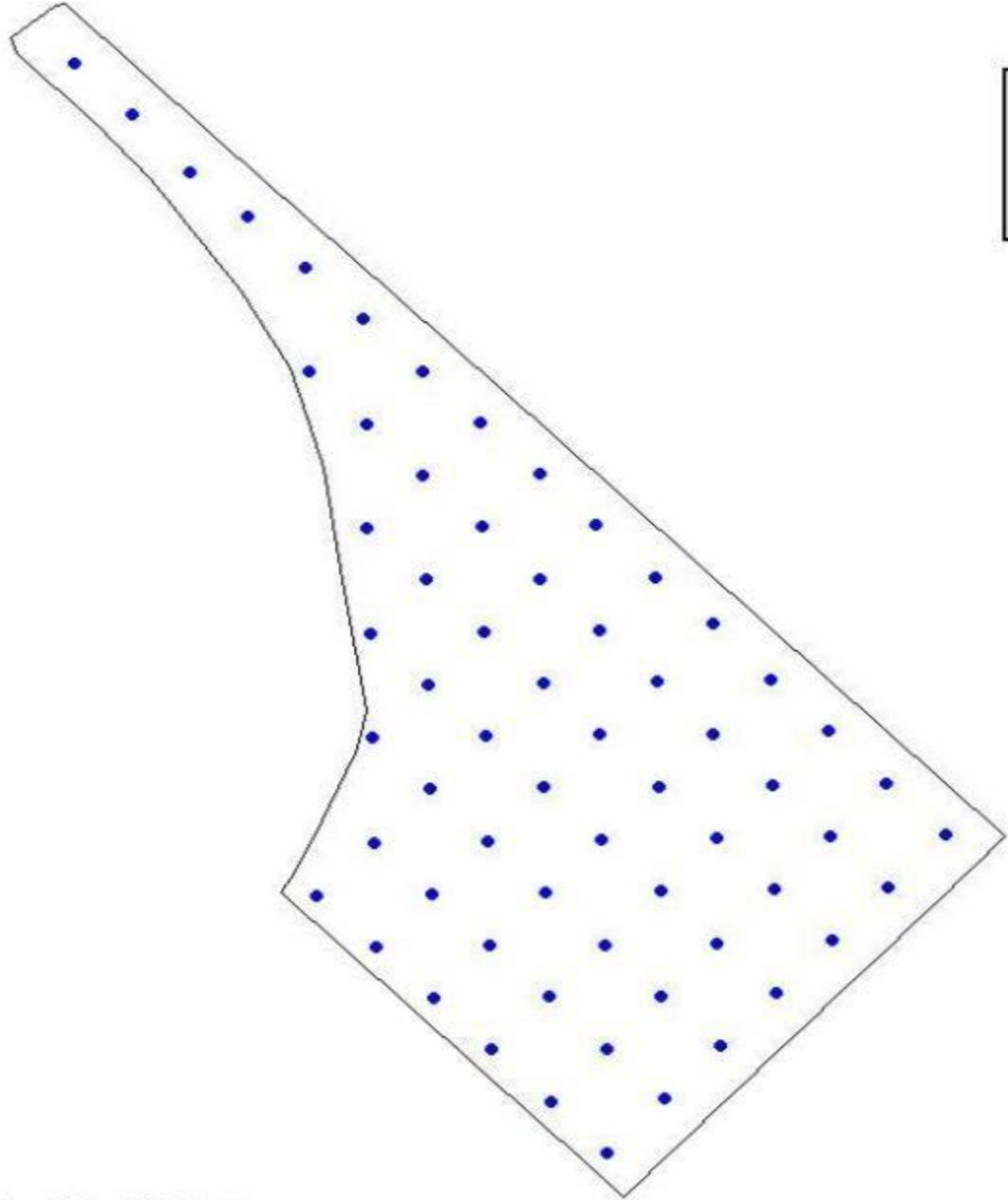
Cliente



Fazenda



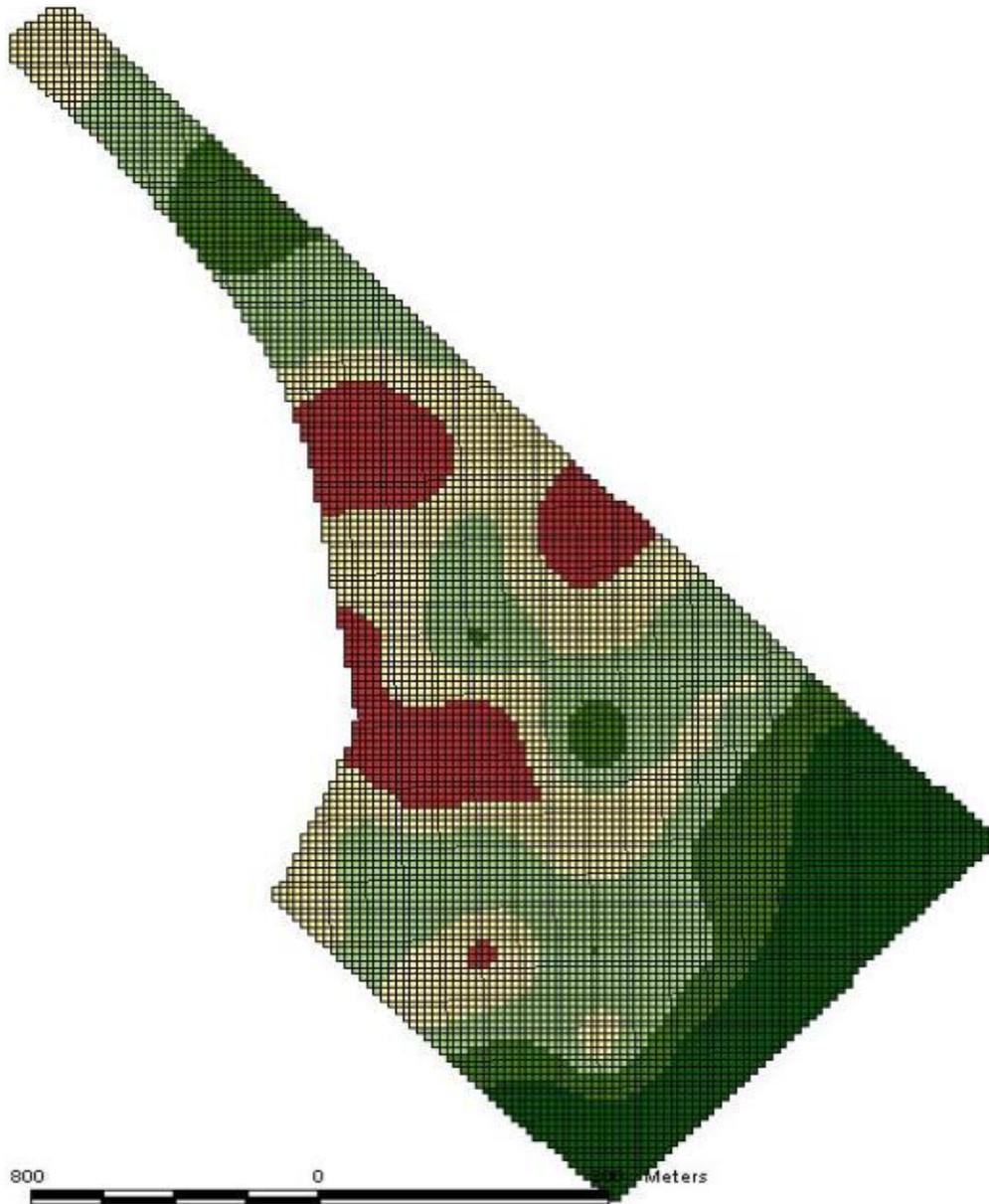
Talhão



