Managing pigs in woodland

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Potential Environmental impact of Outdoor Hog Production

Animal activities

- Grazing , Rooting
- Trampling, Wallowing
- Dunging areas

- Ground cover destruction
- Changes in botanical comp
- Soil compaction
- Nutrients upload

→

- Run off
- Erosion
- Environmental pollution

Damage consequence of pigs activity

Roots dig up and debarking

Roots dig up

Tree debarking

Dig up young trees and shrubs, Seedlings and seedbank

Plant damage after pigs grazing (5 pigs/ac) during 10 months (66 -308 lb)

Plant	Roots	Trunk	Leaves and apexes
Olive (*Olea europaea*)	***	-	**
Pine (*Pinus pinaster*)	-	-	-
Holm (*Quercus ilex*)	*	*	*
Chestnut (*Castanea sativa*)	-	*	*
Bramble (*Rubus fruticosus*)	-	-	***
Euphorbia (*E. characias*)	*	-	-
Arbutus (*Arbutus unedo*)	***	***	-
Oak (*Quercus pedunculata*)	*	-	*
Heather (*Erica arborea*)	-	*	*
Wild apple (*Malus sylvestris*)	***	**	**
Elder (*Sambucus nigra*)	***	***	***

- 0 damage, * low damage (1-30% of the plants), ** medium damage (30-70%), *** high damage (70-100%)

Pistoia *et al.* 2009

Photo courtesy of Vincenza Verriello

The Dehesa

Special ecosystem, Oak trees (*Quercus ilex, Q. rotundifolia and Q. suber*) (14 adult oak trees/ac), native grasses, rosemary, thyme.

MAPA 2007 Standard:
Iberic pig "Pata negra"
Initial weight: 176-253 lb
Initial age: minimum 10 months
Expected gain: 100 lb
Stocking rate: 1.25 ac/pig
November to February

Daily intake
16 – 18 lb of acorn kernel
4–6 lb of grass
2.5 ac/pig
Rodríguez-Estévez et al, 2010

Photo courtesy of J-M Luginbuhl

Lessons from Tuscany history

Agro-silvo- pastoral system

Shephered

Maturation of the acorns and chestnuts.

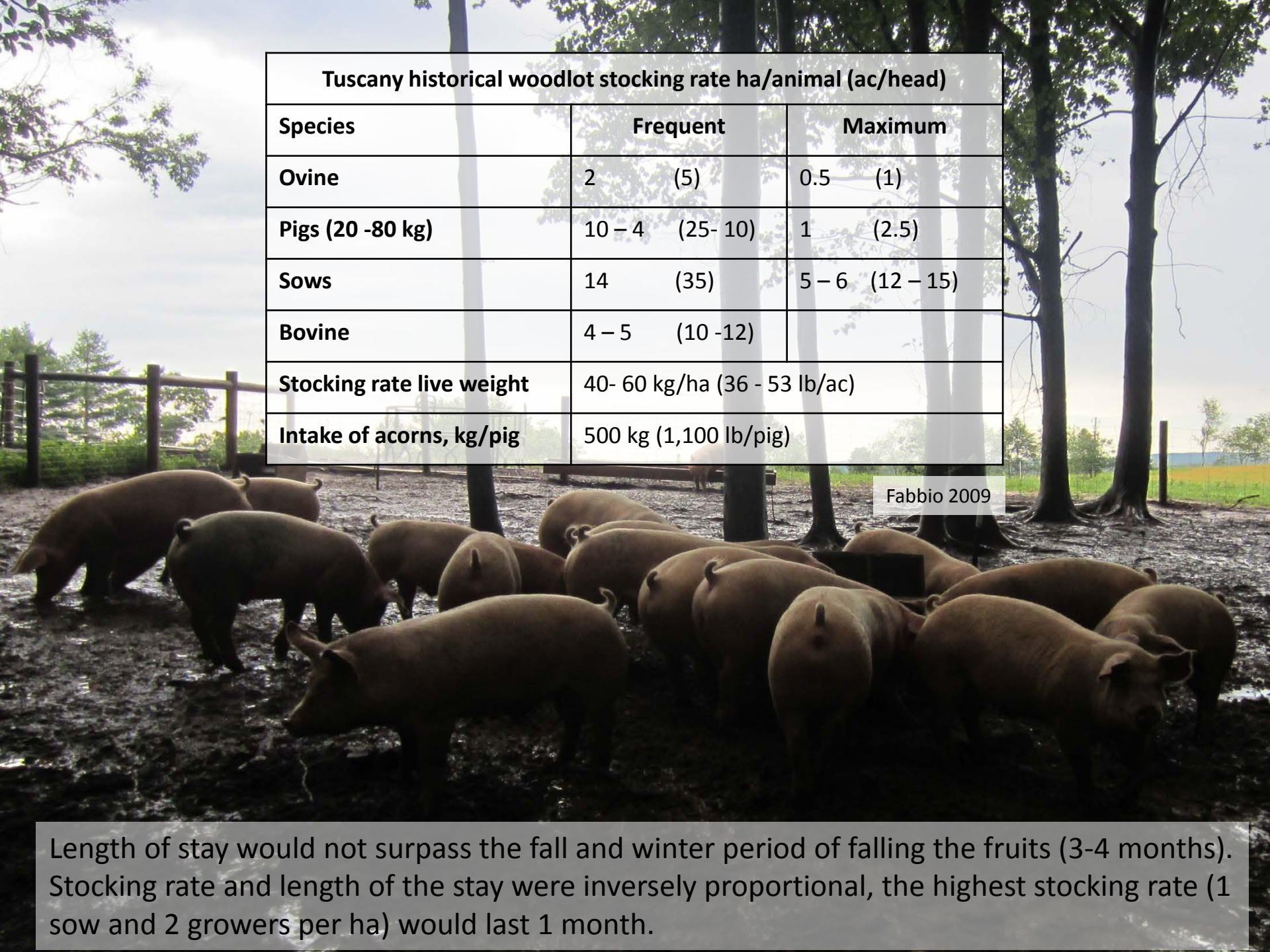
Spend the night at the farm

Feeding
complement “Broda”.

