QUALITY OF LIFE HANDBOOK

The use of environmental enrichment

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TABLE OF CONTENTS

INTRODUCTION	
Improving the Quality of Life of Pigs	2
Goals and Benefits of Enrichment	2
Types of Enrichment	3
Simple Criteria for Choosing Enrichment: the Six S's	3
Recommended Practices	4
Enrichments for Phase of Production	4
How to Assess Effectiveness	8
Economics of Enrichment	8

OVERVIEW OF TYPES OF ENRICHMENTS	
Physical Enrichment	9
• Bedding/floor covering	9
• Feedstuffs	11
• Commercial toys and equipment	12
• Simple objects	14
• Complex objects	16
• Other	16
Social Enrichment	17
Nutritional Enrichment	18
Occupational Enrichment	19
Sensory Enrichment	19

ENRICHMENT BY PHASE OF PRODUCTION	
Gestating Sows	20
Boars	21
Farrowing Sows	21
Lactation	22
Nursery	23
Grower and Finisher	24

INTRODUCTION

IMPROVING THE QUALITY OF LIFE OF PIGS

Compared to pigs living in the wild, pigs reared in commercial farms have limited space and a relatively barren environment, which restricts their ability to perform natural behaviours. There has been an increased interest in society to improve the quality of life of pigs reared for human food consumption. This interest has resulted into conversations on how to improve animal welfare, which has resulted in changes to regulatory regulations. This includes the switch to group sow housing by 2029, as mandated by the National Farm Animal Care Council's (NFACC) Code of Practice for the Care and Handling of Pigs, along with changes to the Health of Animals Regulations under the Health of Animals Act in Canada, as well as Proposition 12 in California that requires increased space allowance for sows.

Most pigs reared for human consumption are kept in intensive, fully slatted barns. The aim of this handbook is to provide suggestions on how to improve the quality of life of pigs in commercial farms in such a way that it won't require large renovations to the barns. This includes things such as positive human interaction, socializing pigs pre-weaning with other litters, increased space allowance, and different types of environmental enrichment.

GOALS AND BENEFITS OF ENRICHMENT

The term *environmental enrichment* is used to describe the changes (modifications or additions to the environment) that are designed to improve the living conditions of the animals by allowing them to express a wider range of natural behaviours.

The Code of Practice for the Care and Handling of Pigs (NFACC, 2014) requires that "**Pigs must be provided with multiple forms of enrichment that aim to improve the welfare of the animals through the enhancement of their physical and social environments.**" The Canadian Pork Council's pigCARE program also states that "Two or more enrichment options must be provided to pigs at all stages of production."

Enrichment provides an outlet for expression of exploration, foraging, and play behaviour, which in turn decreases aggression, competition and stress, allowing for healthier and happier pigs. Growing evidence suggests that these benefits continue beyond the period in which the enrichments are given.

BENEFITS OF PROVIDING ENRICHMENT:

- To increase the range and number of natural behaviours
  - This includes exploration, rooting, and play behaviour
- To reduce severity or frequency of abnormal and damaging behaviours
  - This includes tail and ear-biting, belly nosing, sham chewing, and fighting
- To increase positive use of environment/space
- To increase the animal's ability to cope with physiological and behavioural challenges
  - This includes stressful events such as weaning and health challenges such as a disease outbreak
- To improve growth performance (feed intake, weight gain and feed efficiency)
- To improve reproductive performance (better birthing, less stillborn piglets, less piglets laid on)
- To reduce stress and fearfulness in the animals
- To improve the health of the animals
  - This includes a reduction in lesions, injuries, lameness and gastric ulcers, and an improvement in gut health and the immune system
- To increase handleability of the animals

TYPES OF ENRICHMENT

When talking about environmental enrichment, most people think about objects or substrates added to a pen, such as a chain, toy, straw, etc. These are all forms of physical enrichment. It is a common misunderstanding that simply introducing additional objects into the animals' surroundings constitutes 'enrichment'. The term should only apply to enrichment that is biologically meaningful to the animals in question by stimulating natural behaviours and improving animal welfare.

CHARACTERISTICS OF IDEAL PHYSICAL ENRICHMENTS

- Destructible
- Malleable/Deformable
- Edible
- Chewable
- Odorous
- Clean

There are other forms of environmental enrichment. Did you know that positive interactions with humans is a form of enrichment? And so is playing classical music. Enrichments can be grouped into the following categories:

- Physical enrichment – altering enclosures or adding accessories like objects, substrates or permanent structures (nest boxes)
- Social enrichment – indirect (olfactory, visual, auditory) or direct contact with other pigs or humans
- Nutritional enrichment – presenting novel or varied food types or changing the method of food delivery
- Occupational enrichment – enrichment that encourages exercise and psychological enrichment that provides animals with control or challenges (devices)
- Sensory enrichment – auditory, olfactory, visual, tactile and taste stimuli

"Did you know that positive interactions with your barn staff is a form of enrichment?"

SIMPLE CRITERIA FOR CHOOSING ENRICHMENT: THE SIX S's

When choosing physical enrichment for your swine barn there are six key factors to consider. Enrichment items should be safe, sanitary, simple, soft and suspended, with the site chosen also being an important aspect. Further specifics are provided here:

SAFE

- No sharp edges
- Not poisonous wood or wood that may have been preserved
- No staples or fixings in wood
- No materials that may be toxic to pigs
- No treated rubber (tires, boots)
- Not able to trap limbs or body parts
- Fragments of broken down object do not pose safety risk
- Not able to be used to damage the pen or injure pen-mates

SIMPLE

- If too complex can lead to vice due to frustration
- A number of simple items is better than one complex item and allows more pigs to gain access at one time

SANITARY

- No fouled materials
- Can be easily cleaned or sterilized to prevent disease transmission

SOFT

- Should be malleable to promote novelty – pigs enjoy objects that they can gradually destroy

SITE

- Do not place over lying, feeding or drinking areas
- Dunging areas or open areas are the optimal position
- Maintain novelty by switching sites

SUSPENDED

- Avoids fouling
- More pigs can gain access if the item is suspended in a central location
- Hang at snout or eye level

RECOMMENDED PRACTICES

When providing enrichment in your barn, these practices should be taken into consideration in order to see the most benefits.