□ (302.2ha.) Field Boundary
• Pontos

200 0 200 400 Meters





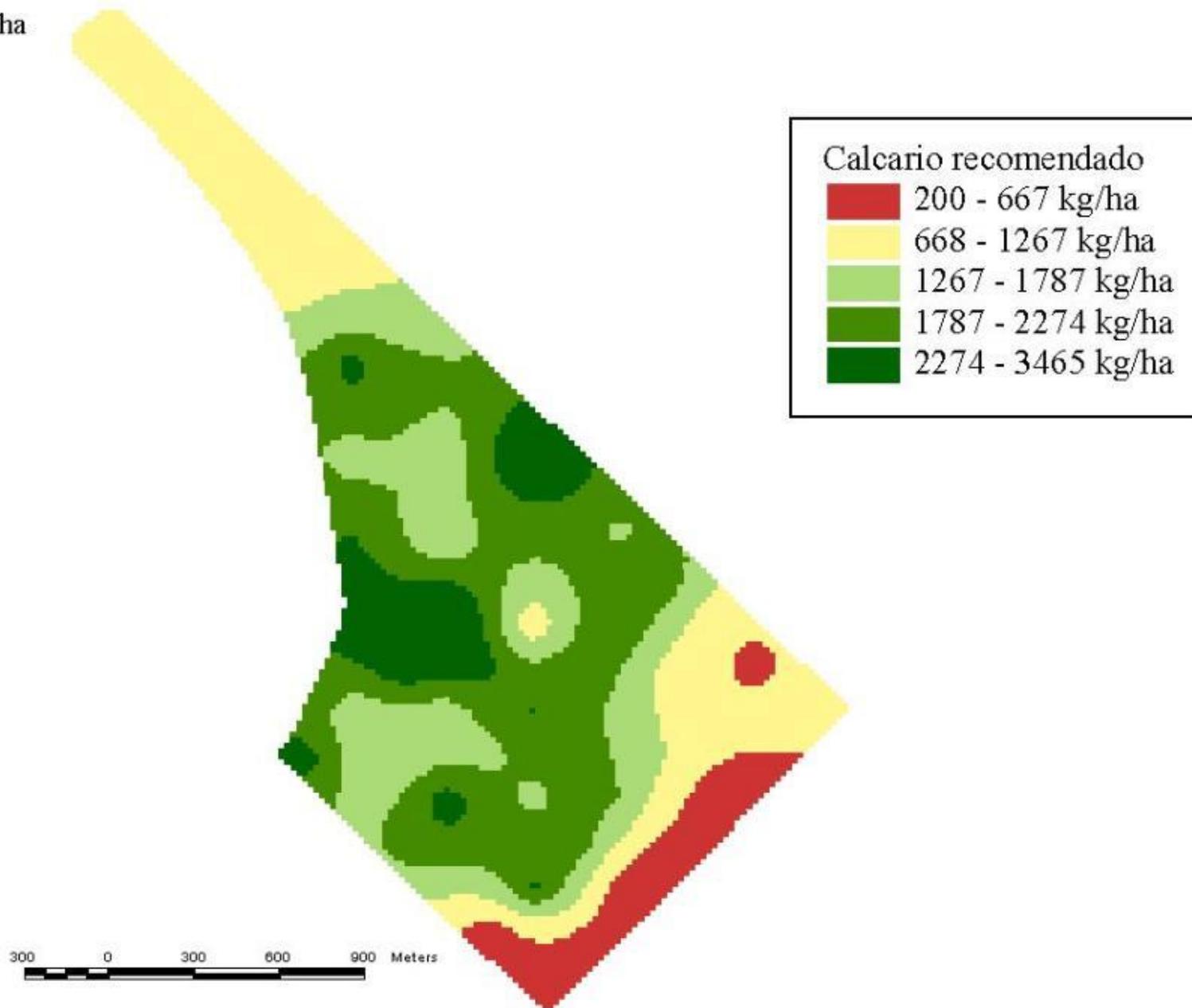
V

Red	21.0 - 33.0
Yellow	33.0 - 37.9
Light Green	37.9 - 42.8
Medium Green	42.8 - 49.7
Dark Green	49.7 - 58.1