Growing animals: Pulse (peas, beans) moistened or grinded

Finishing period will start in fall in the woodlot, and ended indoor (supplemented with acorns and chestnuts)

Sacrifice
December - January



Tuscany historical woodlot stocking rate ha/animal (ac/head)		
Species	**Frequent**	**Maximum**
Ovine	2 (5)	0.5 (1)
Pigs (20 -80 kg)	10 – 4 (25- 10)	1 (2.5)
Sows	14 (35)	5 – 6 (12 – 15)
Bovine	4 – 5 (10 -12)	
Stocking rate live weight	40- 60 kg/ha (36 - 53 lb/ac)	
Intake of acorns, kg/pig	500 kg (1,100 lb/pig)	

Fabbio 2009

Length of stay would not surpass the fall and winter period of falling the fruits (3-4 months). Stocking rate and length of the stay were inversely proportional, the highest stocking rate (1 sow and 2 growers per ha) would last 1 month.

Farm A. Copse of Roverella (Oak pubescens)

Farm B. Cinta senese on pasture

Farm C. Chesnut trees before pigs

Farm C. Cinta senese grzing on sweet chesnut woods

Adapted from ARSIA 2009. Il bosco e l'allevamento della Cinta Senese

Damage caused by Cinta Senese managed in woodlots with different stocking rates

		A[1]. Woodlot		B[2]. Woodlot + Cultivated areas		C[3]. Woodlot Fruit season
Kind of damage	**Species**	**0.82 ac/pig**	**2.47 ac/pig**	**Leccio**	**Chestnut**	**Chestnut**
Stocking rate				**9.9 ac/pig**	**9.9 ac/pig**	**0.12 ac/pig**
Length of stay		**10 months**	**10 months**	**5 months**	**5 months**	**11 days**
Vegetative ground cover reduction, %		56.4	38.1	21.5	32.5	2
Area of soil disturbance, %		76.1	72.3	94.4	91.2	0
Area of soil surface dig out (2-4”), %		43.8	4.0	1.9	35.0	4
Root dig up, % of trees	**Roverella**	95.4	40.0	-	-	-
	Leccio	100.0	92.8	0	-	-
	Cerro	0	0	-	-	-
	Chestnut	-	-	-	0	0
Root debark, % of trees	**Roverella**	54.0	0	-	-	-
	Leccio	100.0	85.0	0	-	-
	Cerro	0	0	-	-	-
	Chestnut	-	-	-	0	0

[1] Farm A. Partially degraded forest, some areas with herbaceous vegetation and shrubs. 35 ac paddocks fenced. Pigs weaning to market (10 months)

[2] Farm B. Mixed farm (1358 ac), 1160 ac woodlo t+ 198 ac cultivated. No fences. Simultaneusly 70 Ovines grazing. Swine finishing from October to February. 0.25 head/ha. Feed supplement 0.44-2.2 lb/head/d

[3] Farm C. 1.2 ac fenced, 10 Cinta senese 264 lb, 11 days while the fruits on the ground lasted. No feed supplementation.

Roverella (*Quercus pubescens* Willd) White Oaks family: downy oak or pubescent oak
Cerro (*Quercus cerris* L.) Tukey or Austrian Oak
Leccio (*Quercus ilex* L.) evergreen oak, holm oak, or holly oak
Castagno (*Castanea sativa* Miller)Sweet chesnut

Adapted from ARSIA 2009. Il bosco el’allevamento della Cinta Senese


As stocking rates increase the damage to the trees and soil disturbance increase.

Tall Fescue

15, 30 and 60 head/acre (3750, 7500 and 15000 lb/ac)

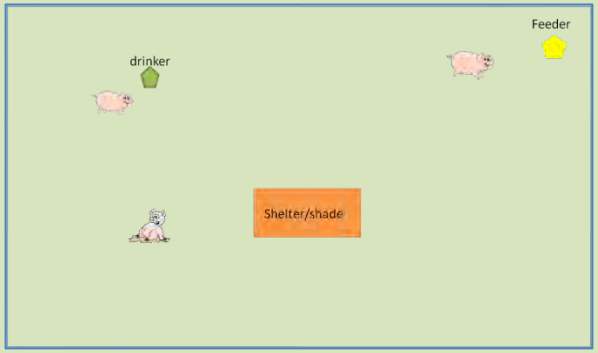
15 pigs / acre 36 days


Tall Fescue
60 pigs / acre 36 days

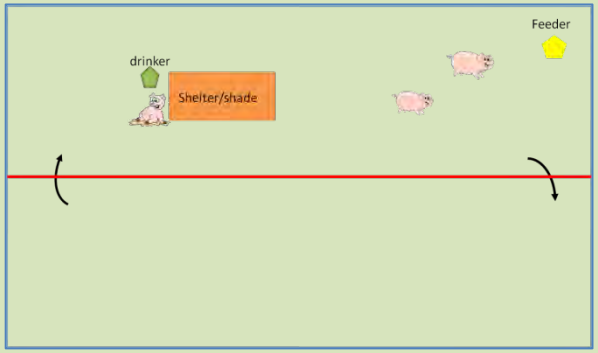
Aproximate stocking rates for rangeland, pastures and woodland for the San Francisco Bay area