- Access to a range of novel suspended toys (cloth strips, rubber, and straw dispensers) should be provided continually and the pen floor should have free toys.
- Physical enrichment like straw, sawdust, hay, wood, peat, mushroom compost, or a mixture of such should be provided if it can be used safely and does not negatively affect the animals' health.
- Provide a number of enrichments and disperse throughout pens to mitigate aggression due to social status
- Rotate enrichment so that a novelty factor remains and benefits are seen
  - Rotation schedule will depend on the type of enrichment, but should be around 1 to 3 times per week
  - Replacing chewed-up ropes with new ropes maintains interest if rotating toys is not an option
- Adjust object size to the size of the pigs so that it can fit in their mouth
- Monitor enrichment objects to ensure they don't cause health problems (e.g. strangulation, choking, poisoning, obstruction of the digestive tract, transmission of pathogens) or compromise food safety

Photo credit: Jen-Yun Chou

ENRICHMENTS FOR PHASE OF PRODUCTION

Environmental enrichment plays a different role as pigs grow and age. For example, enrichment for growing pigs focuses mainly on reduction of boredom and stress, improvement of performance, and prevention of damaging behaviours, whereas enrichment for gestating sows focuses mostly on alleviating hunger-related stereotypic behaviours. This affects the preferences for the types of enrichment in pigs of different ages. More information is provided on the enrichment preferences for each phase of production.

Sows around Farrowing Time

The day before farrowing, sows have an intrinsic need to perform nest-building behaviour. In farrowing crates, an elevated box of long straw, peat, or hay within reach of the sow can allow for some nest building. Sows provided with nesting materials have a smoother farrowing process including less stillborns, experience less stress, and show better maternal behaviours leading to lower piglet mortality and better piglet growth rate. It is also easier to observe which sows are going to farrow based on the use of nesting materials.

Overall Preference: straw, other substrates, burlap

Burlap sack hung on a farrowing crate
Photo credit: MS Schippers

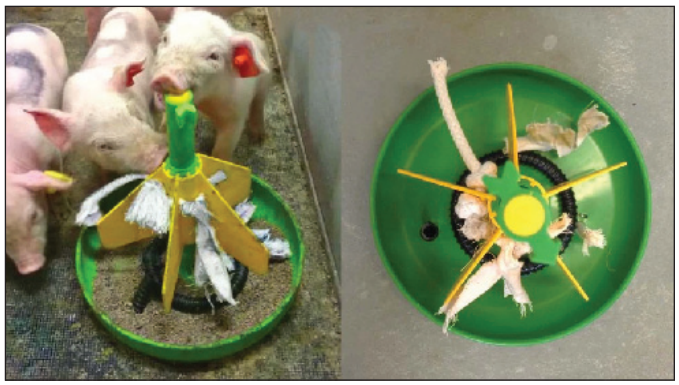
"Did you know... The number of stillborn piglets can be reduced by providing burlap to sows in farrowing crates."

Lactating Sows

Lactating sows can easily overheat, so straw is less suitable once farrowing is finished in the summer. Lactating sows also need to eat a lot, so additional edible enrichments are not ideal. Instead, items to manipulate to reduce boredom could be more suitable, such as a burlap sack or rope fixed to the crate within reach of the sow. Being able to have freedom of movement and unobstructed mother-offspring contact may be more biologically relevant during this time, but this requires a change in the layout design of farrowing crates.

Overall Preference: freedom of movement, extra space, burlap, rope

Loose lactation pen
Photo credit: Vereijken Group



Play feeder for piglets
Photo credit: Middelkoop et al. 2019 - https://doi.org/10.1038/s41598-019-52530-w

Early life management showing extra space, straw, burlap, cardboard and other toys for piglets in the farrowing room
Photo credit: Yolande Seddon

Piglets

Suitable enrichment material for piglets could be a small amount of easily chewable substrate. Piglets prefer malleable materials, such as rope and burlap. Commercial toys should be sized in such a way that piglets can take it in their mouth. On the other hand, the quantity or size of materials or objects needs to be large enough to allow multiple piglets to use it, similar to synchronized suckling bouts.

Providing loose substrates such as sawdust, shredded paper or chopped straw can help piglets with thermal regulation and drying off after birth.

Attaching cloths, ropes and tubes to a creep feeder stimulates piglets to explore the feeder, which may increase eating time post-weaning. Adding ingredients such as celery, breakfast cereals, peanuts, or black soldier fly larvae can increase piglet's pre-weaning feed intake, and adding sand as a rooting substrate inside the feeder will increase the time piglets spend exploring the feeder.

Social enrichment to piglets shows a lot of promise, such as co-mingling of different litters prior to weaning, or positive human interactions. Pre-weaning socialization can reduce aggression later in life, and positive human interaction pre-weaning makes pigs easier to handle throughout their lifetime.

Providing opportunities for piglets to play, through increased space allowance and a rotation of physical enrichments, improves disease resilience later in life.

An important note: Once enrichment has been given in the pre-weaning environment, it is important to continue to provide enrichment to pigs in pens thereafter. Moving a pig from a more to a lesser enriched environment can have negative consequences for the pig.

Overall Preference: straw, bedding, burlap, rope, shredded paper, positive human contact, extra space, social contact with other litters

Nursery

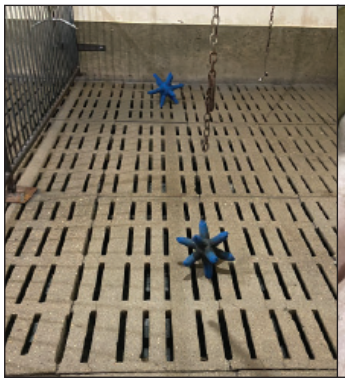
Providing effective enrichment in the nursery is very important to prevent the onset of tail biting and to prevent later severe tail biting. It is especially important in the nursery phase to renew loose substrates or change enrichment items regularly to maintain interest. Enrichment should also be explorable by multiple pigs at the same time.

Straw, peat, wood shavings, and silage increase positive behaviours such as exploration and play. Corn silage might be a better option than straw for the manure handling system. Suspended objects are generally better than floor objects, except for rooting cones and a wooden beam standing vertically on the floor, which pigs spent more time with than suspended objects. Rope is the preferred suspended object, but it must be replaced often. Rope and burlap are preferred in strings versus knotted, though knotted versions last longer. When choosing commercial toys, PorkyPlay is preferred over BiteRite.

Sensory enrichment can be useful in nursery pigs. For example, garlic oil increases nursery pigs' interest in a cotton rope as compared to a non-scented rope, and scented newsprint increases the number and duration of interactions compared to unscented newsprint.