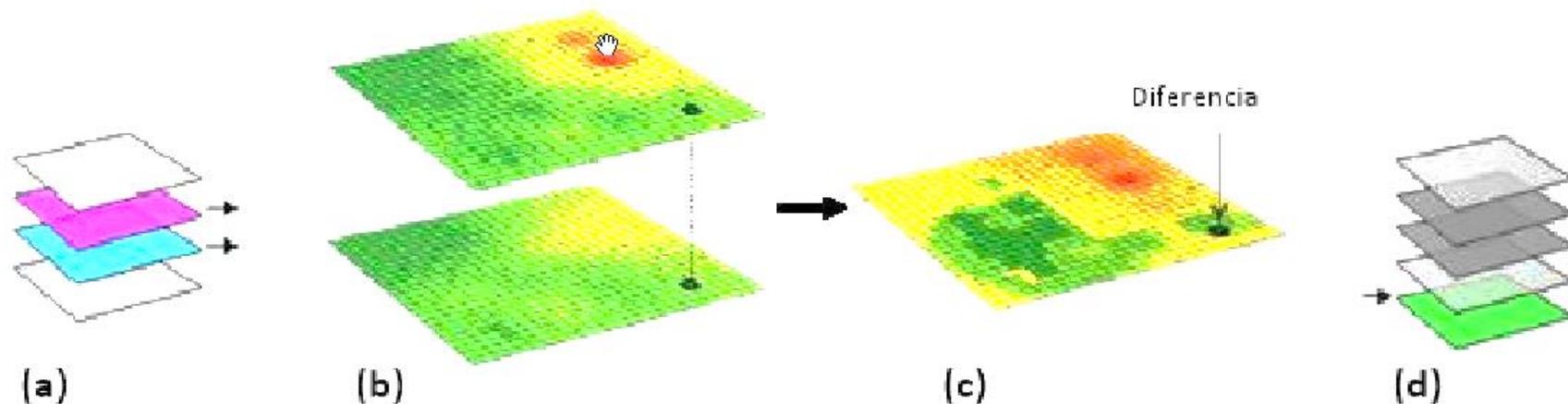
800 0 Meters



Alhao 302.2 ha



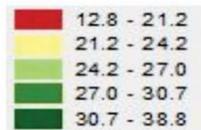
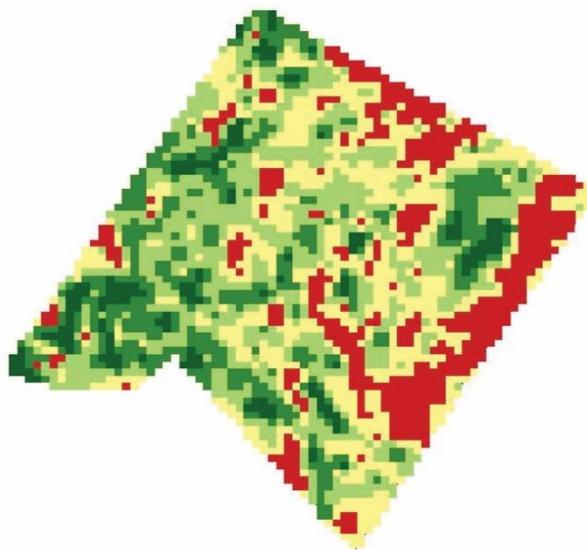
Álgebra de mapas