Annual species	*10 to 20 weaned to finishing head/ac * 2 to 4 sows + litter/ac
Perennial species	* 15 to 30 weaned to finishing head/ac * 4 to 6 sows + litter/ac
Natural vegetation	* 4 to 10 weaned to finishing head/ac * 0.5 to 1 sows + litter/ac
Woodland	Consider: feed availability, Animal weight and physiological stage, supplementation level and length of stay

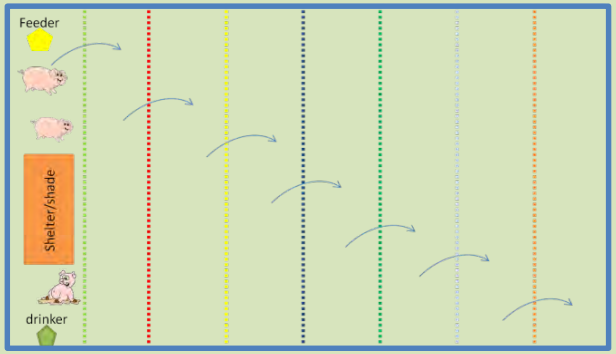
Alternatives to implement rotations



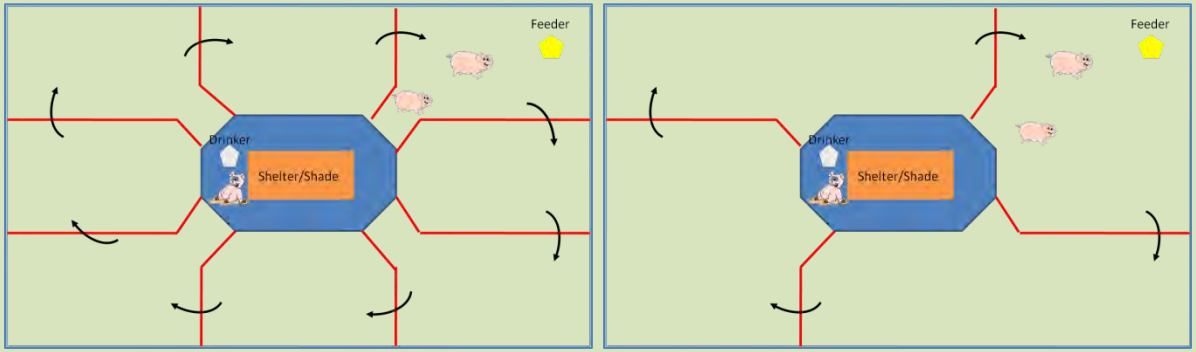
Continuous system
Periodic movement of feeder and drinkers



