

Provision of enrichment for pigs: Why it matters for animals and business

There is growing global momentum to phase out gestation stalls that closely confine sows and to address a range of welfare issues relating to piglets and growing pigs.

However, there is great scope to significantly improve animal health and welfare outcomes, meat quality and business outcomes by ensuring that all animals (sows, boars and growing pigs) are provided with manipulable materials to allow for expression of natural behaviour. Despite modern genetics, pigs retain the innate need to express natural behaviours including; exploration, foraging, rooting, which, given the opportunity, they spend most their time doing [1].

This fact sheet summarises the evidence that enrichment is good for animals and good for business, and provides examples of enrichment materials being successfully used by leading producers in different parts of the world.

Addressing barriers to enrichment

Commonly cited barriers to provision of enrichment include biosecurity concerns, cost of provision of materials, and compatibility of materials with slurry systems.

These concerns have been effectively addressed by some of the world's biggest pig producers as outlined in this document who have found locally available materials improve animal welfare and financial outcomes.

The role of enrichment



Effective enrichment provides animals with materials to stimulate and express natural behaviors and reduce stress, frustration and abnormal behaviours [2 - 10] that decrease animal health and productivity.

Abnormal behaviours (for example stereotypies) are usually considered an indicator of reduced welfare [11][12] and a coping mechanism to stress in abnormal environments where natural behaviour and/or feeding is restricted.

Consequently, stereotypic behaviour in pigs usually takes the form of oral-nasal-facial manipulations. These include; sham chewing, air sucking, bar biting, water playing, repeated licking, and belly nosing. Other abnormal oral behaviours may be redirected at other pigs e.g. ear and tail biting. Abnormal behaviours waste energy, cause damage and cost money.

Photo: Pigs at a higher welfare indoor farm in the Netherlands. Sows are housed in a group with plenty of straw (including fresh delivery, pictured) and have access to an outdoor yard. The farm is run by the Ten Have-Mellema family. Netherlands
World Animal Protection / Bas Niemans

Benefits of effective enrichment:

Enrichment provides many production and health benefits for pigs. It can also prevent facility damage as animals will spend more time interacting with the enrichment materials and less time fighting with other pigs which minimises negative impacts and abnormal behaviours.

Animal welfare benefits of enrichment	Business benefits of enrichment
<ul style="list-style-type: none"> • Pigs can make choices of thermal/physical environment, what to explore and learning is stimulated [13] • Reduces fear and harmful, abnormal behaviours [14] and less fighting so generally lowers the risk of injury and/or stress to their pen-mates, also less risk of infection and less antibiotics needed. • Prevents or reduces damaging behaviours such as ear and tail biting [15][16][17][18] and associated energy/feed wasted. • Improves health and immunity (by reducing chronic stress [19], and limiting the occurrence, severity and pain of gastric ulcers [20] [21]. • Increases play, learning, exploratory, and foraging behaviours [22] [23] [24] [25] • Wallows can also have positive social and sexual behavioral implications beyond just thermoregulation [26] • Enables nest building which stimulates oxytocin release and farrowing • Increases maternal care and social bonds between sows and provides warmth for piglets [27][28] [29][30][31]. 	<ul style="list-style-type: none"> • Improves piglet coping ability and adaptability at weaning [32] • Improves sow reproductive performance as stress lasting longer than two days can cause sows to abort pregnancies [33]. • Prevents health and production impacts from teeth damage and reduced nutrition of sows. [34][35] [36] • Improves growth rates and meat quality (tenderness, less cooking moisture loss) in growing pigs [37] and increased carcass weight [38] [39] [40] [41] [42] • Reduces post-weaning diarrhoea and gastric ulcers in growing pigs [43] [44] [45] [46] [47] [48] • Reduces farrowing time and increases piglet survival rates [49] [50] • Potential reduction in the use of antimicrobials in both sows and meat pigs. • Potential export opportunities for producers seeking to access the European Union market that requires enrichment.
Negative welfare associated with lack of enrichment	Negative business implications from lack of enrichment
<p>Bar-biting is the continuous and repetitive behaviour of pigs biting the bars of their crates or pens. It is associated with confinement, lack of sufficient food to promote satiety and frustration from inability to forage.</p> <ul style="list-style-type: none"> • More common in sows in stalls than in group housing [51] • Associated with barren, unenriched environments • Associated with lack of nest-building material [52] 	<p>Bar-biting Causes damage to a pig's teeth or gums and as such may affect their eating ability.</p> <ul style="list-style-type: none"> • It has a detrimental effect on reproduction and productivity levels [53] • Common in boars spending a majority of their time 'motionless' in barren pens affecting their reproductive performance [54]

Sham-chewing (also known as vacuum-chewing or champing), is the continuous action of chewing when no food is in the pig's mouth and is commonly seen in sows. It usually involves jaw movements, mouth gaping and the production of foaming saliva [55], it is associated with insufficient and/or low fibre feed, housing and age.

- It occurs in around 52-69% of sows [56][57][58] and when measured is often the most prevalent stereotypy [59]
- More common in dry sows housed in stalls than in groups [60][61] [62]
- Has been reported to increase (8.14% to 13.1% of sows) as parity increases (0 - 3) [63].

Sham-chewing causes injury to teeth, gums and jaws, and consequently may affect sow eating ability

- Reduced feeding and nutrition may then have a detrimental effect on reproduction and productivity levels [64] [65] [66]
- Sows with severe teeth wear have fewer lifetime piglets born alive and fewer piglets born per sow than sows without severe teeth wear [67]

Other destructive behaviours not only affect the welfare of pen mates, they also damage facilities and equipment.