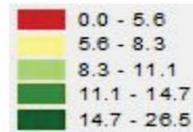
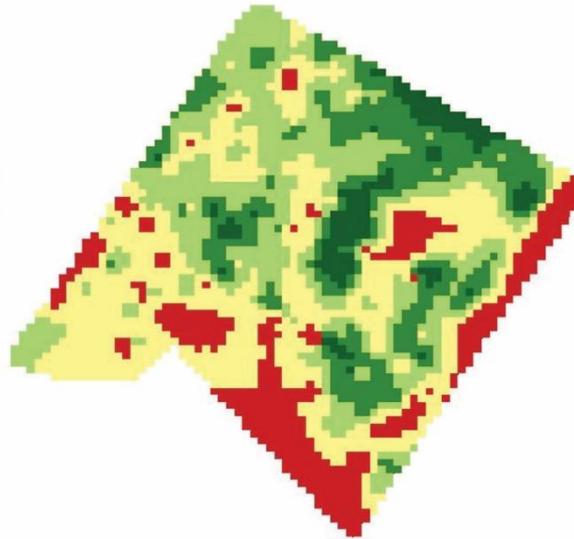
Os dados (mapas) são adquiridos da base de dados (a); dois temas no formato raster são usados (b) para gerar um terceiro tema (mapa) por álgebra (c) e o novo tema (mapa) é armazenado na base de dados (d)

© 2007, Joseph K. Berry—permission to copy granted

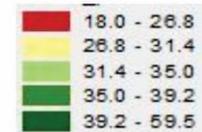
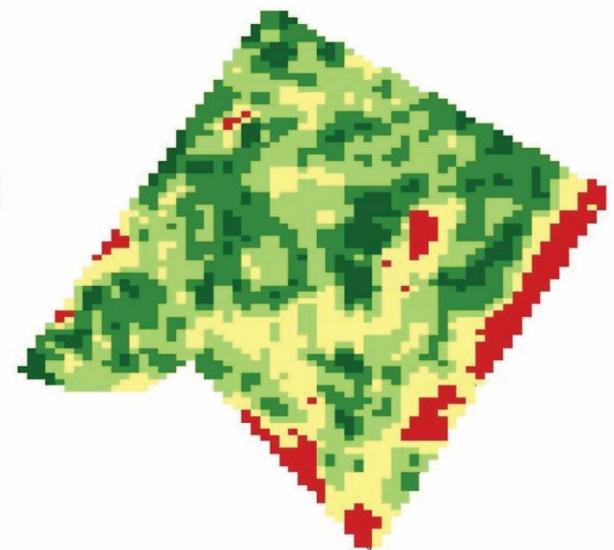
Mapas de colheita de laranja com suas respectivas legendas: primeira colheita (a), segunda colheita (b) e da soma das colheitas (c)



(a)