Alternate grazing

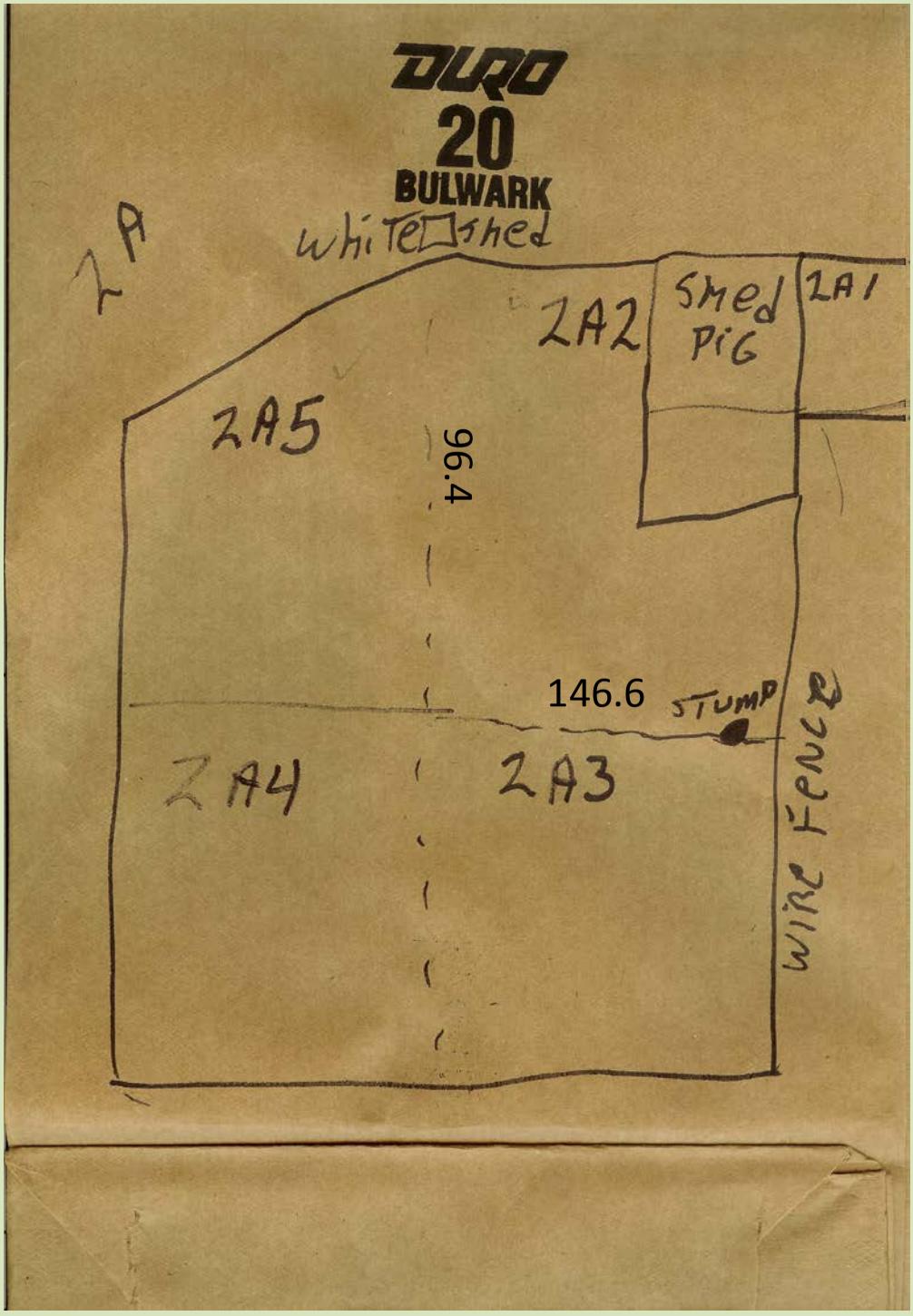


Strip grazing



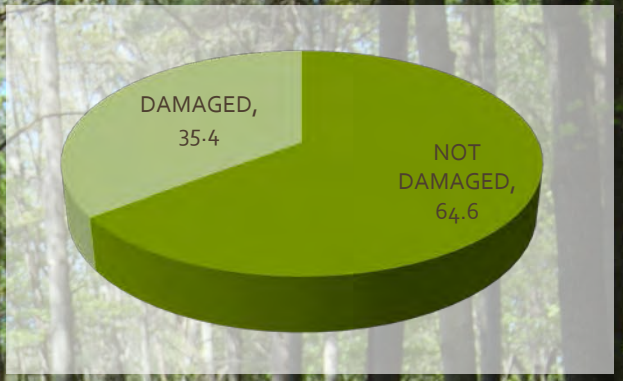
Rotational Grazing


Electric fence make easier to follow land contour



Great ideas don't start only on paper napkins ...

Continuous versus rotational management



Percent of trees damaged in the area under continuous management

Number of animals	27
Average Weight	198 lb
Days in paddock	43 d
Area	1.5 ac
Stocking density	18 pigs/ac

No damage was observed in the area under weekly rotation. Trees damaged were Oaks, no damage was observed in pine species.


Pigs as silvo-cultural tools for ground preparation, weeding and pest control

Pigs in the orchard

46.45 m^2/pig	(500 ft^2/pig)
24.4 m^2/pig	(263 ft^2/pig)
45 kg	(99 lb)

2 days
June (bloom)
October (Post harvest)

Nunn *et al.* 2007
Buehrer and Grieshop 2014

Weed and grass control
Cleaning up drop fruits
Control insects larvas
No *E. coli* on leaf or fruit samples

Pig Tractors

Pig's grazing, trampling, rooting and fertilizing behavior at work for you

Market garden operations

Orchard

Pond preparation

Land clearing

Pasture improvement

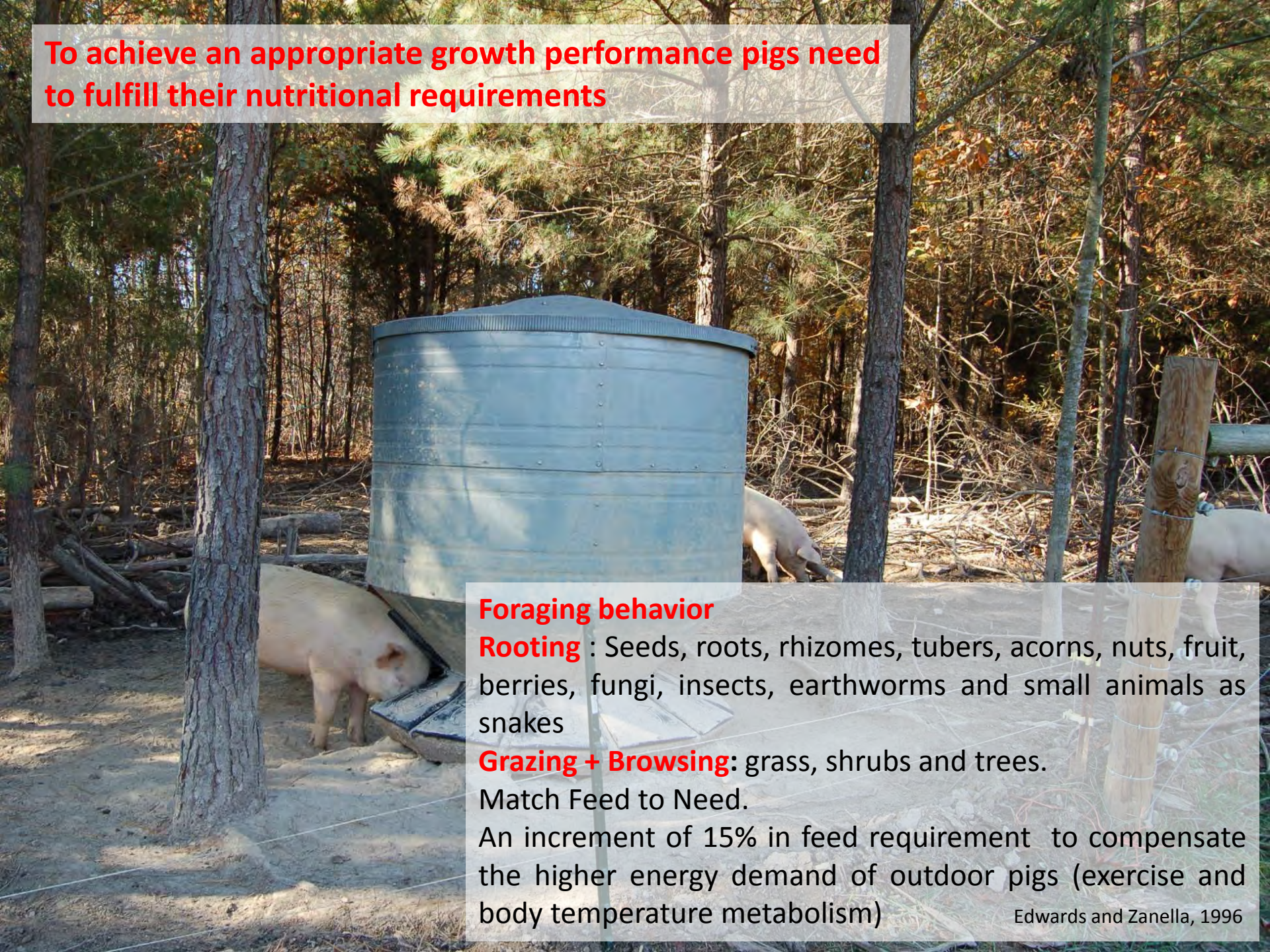
Keep them in small areas that they can work in one week and then move them to the next site.