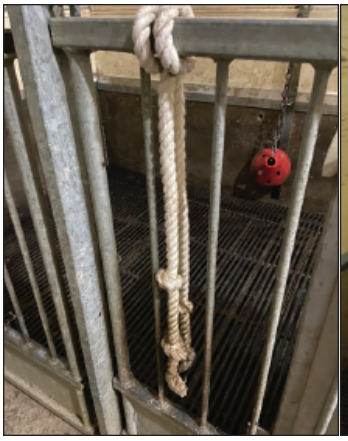
Overall Preference: straw, wood shavings, wood bark, burlap, rope, newspaper pieces, rubber hose, commercial toys, rubber mat

Rack with grass and wooden log in the back
Photo credit: Jen-Yun Chou



Easyfix Luna and chain

Wood block on a chain



Rope in the front and chewed up Bite-Rite in the back

Straw on a solid mat
Photo credit: Yolande Seddon

PorkyPlay on a chain

Grower and Finisher

Due to limited space in the finisher phase, provide loose enrichment materials or multiple objects that are widely available and accessible throughout the pen. Straw is best, especially when provided in deep bed systems. Other types of bedding are also great for enrichment. Racks with enrichment such as straw, mushroom compost, silage, or grass work well in slatted floor systems, but they need to be accessible to not increase aggression. These racks provide a high level of engagement with the enrichment material and reduces skin lesions, tail biting and water wastage (due to less playing with the drinker). A rooting tower filled with organic material such as straw works to a lesser extent. Wooden logs hung from a chain and provision of newspaper sheets several times per week are options too. Simple objects like chains, balls and commercial toys should have supplemental enrichment that involves destructible or rooting materials.

Overall Preference: straw, bedding, fresh soft wood (birch wood is best), food enrichment (beet, grass, turnip), straw or mushroom compost in racks, rope, shredded paper, rubber, soft plastic, hard wood, PVC pipe, balls

Boars and Replacement Gilts

Breeding and teaser boars get released from their pen on a regular basis and experience human interaction and social contact with females, which can be a good type of enrichment. However, the rest of the time boars are housed in barren environments, often alone, so they need enrichment in their pen. Boars seem to have similar preferences as grow-finish pigs, with substrate bedding being the best option, and suspended cotton ropes being better than rubber chew sticks.

For gilts arriving newly to a farm, providing edible substrate can help them get used to the presence of humans. In addition, both boars and gilts are restrict-fed, so they may have similar challenges to gestating sows and potentially display redirected foraging behaviour (stereotypies). Recommendations for gestating sows may therefore also be useful for boars and replacement gilts.

Overall Preference: Straw bedding, straw in rack, positive human interaction, social contact with other pigs, hanging rope, rubber chew sticks, BiteRite, Tri-Star Standard Toy, hanging wood, smaller balls, PorkyPlay

Gestating Sows

Gestating sows are very feed motivated resulting in intense foraging behaviour. Without proper enrichment, stereotypic behaviour such as sham chewing may develop. Suitable enrichment for gestating sows includes feedstuffs and other edible enrichment, as well as objects that are chewable and destructible. Providing a variation of enrichment types can further stimulate sows to perform different repertoires in foraging behaviour. Due to dominance hierarchies in gestating sows, enrichment should be plentiful and accessible to all animals. Bedding such as straw is again the ideal enrichment. Racks with enrichment such as straw, mushroom compost or silage work in slatted floor systems, but they need to be accessible to not increase aggression. Sows usually prefer rope over wood or a chain. Simple objects like chains, balls and commercial toys should have supplemental enrichment that involves destructible or rooting materials.

Sow welfare was improved with a call feeder as cognitive enrichment. Cognitive enrichment should be researched more as an option for enrichment of gestating sows.

Overall Preference: Straw bedding, straw in rack, positive human interaction, EasyFix Astro, hanging rope, BiteRite, Tri-Star Standard Toy, hanging wood, smaller balls, PorkyPlay

Two boars housed together to provide social enrichment

Weaned Sows

After weaning, sows are often kept in gestation stalls for several weeks. It is currently unknown how enrichment during this time can help alleviate their mental stress from weaning, confinement and physical recovery from farrowing and lactation. Very little information is known about the best enrichment types for weaned sows in stalls. They seem motivated to access different enrichment materials, such as compost and straw. While weaned sows get exposed to boars during the breeding period, the exposure time is only a few minutes and is likely too short to be considered meaningful enrichment.

Overall Preference: Straw bedding, straw in rack, positive human interaction, social contact with other pigs, hanging rope

Wooden log, rope, and chewed up Easyfix Astro on chains

HOW TO ASSESS EFFECTIVENESS

How effective the enrichments are in a barn can be measured through various parameters. These include the number of interactions, length of interactions or contact with the object, time spent near the enrichment, an increase in animal activity and pen utilization, as well as a reduction of aggressive, stereotypic or undesirable behaviours, and improved performance and resilience. Often these measures are taken before and after the enrichments have been implemented into the pens to see how much of a difference has been made. When the objects are rotated throughout the pens, all of these measures see an increase. Pigs interact most with the object on the first day it is available, with contact decreasing shortly after, depending on which object is being used. For each piglet that contacts the object, the number of times they interact with it over an hour ranges from 5 to 20 times. When enrichment objects are rotated three times a week, many more sows are within less than a meter of the enrichment compared to when it is not rotated showing that novelty is very important to keeping enrichment effective.

Pigs enjoying time in a play pen with multiple forms of enrichment
Photo credit: Yolande Seddon

"Novelty is very important to keeping enrichment effective."

ECONOMICS OF ENRICHMENT

Enrichment objects can be implemented on swine barns for a low cost considering the many benefits they provide. Objects found around the barn may be useful, such as untreated wood, chains, cardboard boxes, rope and burlap. Depending on the enrichment used, objects and durability will vary. Suspended enrichments are the most common form in slatted floor systems as they do not get as dirty and are more effective for the pigs. These use a chain and mounting hardware that costs about $40 per enrichment. Attachments can be added to the chain to increase effectiveness and to add novelty. In a year, a chain with a cotton rope attached is around $0.65 per pig.

Costs of physical enrichment are often low. For example, burlap is around $1.04 per pen and rope is around $1.90 per pen. Since these objects are often manipulated by the pigs, they may need to be replaced every 3-20 days, costing about $5 per pen over six weeks.