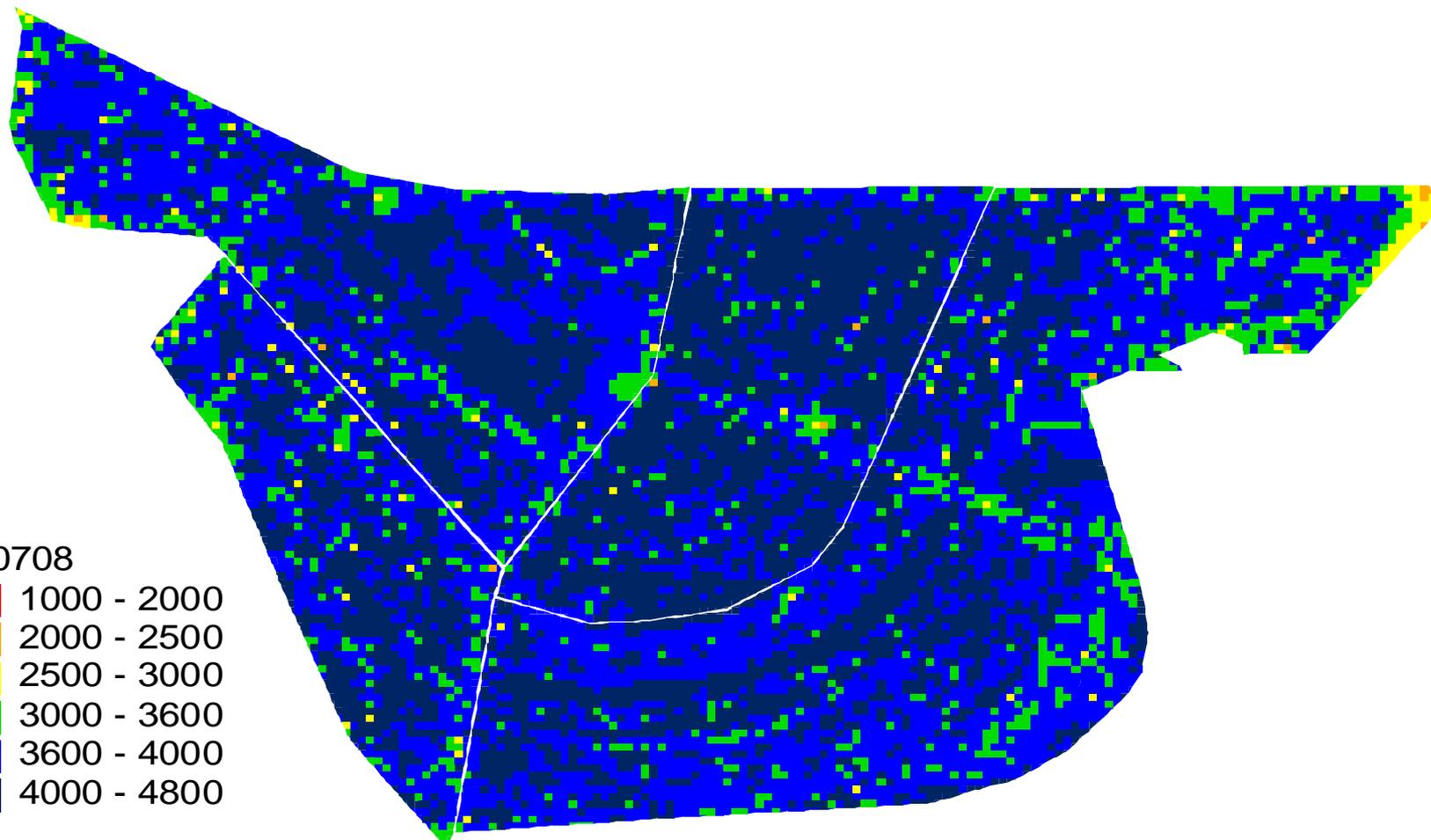
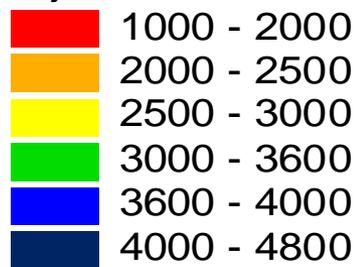
(b)