Use a stocking rate equivalent to 12000 lb/ac.

Sprinkle some grain or to remove stumps dig holes around the roots and fill them with shell corn.

Older pigs work better.


To reduce damage to trees
Move animals frequently



To achieve an appropriate growth performance pigs need to fulfill their nutritional requirements

Foraging behavior

Rooting : Seeds, roots, rhizomes, tubers, acorns, nuts, fruit, berries, fungi, insects, earthworms and small animals as snakes

Grazing + Browsing: grass, shrubs and trees.

Match Feed to Need.

An increment of 15% in feed requirement to compensate the higher energy demand of outdoor pigs (exercise and body temperature metabolism)

Edwards and Zanella, 1996

Alternative Feedstuff

Feed is the largest production cost in swine production 60-80 %

When feeding alternative feedstuff consider:

- Cost
- Large variation in nutritional value
- Energy and nutrient digestibility
- Antinutritional factors
- Palatability
- Ease of storage and handling
- Risk of toxic residues
- Impact on carcass composition and pork quality

Dried Distillers grains with solubles DDGS, field peas, sweet potatoes, wheat shorts, liquid whey, whey permeate, bakery products, waste corn steep water, brewers yeast, beans, cotton seed meal, soybean hulls, alfalfa meal.

In the woods

Fall swine intake (fresh)

Acorns 13.2 to 22 lb/d

+

Grass 2.2 to 3.3 lb/d

Fulfill their energy requirement but not the protein

Edwards, 2003

Nutritional value of acorns and chestnut

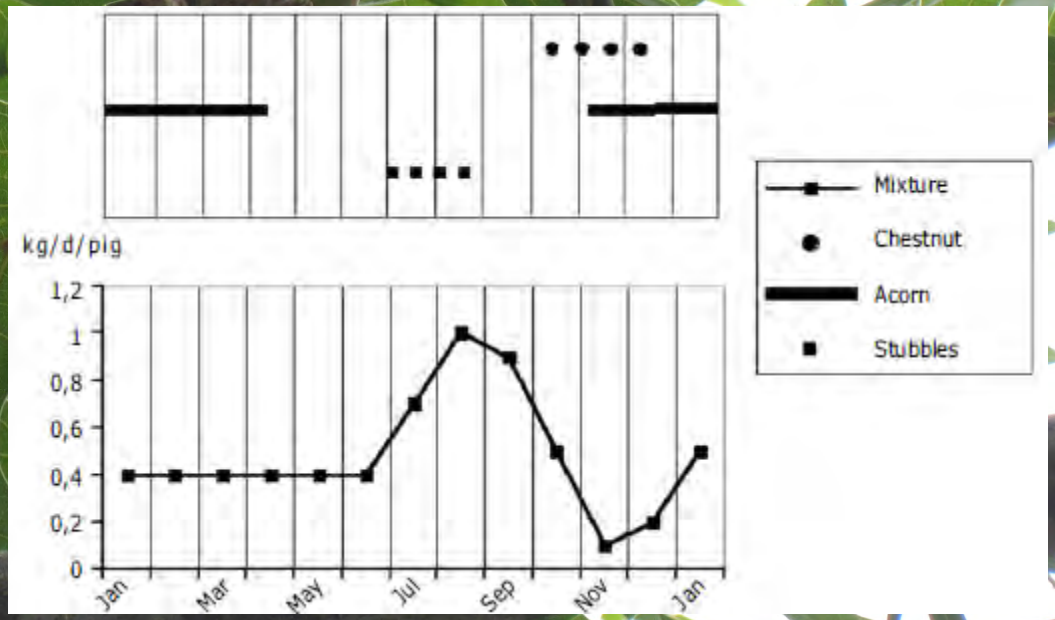
	Acorns	Chestnut
Palatability	+	++
Protein	--	--
Tannins	+	+-
Starch	+	+
Fiber	+-	-
Unsaturated fat	+	++
Energy	++	++