The labour needed to provide and maintain enrichment is most of the cost. For example, providing positive human contact to pigs adds time to daily pen checks. Rotating and/or replacing physical enrichments takes a considerable amount of time, so it could be beneficial to use more durable objects. More durable items are often more expensive up front, but they can last three months or more, as is seen with commercial toys.

When burlap is placed pre-farrowing, the number of stillborn pigs is reduced to the extent that every $1 spent on the burlap provides $3 return through piglet value, so it is well worth the initial investment. Another benefit of enrichment is the decrease in health costs. This is due to a decrease in aggression between pigs, as well as a decrease in stress that in turn boosts the immune system.

PHYSICAL ENRICHMENT

Bedding/floor covering

Straw

Phase of production: Ideal for any age of pig

Implementation	Practical considerations	Photos
• Spread out on the floor as bedding • Cannot implement on slatted floors • Keep dry and clean • Areas without straw are needed to help pigs cool down • Should be properly stored on site • Not ideal for lactating sows in summer due to potential heat stress	• Rated 7 out of 10 for animal well-being • Reduces culling due to lameness by reducing balance difficulties • Improves physical comfort, nutrition and thermal behaviour • Encourages natural rooting and exploration behaviours • Maintains the pigs' interest • Allows nest-building behaviour of sows • Improves piglet physiological and morphological maturity when given to sows in gestation • Increases play behaviour • Positive effects seen in offspring, with long-term effects • Is a buffer during fighting • Lowers aggression and reduces biting of penmates • Calms animals and lowers stress • Improves immune response • Can be a biosecurity risk due to the possibility of harbouring disease-causing agents such as salmonella and mycotoxin molds	 

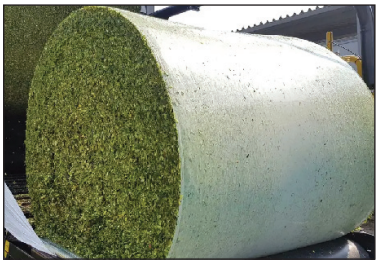
Sawdust

Phase of production: Ideal for any age of pig

Implementation	Practical considerations	Photos
• Spread out on the floor as bedding • Not usable on slatted floors • Cannot be from wood that has been chemically treated • Should be stored on site • Keep dry and clean	• Can be a buffer during fighting • Encourages natural rooting and exploring behaviours • Improves pigs' thermal regulation and comfort • Supports nest building behaviour and calms animals • Reduces parturition time • Reduces piglet mortality • Improves growth rate and immune response when given as part of a varied enrichment routine	 *Photo credit: Vermette Wood Preservers*

Other bedding

Phase of production: Ideal for any age of pig

Implementation	Practical considerations	Photos
• Other bedding types include peat, silage, mushroom compost, soil and forage (dried plant material) • Provide in the farrowing crate around the head of the sow, or place in a trough. Farrowing pens, provide on the floor. Provide 4 kg on day 1, followed by 2 kg top-ups as needed pre-farrowing • Provide peat in a tray, a small feed hopper, a box, or a creep tray • Should be stored on site • Spread out on the floor as bedding • Not usable on slatted floors • Keep dry and clean	• Can be more attractive than straw • Encourages natural rooting and exploring behaviours • Edible which increases its appeal, especially corn silage • Improves thermal regulation and physical comfort • Can be a buffer during fighting • Lowers stress • Helps with cognitive development • Supports smoother weaning transition • Peat improves production performance when given from birth to slaughter	 *Corn silage bale* *Photo credit: Orkel*

Rubber mat on floor

Phase of production: Gestation, lactation, nursery, grow-finish

Implementation	Practical considerations	Photos
• Provide matting in lying areas • Rubber mat needs to be firmly fixed on the floor to prevent slippery surface • Can get slippery so should be away from water source • Option to also coat slats in rubber • Sturdy rubber can prevent wear and tear • Climatic conditions will influence the use of mats by pigs. Provide a choice of flooring	• Improves thermal regulation and physical comfort • Reduces lameness • Reduces sow shoulder and claw lesions	 *Rubber mat in nursery* *Photo credit: Yolande Seddon*

"In barns with slatted flooring, you can put rubber mats on parts of the floor and provide some straw, sawdust or other bedding on the mats."

Rubber mats with straw in a grower barn with slatted floors
Photo credit: Yolande Seddon

Feedstuffs

Straw in rack

Phase of production: Gestation, farrowing, lactation, nursery, grow-finish

Implementation	Practical considerations	Photos
• Place so that access by the pigs is maximized and refilling is possible from the main walkway • Can be used in a slatted floor system if a metal plate is underneath the dispenser to collect straw • Straw should be easy to remove from the dispenser • Place above liquid feed troughs to reduce straw wastage or in a lying area that has solid floor • For sows, provide 1 day prior to farrowing to support nest building behaviour. • Dispenser should be around 40 cm deep • Dispenser's bottom rung should be 1 m above the floor • Space between dispenser bars should be around 4 cm	• Straw in a dispenser is a 6/10 for animal well-being • Encourages natural exploring and rooting behaviour • Can be added to the feed ration if the feeding system allows • Holds the interest of the pigs • Lowers aggression and stress • Improves colostrum intake of piglets and reduces mortality of foster piglets • Improves immune response • Improves production performance when given from birth to slaughter • If pigs do not have enough access to the dispenser, it can cause aggression	 *Photo credit: Jen-Yun Chou*

Sugar beet pulp

Phase of production: Sows and grow-finish pigs

Implementation	Practical considerations	Photos
• To hold the pigs' interest, 0.5 kg of beet pulp should be added to each pen • Is available in pellet form • Needs to be stored properly in order to ensure butyric acid bacteria (BAB) spores are not present	• Can use in feed bins • Edible and also allows rooting behaviour • Can be used on slatted floors • Easy storage and transport • Provides nutrition • Improves gut health, reproductive rates, fertility and animal handling	

Dried seaweed

Phase of production: Farrowing sows and grow-finish pigs

Implementation	Practical considerations	Photos
• Provide seaweed in boxes or compressed in cylinders attached to the crate or on a rack • Can be used on slatted floors • Needs to be constantly renewed	• Calms animals • Is edible and encourages exploration • Supports nest building behaviour • Has a significant cost • Supply may be difficult	 *Photo credit: Wowo-great*