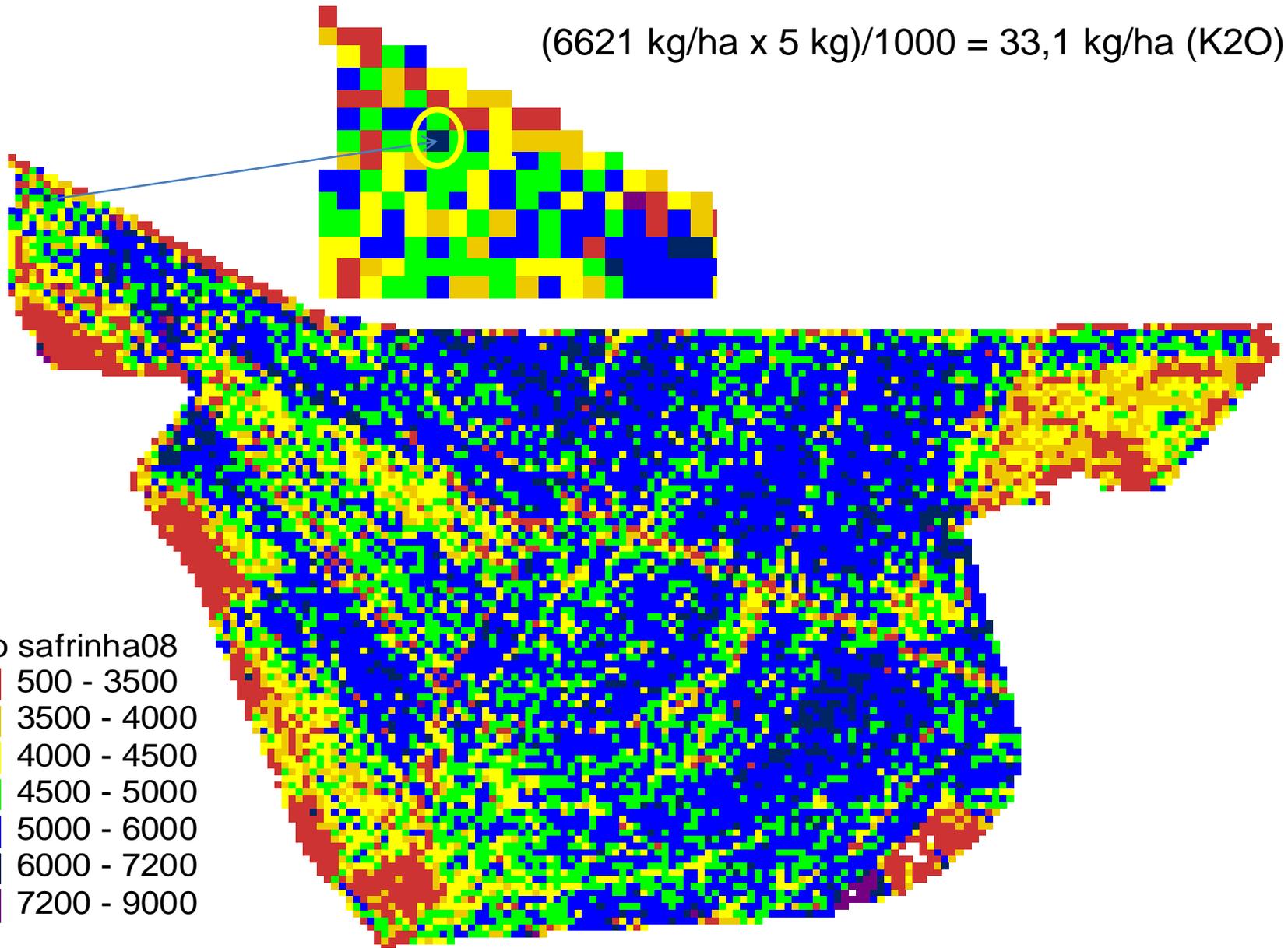
(c)

As planilhas permitem que o usuário efetue operações aritméticas no próprio SIG. Mantendo a coluna “Id”, que é a coluna de identificação dos pixels, pode-se adicionar novas colunas nessa tabela, como por exemplo as produtividades de outros mapas. Após adicionar a produtividade de outro mapa, pode-se fazer as somas das produtividades.

soja0708



$$(6621 \text{ kg/ha} \times 5 \text{ kg})/1000 = 33,1 \text{ kg/ha (K2O)}$$

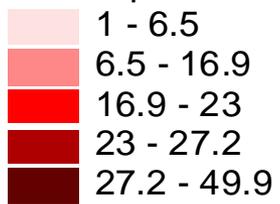


Milho safrinha08

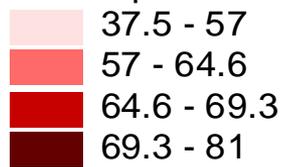
- 500 - 3500
- 3500 - 4000
- 4000 - 4500
- 4500 - 5000
- 5000 - 6000
- 6000 - 7200
- 7200 - 9000



K2O Exportação Milho



K2O Expotacao Soja



Recomendação para aplicação de KCl com base na exportação do milho e da soja

Total : 39408.88 Kg.