	Animal weight lb		
Intake	**110 - 154**	**176 - 198**	**> 220**
Acorns, lb/d	13.2 – 15.4	17.6	19.8 - 22

Adapted from Acciaioli

Feeding program for outdoor pigs

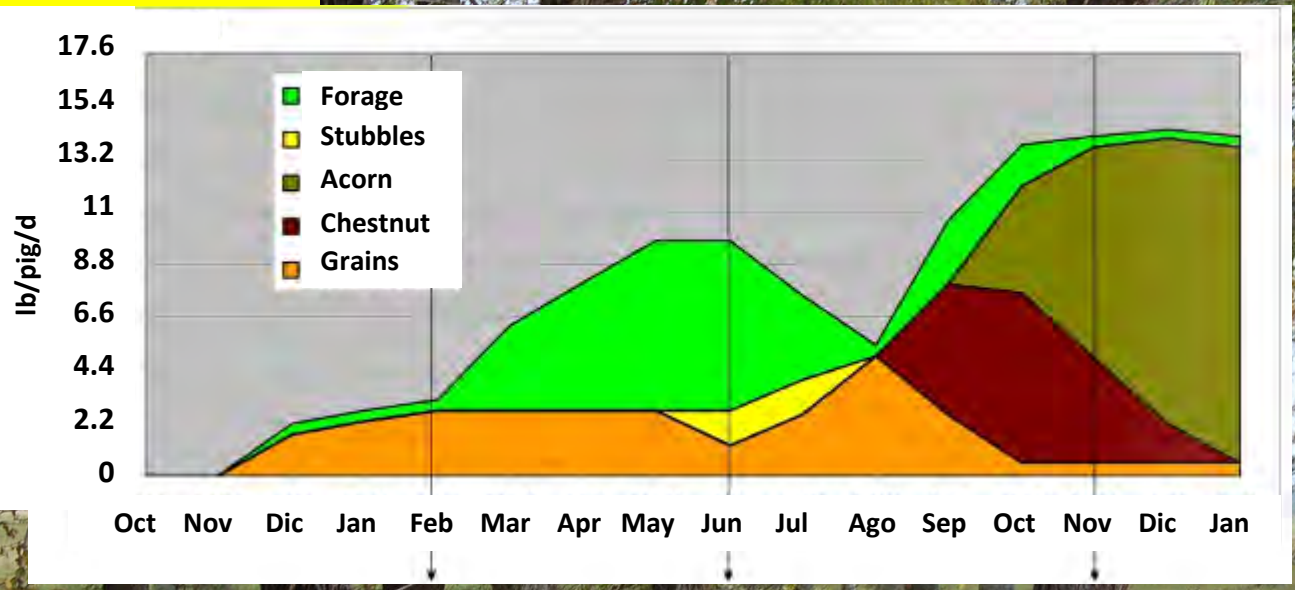
Forest products are seasonal



Acciaioli *et al.* 2002

Feeding program to optimize the use of farm available feed stuff

Pigs born in Autumn



Weight, lb	100	220	264
Age, months	5	9	14

Diet:	2.2 lb grains 1.1 lb forage	2.2 lb grains 7.7 lb forage	0.44 lb grains 8.8 lb acorns 4.4 lb chestnut 1.1 lb forage

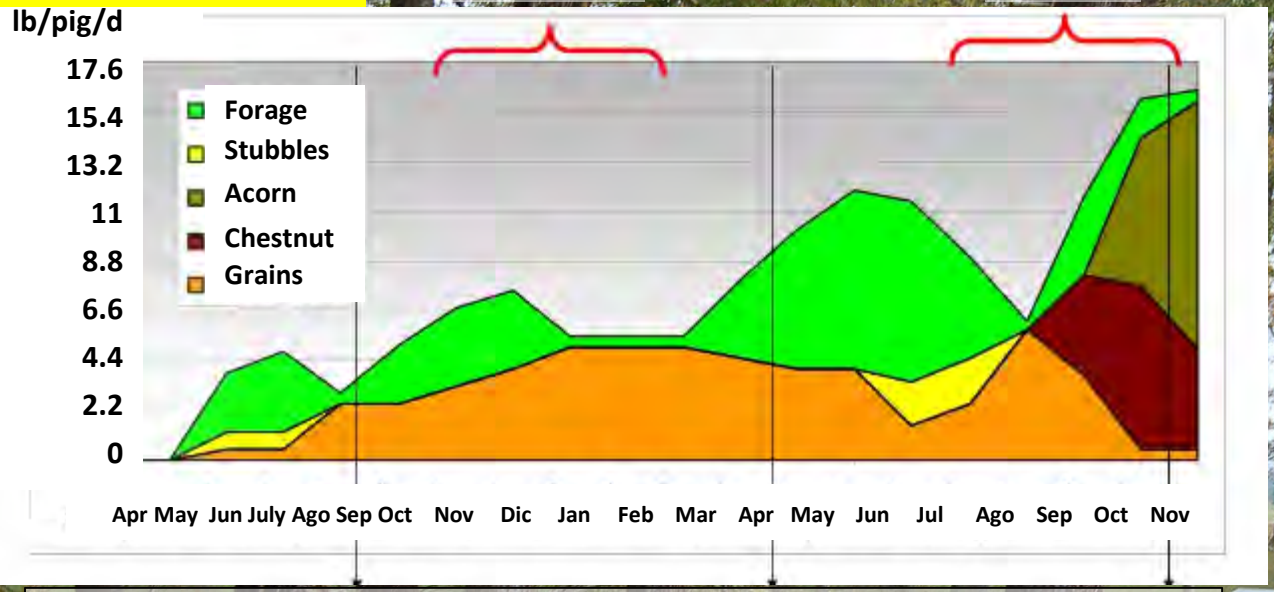
Average daily gain: 0.594 lb/d
Market age: 15 months