Other

Phase of production: Sows, nursery and grow-finish pigs

Implementation	Practical considerations	Photos
• Other enriching feedstuff includes silage or grass in a rack, cabbages on the floor, suspended carrots on a string, rutabagas in a box and coconuts cut in half • Can be used on slatted floors	• Provides nutrition • Is edible and encourages exploration • Reduces tail biting • Grass silage reduces gastric ulcers in growing pigs	 *Grass in a rack* *Photo credit: Jen-Yun Chou*

Commercial toys and equipment

Bite-Rite™

Phase of production: Sows, nursery, and grow-finish pigs

Implementation	Practical considerations	Photos
• Two versions: red for sows and finisher pigs and blue for piglets • Easy to install with chain • 20 to 25 pigs can use one Bite-Rite™ toy • Chew sticks can be replaced • The elastic nature of the chew sticks make them more attractive to pigs • Can be used in a slatted floor system • Ikadan is the manufacturer	• No floor space is taken up and it stays clean longer • Several pigs can use it at once • Easy to chew • More durable than some non-commercial options • Can lose appeal quickly • Sticks become damaged and need to be replace often (around 3 weeks the first time, then every couple of days)	 *Photo credit: Ikadan*

Rooting cone

Phase of production: Nursery, and grow-finish pigs

Implementation	Practical considerations	Photos
• Fasten it to the floor so it stays in an ideal location • Should be installed in the center of the pen to increase access to the object • Pigs should be able to put the ball in their mouth without destroying it • Can adapt the size to different pig sizes; 80 mm diameter for finisher pigs, 60 mm diameter for piglets • 21 to 25 pigs can use one Rooting Cone • Estimated to last for two years • Can be used in a slatted floor system • Weda is the manufacturer	• Safe material for animals and is long-lasting • Can be used by the pig when standing, lying down or sitting • Helps animals express natural behaviours • Maintains pig interest • More durable than non-commercial options • The balls can be damaged by the pig and will need to be replaced • Not very effective for sows	 *Photo credit: WATT Poultry*

PorkyPlay

Phase of production: Nursery pigs

Implementation	Practical considerations	Photos
• Easy to install with chain • Can be used in a slatted floor system • Ketchum is the manufacturer	• Has an antibacterial function • Can come in various scents with odour allowing for maintained interest • More durable than non-commercial options	  *Photo credit: Ketchum*

Tri-Star pig toy

Phase of production: Any phase of production

Implementation	Practical considerations	Photos
• Plastic disc that hangs and has replaceable chew sticks	• Very durable disc portion • Chew sticks could end up in the manure pit • Chew sticks can be removed by sows too easily so they are often not used	 *Photo credit: ONswine*  *Photo credit: Huron Citizen*

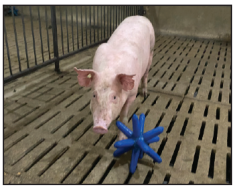
EasyFix Astro

Phase of production: Sows and grow-finish pigs

Implementation	Practical considerations	Photos
• Occupies up to four pigs at once • Easy to install with chain • EasyFix is the manufacturer	• Sows really enjoy it, maintains interest • Durable, lasts around 1.5 months before replacement is needed, though this may vary for each barn	  *Photo credit: Jen-Yun Chou*

EasyFix Luna

Phase of production: Gestating sows, nursery, and grow-finish pigs

Implementation	Practical considerations	Photos
• Is a floor level toy that is mobile and rolls easily • Can occupy up to six pigs at once • Use 1 toy per 7 pigs • Different sizes available for each phase of production • EasyFix is the manufacturer	• Durable, lasts around 3 months • Reduces tail biting and increased weight gain when given as part of a variety of enrichment items and replenished when depleted. • Can get stuck in the door of ESF systems • No benefits found for sows; sows lose interest after one day • No benefits found when 1 toy was given per 14 grow-finish pigs	

Rally rooter foraging tower

Phase of production: Gestating sows, nursery, and grow-finish pigs

Implementation	Practical considerations	Photos
• Used to dispense organic material like straw • Has to be refilled regularly • Can be built into the wall of the pen or freestanding • Opening size can be adjusted • Big Dutchman is the manufacturer • Can be used in a slatted floor system	• Allows access to organic material at any time • Allows for natural foraging behaviour • Adds fibre to the pigs diet • Needs to be placed so that many pigs have access to avoid aggressive behaviours • May need multiple per pen depending on pen size	  *Photo credit: Big Dutchman*

"Commercial toys are often more expensive than other enrichment options, but generally last longer."

Simple objects

Burlap or jute

Phase of production: Farrowing sows, lactating piglets, nursery, grow-finish pigs

Implementation	Practical considerations	Photos
• Fasten onto farrowing crate around sow shoulder height near the front of the crate • For piglets, attach to the wall at a height that is accessible to the piglet's snout when sitting or standing, using 1 jute sack per two pens • In nursery, use 1 burlap sack per pen, hung to side of pen at pig shoulder height • In grow-finish, use 1 burlap sack per 10 pigs • Replace immediately once depleted	• Supports nest building behaviour • Calms animals • Reduces still births • Eases transition into weaning • Reduces biting of pen-mates • Improvement in weight gain and immune response when given as part of a varied enrichment routine	 *Photo credit: Jen-Yun Chou*

Wood

Phase of production: Gestation, lactation, nursery, grow-finish pigs

Implementation	Practical considerations	Photos
• Can be used as a wooden stake in the corner of a pen, block of wood suspended from one or two chains, logs and branches, sawdust in a box, attached vertically through a U-shaped plastic tube or hook mounted on the wall and can be put in a holding device • When using a holding device, the woods diameter should be 10 cm or more, at least three should be in the same pen and distance between the holding devices should be 40 cm • Softwood (spruce, birch) is preferable over hard wood and fresh cut wood is most effective • Size of wood blocks should be proportional to the pigs	• Quick and easy to install • Can be used in slatted floor systems • Reduces piglet mortality when given during gestation • Increases exploratory and play behaviour • Reduces biting of pen-mates and tail biting • Wood shavings improves immune response • Wood is only a 3/10 for animal well-being • The object is ineffective when it is dirty and mobile	 *Photo credit: Jen-Yun Chou*

Chains

Phase of production: Sows and grow-finish pigs

Implementation	Practical considerations	Photos
• Hang from the ceiling or from the pen wall • Chain size should be adapted to the animals' size • Usage is increased when positioned closer to the floor • Can be used in slatted floor systems	• Easy and fast to implement • Sturdy • Chains are a 2/10 for animal well-being • Loses novelty quickly • Should be used with other materials or rotated weekly with other materials • Pigs manipulate the chain but no benefits have been found. Chains do not fulfil a role in reducing damaging behaviours on farm.	

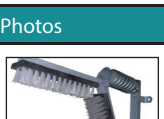
Rope

Phase of production: Ideal of any age of pig

Implementation	Practical considerations	Photos
• A sisal rope (natural fibre) or strips of pure cotton are recommended • To increase its longevity, knots can be made • Can be used in slatted floor systems • Should be 1 m long with a diameter of 14 mm (1/2 inch) with 20 cm touching the floor • Locate at a height that is accessible to the pigs' snout when sitting or standing. • Monitor cleanliness and integrity of the rope to encourage its use. Change rope when dirty.	• Quick and easy to install • Is chewable • Can be used in slatted floor systems • Is only a 3/10 for animal well-being • Reduction in stereotypic behaviour • Calms animals • Support natural behaviour • Reduces biting of pen-mates and tail biting • Reduces fear	

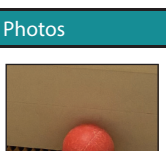
Brush

Phase of production: Sows and grow-finish pigs

Implementation	Practical considerations	Photos
• Can attach the end of a stiff broom to the wall or at the level of the pigs' head • Injury to the animal should not be caused by the type of brush used	• Amuses pigs and allows them to scratch • If broken it may need replacing	 *Photo credit: MS Schippers*

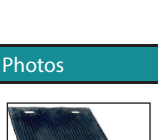
Plastic ball

Phase of production: Nursery and grow-finish pigs

Implementation	Practical considerations	Photos
• Size should be chosen based on the size of the pigs • Can be on the floor or suspended • Can be placed in a box on the floor to prevent it from becoming dirty • Can be used in a slatted floor system • Should be replaced if damaged or soiled • Pigs are usually not interested in larger size balls; stay under 30 cm or so	• Easy to install and manage • When hanging, maintains interest and is durable, often lasting over 3.5 months • Only a 2/10 for animal well-being • Becomes dirty easily so pigs are less interested	

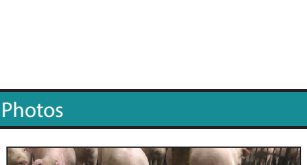
Hanging rubber mat or rubber sticks

Phase of production: Gestation, lactating piglets, nursery, grow-finish pigs

Implementation	Practical considerations	Photos
• Locate at a height that is accessible to pig's snout when sitting or standing. • Consider 1 mat per 6 animals or 1 rubber toy per 9 animals • •nsure cleanliness and integrity of the items to encourage its use • Consider rotation of items regularly to increase interest • Aromatizing the chews increases use	• Appeal is lost when objects are soiled • Increases play behaviour in animals • Calms animals • Eases transition to weaning for piglets • Lowers aggression	 *Photo credit: Hog Slat*

Paper/cardboard

Phase of production: Lactating piglets, nursery, grow-finish pigs

Implementation	Practical considerations	Photos
• Newsprint paper is easy to crumple and works well • Do not use paper/cardboard with ink on it (like newspapers), because ink can be toxic to pigs • Provide several sheets per pen • Renew paper several times per week • Remove staples and tape from cardboard boxes before providing to the pigs	• Improves maternal behaviour • Supports natural behaviours • Calms animals • Eases transition into weaning • Reduces the severity of tail biting • Paper given alone in minimal quantities is not a particularly effective enrichment, as it is quickly consumed, leaving the pigs with no enrichment. Best provided to add novelty to an existing enrichment routine	 *Photo credit: Yolande Seddon*

Play feeder

Phase of production: Lactating piglets

Implementation	Practical considerations	Photos
• Attach cloths, ropes and/or tubes to a creep feeder • Add ingredients such as celery, breakfast cereals, peanuts, or black soldier fly larvae to the creep feeder • Add sand as a rooting substrate inside the feeder	• Stimulates piglets to explore the feeder, which may increase eating time post-weaning. • Can increase piglet's pre-weaning feed intake • May increase the time piglets spend exploring the feeder • Eases transition into weaning	 *Photo credit: Middelkoop et al. 2019*

Complex objects

Garden hose with chain inserted

Phase of production: Sows and grow-finish pigs

Implementation	Practical considerations	Photos
• Chains are inside of plastic garden hose and fixed to the floor • Replace damaged hoses • Easy to use in slatted floor systems	• When the hose is worn out, the chain is a new object to explore • Holds the interest of the pigs	 *Photo credit: Gates*

Rocking devices with objects

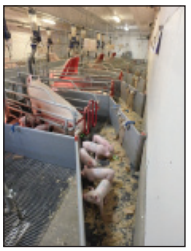
Phase of production: Sows and grow-finish pigs

Implementation	Practical considerations	Photos
• Can be installed between two pens • Should be installed so that it is safe for animal use • Ensure object attached to the end of the rocking device is secured tightly so that appeal is maintained • KONG-type dog toys, PVC garden hoses or any other objects can be attached to the end of the rocking device • Should be installed so several pigs have access • Can be used in a slatted floor system	• Can reuse some materials from the farm • Maintains pig interest • Objects stay clean • Toys hanging from the device can break and may need to be replaced which increases labour	 *Photo credit: Big Dutchman*

Other

Increased space

Phase of production: Ideal of any phase of production

Implementation	Practical considerations	Photos
• Extra space can be provided to piglets in the farrowing room by using the space behind farrowing crates • Additional space for lactating sows requires a redesign of farrowing crates • In the nursery and grow-finish, increased space can be provided by reducing the group size in a pen or by addition of a balcony area above the pen that pigs can access via a ramp. The balcony system has the ability to provide extra space within the existing building footprint • A division of areas is more effective in lowering aggression than simply giving more space because it allows subordinate pigs to hide from aggressive pigs. The area provided will depend on barn design, pen sizes and group sizes	• Increases boar libido and sperm volume • 3.5 m2 per gestating sow in combination with straw, improves immune response, lowers stress, and improves neonatal survival through better piglet physiological and morphological maturity • Farrowing sows: improves sow metabolic state when space is provided in combination with nesting enrichments. Improves nursing. • Piglets pre-weaning: increases play behaviour, lowers aggression, reduces fear, improves growth rate at weaning. • Nursery: lowers aggression, reduces tail biting, reduces fear, enhances natural behaviours, reduces injury and lameness, and increases growth rate • Grow-finish: Lowers stress, calms animals. When used in conjunction with other substrates and straw on the floor, it reduces aggression and biting of pen-mates, reduces fear, increases play behaviour and other appropriate behaviours, improves immune response, growth rate, feed conversion, carcass weight and reproduction. • Additional space through reducing group size in nursery and grow-finish reduces throughput and revenue • Adding a balcony space in nursery or grow-finish is expensive	 *Piglets with access to the area behind the farrowing crate Photo credit: Yolande Seddon*  *Nursery pigs with access to the alley between pens Photo credit: Yolande Seddon*