Acciaioli *et al.* 2002

Feeding program to optimize the use of farm available feedstuffs

Pigs born in Spring

No forest | **Forest**



Weight, lb	**110**	**220**	**330**
Age, months	**6**	**12**	**20**

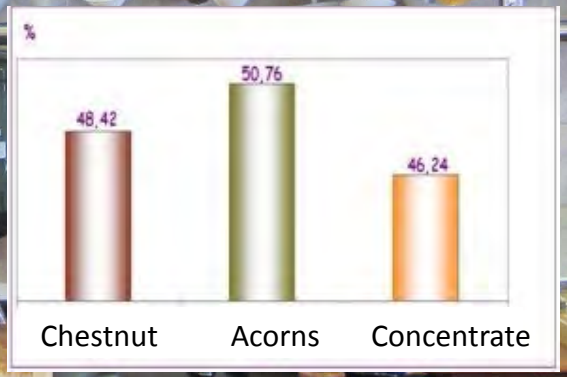
Diet:	**2.2 lb grains** **0.66 lb forage**	**4.4 lb grains** **4.8 lb forage**	**0.44 lb grains** **5.7 lb chestnut** **17.6 lb acorns** **2.4 lb forage**

Average daily gain: 0.462 lb/d
Market age: 20 months

Acciaioli *et al.* 2002

Jamon Iberico de bellota

Fat composition of hams from Cinta senese



Oleic acid content

Omega 3 fatty acid content

Pugliese 2011

Production of local breeds

Superior eating quality of products from local breed pigs

Production of local breeds is costly

- Low reproduction performance
- Slow growth

"Unfitted" for fresh pork sales because consumers don't like meat cuts with high fat content.

Are used at the producing of high value-added processed products, mostly dry cured. Involved in processes for Protected Designation of Origin Labels. Niche market.

Crossed with conventional breeds allow to achieve lower production costs, better carcass quality and leaner cuts. The eating quality of these crosses is usually intermediate

Bonneau and Lebret 2010

More competitive with differentiate products of high added value

Araujo *et al.* 2011

Photo courtesy of J-M Luginbuhl

Cinta senese pork quality according to rearing systems

	Indoor	Pasture
Slaughter weight (kg)	136.2[a]	127.7[b]
Age (days)	312[a]	510[b]
Total fat cuts (%)	36.7[a]	41.0[b]
IMF (%)	3.3[a]	4.0[b]
Cooking loss (%)	26.6[a]	30.3[b]
Shear force on cooked meat (N)	105[a]	151[b]
L*	50.13[a]	45.78[b]
a*	11.77[a]	14.95[b]
In subcutaneous fat (% of FAs)		
MUFA	53.3[a]	55.08[b]
PUFA n-3	0.39[a]	1.02[b]
PUFA n-6	10.05[a]	12.30[b]

a, b; $P < 0.05$

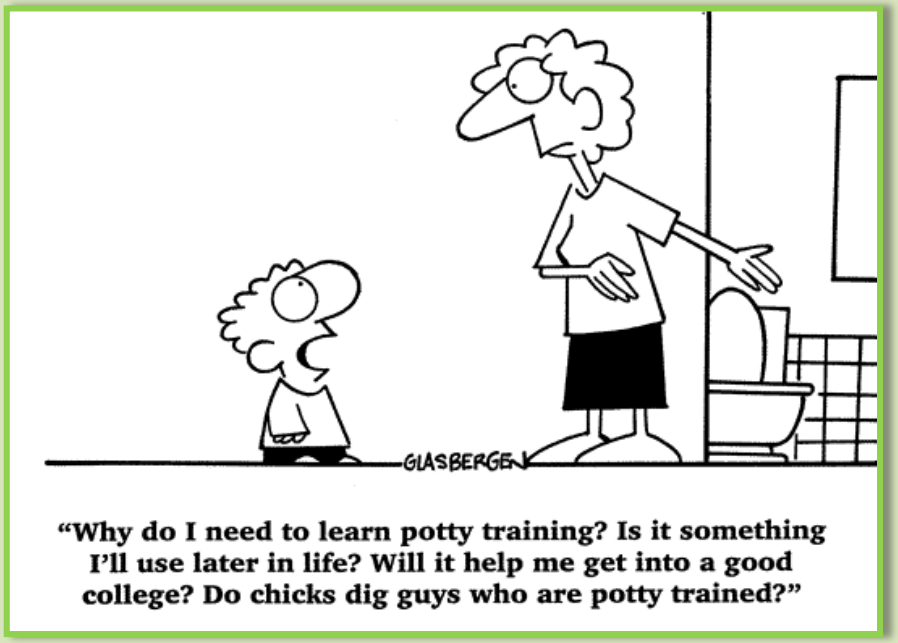
Pugliese et al 2005, Pugliese 2011

Positive genotype x environment interaction

(Edwards 2005; Lebret 2008)