SOCIAL ENRICHMENT

Visual contact with another pig

Phase of production: Boars, sows, nursery, grow-finish

Implementation	Practical considerations	Photos
• Use pen/stall walls or gates with bars so pigs can see pigs in the next-door pen/stall or a pen/stall across the alley • Provide a pen, stall or crate with a window into the next pen, stall or crate	• For individually housed pigs (boars, sick pigs), visual contact with another pig in combination with rubber mat and mirror improves immune response and lowers stress • Unclear what the effect is without the addition of the mirror and rubber mat	

Contact with other litters pre-weaning

Phase of production: Lactating piglets

Implementation	Practical considerations	Photos
• Where possible, remove adjacent pen walls in farrowing crates so several litters can co-mingle • Open the back doors of two adjacent farrowing crates towards each other to create extra space and a place to co-mingle (may interfere with farrowing room management) • Allows piglets to socialize with other litters at an age at which they would naturally do this in the wild	• Pre-weaning socialisation with other litters reduces post-weaning skin lesions • No difference of weight gain between socialized/non-socialized piglets • Cross-suckling is rare • Possibility of disease transmission between litters • Eases transition at weaning, improves disease resilience • Lowers aggression and reduces biting of pen-mates • Reduces fear, lowers stress and calms animals • Improves immune response and gut health	 *The wall between farrowing pens is replaced by a divider with an opening* *Photo credit: M. Farish (SRUC)*

Positive human interaction

Phase of production: Ideal of any age of pig

Implementation	Practical considerations	Photos
• Walk pen slowly and stop to pat, stroke, scratch and talk softly to the pigs • Let the pigs come to the handler, not the other way around • Allow physical contact when pig initiates it • Don't force an interaction with the pig	• Reduces fear, lowers stress, and calms animals • In piglets, it reduces biting of pen-mates after weaning • Improvements in growth performance and meat quality from reduction in stress in response to handling • Increases testicular cell production in boars • Increases reproductive performance in sows • An interaction the pig is trying to avoid can be stressful	

"On your daily walk through the pens to check feeders, drinkers and pig health, take a few extra minutes to interact with pigs coming to you."

NUTRITIONAL ENRICHMENT

Lick block

Phase of production: Gestation, nursery, grow-finish pigs

Implementation	Practical considerations	Photos
• Can provide on floor, tethered to a chain, or hang by rope • Can get dirty when placed on the floor • Pigs prefer blocks that are brick shaped • Follow manufacturer's instructions	• Less injury and stress from aggression • Calms animals • Increases natural behaviours • Reduces biting of pen mates • Increases learning ability in nursery pigs • Pigs may lose interest	 *Photo credit: Sifto Canadian Stockman*

Wheat straw pellets

Phase of production: Gestation

Implementation	Practical considerations	Photos
• Add 200-400 g/d/sow into the feeder	• Increases satiety • Improves neonatal survival	 *Photo credit: EZ Ag Products*

Oat straw pucks

Phase of production: Gestation

Implementation	Practical considerations	Photos
• Provide 10% of daily feed allowance	• Increases satiety • Improves piglet birth weight • Improves growth performance	 *Photo credit: Tumuluru et al. 2014*

Magnesium rich marine supplement

Phase of production: Grow-finish pigs

Implementation	Practical considerations	Photos
• CeltiCal is manufactured by Celtic Sea Minerals • Provided 59,520 mg/kg magnesium, fed at 0.05% of diet • Can use as top-dress • Follow manufacturer's instructions	• Less injury from mounting behaviour, • Improves performance and meat quality • Lowers aggression • Lowers stress	CELTIC SEA MINERALS

OCCUPATIONAL ENRICHMENT

Cognitive enrichment

Phase of production: Ideal for any age of pig

Implementation	Practical considerations	Photos
• Provide a task for pigs to learn and obtain a reward • Ensure the tasks do not frustrate the animal by proving too difficult to receive the reward, or by not delivering the reward on a constant schedule • Automation can be applied to develop cognitively rewarding systems. • Use a call feeder: a feeding station that calls individual pigs up to feed with a sound cue and pigs must press a button to receive feed	• Provoking attention and cognitive activity which is rewarded by feed may evoke positive emotions improving immune system responses • Using a call feeder for gestating sows can lower arousal and aggression during feeding and less fearfulness. • Call feeding only works well with ESF systems • Cognitive enrichment is not well studied	  *Icon credit: Muhammad Usman*

SENSORY ENRICHMENT

Music

Phase of production: Ideal for any age of pig

Implementation	Practical considerations	Photos
• Install speakers in each room • Position speakers in such a way that all animals can hear the music • Classical music can be played to pigs of any age • Play music for a few hours up to 12 hours per day, and 2 to 7 days per week • Do not play music continually, pigs need a break from the music • Avoid playing rock music as it increases stress in pigs	• Playing classical music may reduce stress and stereotypic behaviours, enhance the immune response and reduce piglet mortality • Calms animals • Reduces piglet mortality during lactation • Enhances immune system in nursery pigs • Stimulates positive behaviours (play) in nursery pigs • Many background noises (especially fans) may drown out the radio • Short term use of other types of noise has been found to increase aggression, and long-term exposure to decrease the immune response. • Some music increases fear and stress in pigs	

Massage/tactile stimulation

Phase of production: Gestating and lactating sows

Implementation	Practical considerations	Photos
• Tactile stimulation can be given on the back and sides of pigs using a variety of objects: waterproofing roller covered with synthetic grass, multipurpose work gloves, or floor scrub brushes. • Consider safety to do this with more vigilant sows	• Sows scratched on the back for 15 second/day prior to farrowing by a stockperson showed reduced piglet mortality during lactation • This is also a positive human interaction • Enhances natural behaviour/calms animals • Reduces piglet mortality during lactation • Requires time to familiarise the sows with human contact	 *Photo credit: Weaver Livestock*