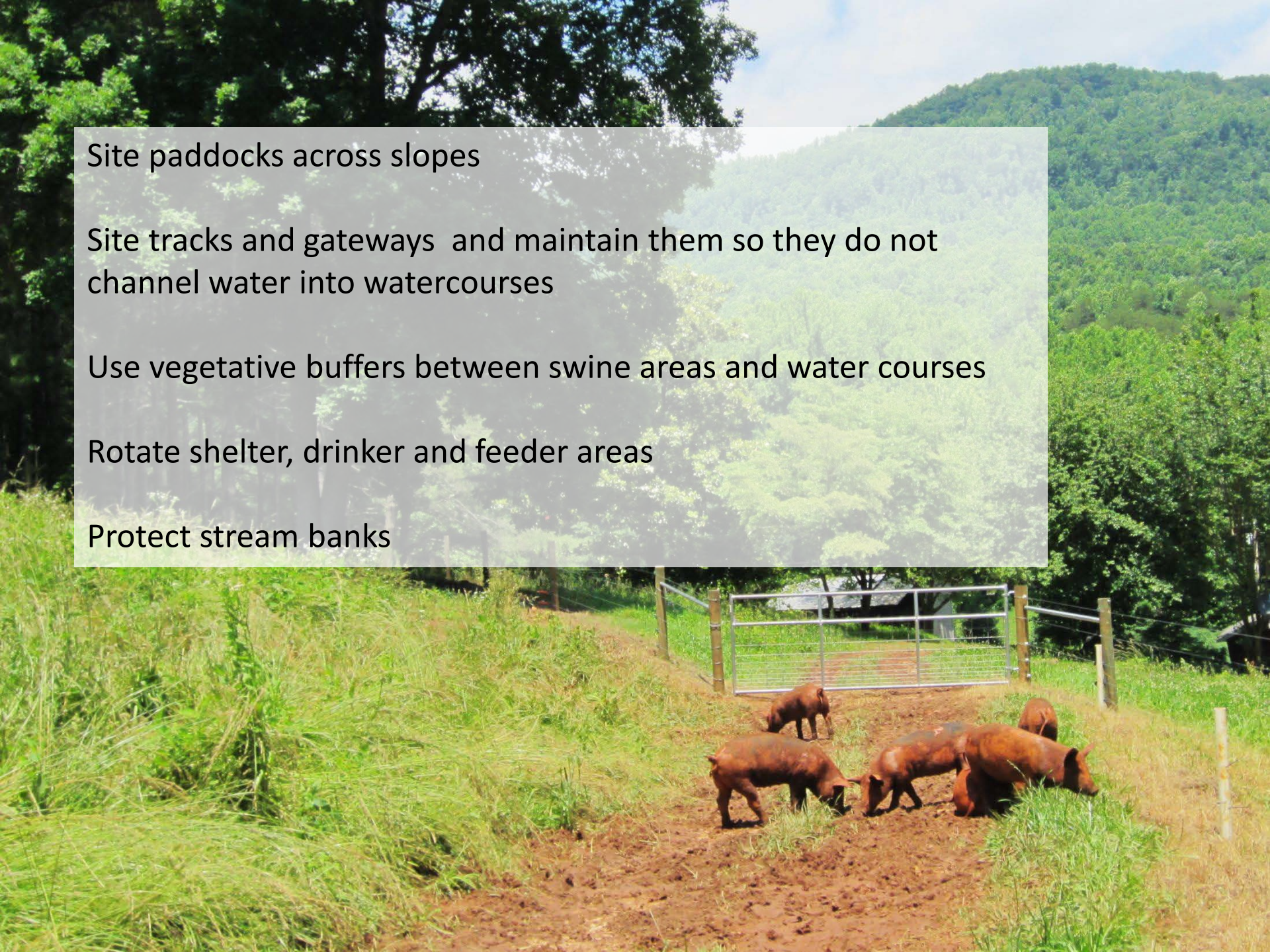
Eating quality of dry cured Iberian hams is impaired when animals are raised in confinement instead of extensive finishing systems. (Cava et al 2000)

“Potty train” your pigs



www.glassbergen.com

Persuade them into doing their business in areas where the waste can be contained, this material can be collected at the end of the production cycle and composted or vermicomposted.



Site paddocks across slopes

Site tracks and gateways and maintain them so they do not channel water into watercourses

Use vegetative buffers between swine areas and water courses

Rotate shelter, drinker and feeder areas

Protect stream banks

To reduce ground cover damage and soil compaction

Protect HUA with locally available organic materials

The use of perforated slats under feeders and drinkers can help reduce soil compaction


To reduce damage to trees in a woodlot
Fence out sensitive areas


Endangered system?
Animal density
Trees density
Rotation pattern
Pinto Correia 1993
Grazing system implemented in the Dehesa is not allowing to regenerate *quercus* species in the appropriate rate (Plieninger 2007).

For a Sustainable Outdoor swine Operation:

Design a flexible production system adapted to the unique circumstances of your farm.

Select an animal breed suitable for outdoor production.

Select a site that minimizes potential runoff to waterways.

Use appropriate vegetation.

Build vegetation buffer filters to limit runoff to waterways or drainage ditches.

Include locally-available feedstuffs in your feeding program.

Implement management practices to reduce environmental impact and adapt them to the season

- Adjust stocking rate and length of animals stay according to climate, soil, drainage and managers' skills.
- Allow your paddock a resting period
- Protect areas sensitive to soil compaction
- Reduce feed wastage
- Plan periodic movements of structures and equipment
- Utilize crops to remove soil nutrients
- Conduct periodic soil tests