Essential oils/scents

Phase of production: Ideal for any age of pig

Implementation	Practical considerations	Photos
• Pigs are attracted to some essential oils and showed a preference to enrichment items with certain odor. • Soak cotton rope in garlic oil and water solution (30 ml : 1 L). Allow to dry before giving to pigs. • Spray newsprint with a scent. • Spray Phytozen on another enrichment, such as ropes, burlap, cardboard, commercial toys, etc.	• Enhances natural behaviours • Keeps pigs interested longer in the enrichment object • Lavendar oil reduces skin lesions	 *Photo credit: Farmers Depot*

ENRICHMENT BY PHASE OF PRODUCTION

This section provides an overview of the different types of enrichments for each phase of production that has been studied. It shows what kind of effects were seen when providing these types of enrichments in specific production phases. If an enrichment is not mentioned in the table, it means that it was not studied. It does NOT mean that you can't try using it, it just means that there is no scientific evidence that the chosen enrichment will work. When choosing enrichments, remember that environmental enrichment plays a different role as pigs grow and age. For example, enrichment for growing pigs focuses mainly on reduction of boredom and stress, improvement of performance, and prevention of damaging behaviours, whereas enrichment for gestating sows focuses mostly on alleviating hunger-related stereotypic behaviours. This affects the preferences for the types of enrichment in pigs of different ages.

Gestating Sows

Enrichment type	Enrichment	Behaviour	Health	Production performance	Page	Comments
Physical - Floor covering	Rubber mat on floor		X			
Physical - bedding	Straw on the floor	X	X	X		Including effects seen in offspring
Physical – feedstuff	Straw in rack	X				Including effects seen in offspring
Physical – simple	Wood	X		X		
Physical – simple	Chain					No benefits found for pigs of any age
Physical – simple	Rubber mat, sticks	X				
Physical – simple	Hanging rope	X				
Physical – commercial toys	Easyfix Luna					No benefits found for sows
Physical - other	Increase space		X	X		Improves piglet physiological and morphological maturity
Social	Positive human interaction	X				
Nutritional	Oat straw pucks			X		
Nutritional	Lick block	X				
Nutritional	Wheat straw pellets			X		
Sensory	Music	X				Reduced stereotypic behaviour
Sensory	Massage/tactile stimulation	X				Effect seen in offspring

Boars

Enrichment type	Enrichment	Behaviour	Production performance	Page	Comments
Physical - simple	Hanging rope	X			Reduction in stereotypic behaviour
Physical - other	Increased space		X		Increased boar libido and sperm volume
Social	Positive human interaction		X		Increased testicular cell production

Farrowing Sows

Enrichment type	Enrichment	Behaviour	Health	Production performance	Page	Comments
Physical – bedding	Straw on the floor	X	X	• X		Piglet ADG improves at weaning
Physical – bedding	Peat	X				
Physical – bedding	Sawdust	X		X		
Physical – feedstuff	Straw in rack	X	X	X		
Physical – feedstuff	Dried seaweed	X				
Physical – simple	Chain					No benefits found for pigs of any age
Physical – simple	Burlap or jute	X		X		
Physical – other	Increase space	X	X	X		Piglet ADG improves at weaning

Lactation

Enrichment type	Enrichment	Behaviour	Health	Production performance	Page	Comments
Physical – floor covering	Rubber mat on floor		X			
Physical - bedding	Soil		X	X		
Physical – bedding	Sawdust			X		
Physical – bedding	Peat	X	X			
Physical – bedding	Straw on the floor	X	X	X		
Physical – feedstuff	Straw in rack	X	X			
Physical – simple	Chain					No benefits found for pigs of any age
Physical – simple	Rubber mat, sticks	X	X	X		
Physical – simple	Rope	X	X	X		
Physical – simple	Paper	X	X	X		
Physical – simple	Burlap/jute	X	X			
Physical – simple	Wood shavings	X	X	X		
Physical – simple	Logs and branches	X		X		
Physical – simple	Play feeder	X		X		
Physical – other	Increase space	X				
Social	Contact with other litters	X	X	X		
Social	Positive human interaction	X	X			
Sensory	Music			X		
Sensory	Back scratching by human			X		

Nursery

Enrichment type	Enrichment	Behaviour	Health	Production performance	Page	Comments
Physical – bedding	Peat	X	X	• X		
Physical - bedding	Straw on the floor	X		X		
Physical – feedstuff	Straw in rack	X				
Physical – feedstuff	Grass in rack	X				
Physical – simple	Chain					No benefits found for pigs of any age
Physical – simple	Plastic chews	X	X			
Physical – simple	Rubber mat and sticks	X				
Physical – simple	Rope	X		X		
Physical – simple	Paper/cardboard	X				
Physical - simple	Burlap/jute	X				
Physical – simple	Wood shavings	X				
Physical - other	Increase space	X	X	X		
Social	Positive human interaction	X				
Nutritional	Lick blocks	X				
Occupational	Cognitive enrichment		X			
Sensory	Music		X			
Sensory	Essential oils	X				

Grower and Finisher

Enrichment type	Enrichment	Behaviour	Health	Production performance	Page	Comments
Physical - bedding	Straw on the floor	X	X	X		
Physical – bedding	Peat	X	X	X		
Physcial – floor covering	Rubber mat		X [a]			
Physical – feedstuff	Straw in rack	X		X		
Physical – feedstuff	Grass in rack	X	X	X		Reduced gastric ulcers
Physical – simple	Chain					No benefits found for pigs of any age
Physical – simple	Plastic chews	X				
Physical – simple	Rubber mat and sticks	X		X		
Physical - simple	Wood	X		X		
Physical – simple	Rope	X				
Physical – simple	Paper/cardboard	X	X	X		
Physical - simple	Burlap/jute	X	X	X		
Physical – simple	Saw dust	X	X	X		
Physical - simple	Logs and branches	X	X	X		
Physical – commercial toys	Easyfix Luna	X		X		
Physical - other	Increase space	X	X	X		
Social	Visual contact with other pig		X [a]			
Social	Positive human interaction	X	X	X		
Nutritional	Magnesium rich marine supplement	X				

[a] Improvements seen in pigs housed alone when given a rubber mat, a mirror and visual contact with another pig