- Flank or belly nosing commonly seen in early-weaned piglets, usually between 3-7 days post weaning
- Belly/flank nosing can be seen in up to 50% of piglets weaned 16-18 days to 81% weaned 12-14 days [68][69].

Other abnormal behaviours that affect animal welfare as a result of permanent stress are:

- Air sucking
- Water playing
- Repeated licking of other pigs, pen, bars

Destructive behaviours against pen mates generate lesions and illness and also increase the production cost and additional treatments.

- Tail, flank, ear, and vulva biting, belly nosing are the most common behaviours that cause infections and economic losses, disease or carcass condemnation
- Also associated with energy wastage and a reduction in growth rate [70].
- Reduced immunity and resilience to disease.



Photo: Growing pigs interacting with point source and substrate (straw) enrichment. Denmark.

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Photo: Dexing Farm near Shantou city in Guangdong Province in China. World Animal Protection

Example: Lack of enrichment generates permanent stress:

- Both acute and chronic stress have implications on the immune system and reproductive performance [71] [72].
- Stress lasting longer than two days can cause sows to abort pregnancies [73].

Several feeding factors can produce severe animal welfare problems

- Restricted feeding of sows generates chronic hunger and oesophageal and gastric ulcers (OGU) and feeder competition leads to vulva biting.
- Concentrated pellet/grain feed and lack of insoluble fibre or foraging material produces also OGU [74] [75]
- In some cases up to 67% of growing pigs have gastric ulcers at slaughter [76]

Characteristics of effective enrichment

Effective enrichment can be achieved by providing pigs with materials and objects with 'ingestible' (or edible components that can be assimilated by the pig), 'chewable', 'odorous', 'deformable' and 'destructible' characteristics [77] and where possible provide physical comfort [78]. Effective enrichment must be novel, varied and offered regularly. Novelty increases interaction, so pigs can be stimulated by regularly changing the enrichment objects in their environment.

Complex items which are clean, edible and destructible are most attractive to pigs [79] [80] as these are tactile and rewarding [81].

Effective enrichment also needs to be suitably located in the pen. It must be readily available locally, cost effective and practical to maintain. It also needs to be safe and not generate any risks for pigs or for the farm [82][83][84][85].

Enrichment examples from pig producers

BETAGRO in Thailand:

Betagro Group is a vertically integrated food producing company and among the top 20 global pig producers. It produces 2.4 million pigs for consumption annually. In September 2017, the company committed to transform all company sow housing to enriched group systems and free farrowing by 2027.

Enriched group systems and free farrowing produce stronger, less stressed sows, fewer stillborn piglets and better mothers whose piglets are more robust and heavier at weaning.

Nesting behaviour helps trigger farrowing and the pen enables better piglet colostrum uptake, immunity, weaning weight and piglet adaptability. The nesting mats can be broken up/chewed by the sows allowing them to fulfil their nesting instinct. This material also allows the pens to be easily cleaned and staff welcome its use too. Betagro is also using enrichment for growing pigs to enable phasing out of tail docking and further minimising tail biting.



Photo: A fibre dispenser – part of Betagro's group housing system – encourages pregnant sows to move more freely and socialize as they feed. Photo: Betagro Group, Thailand.

Behavioural motivations of sows at farrowing

- Modern sows are still motivated to perform elaborate nest building behaviour before farrowing.
- Nesting is an important maternal behaviour, stimulating oxytocin release, with branches and straw bedding being optimal material.
- Nest building in crates (vs pens) is not satisfactory. Restricted space and no access to nest-building substrates can be associated with longer parturition, and more stillbirths.

QINGLIAN in China:



Zhejiang Qinglian Food Company Ltd (Qinglian) is a vertically integrated business with more than 1,200 retailer outlets in China. Its pig unit breeds from 10,000 sows which produce 200,000 pigs annually.

Qinglian has now committed to replacing gestation stalls with enriched group housing for all pregnant sows by 2025. They have found that sows are happier and healthier and producing more robust piglets. They are also providing growing pigs more room to move, comfortable flooring and effective enrichment.

Photo: Fresh grass in hanging baskets at a Qinglian farm. China.

BRF in Brazil:

BRF is Brazil's largest pig producer and one of the world's top 10. They have obtained excellent production results by implementing effective enrichment. According to their initial results, effective environmental enrichment (using straw, fibre in racks, ropes or bedding) reduces harmful social interactions such as fighting, tail biting, and biting of the vulva as well as enabling expression of natural behaviour.

Effective enrichment is well received by BRF employees as it generates successful welfare outcomes such as improved behaviour and those results are leading to positive yield outcomes. Straw bedding is used for sow enrichment on some farms. On others, straw is scattered on solid flooring or knotted sisal ropes are provided in the activity areas of the pens.



Photo: BRF provides straw for the group sow housing system. Brazil.

MAPLE LEAF FOODS (MLF) in Canada:

MLF was the first large-scale Canadian production company to commit to phase out gestation stalls and they are currently piloting the implementation of effective enrichment for sows and growing pigs.

Greg Douglas, vice president of animal care at MLF states: "We're trying to have a programme that's comprehensive for training, for oversight, and aligned with what society is expecting of us as a company... open housing is absolutely critical and it really helps me align my values of caring for animals and making sure we look through their eyes in providing care and animal health and welfare."

Practical considerations:

- It is important that animals have continuous daily access to effective enrichment.
- Bedding (especially if edible, like straw) provides the most consistent increased weight gain in growing pigs (vs point source enrichment) [86] [87]
- Pigs spend more time interacting with items suspended at eye or floor level, and with deformable items like wood or rope [88].
- Enrichment placed at ground level may become soiled in faeces, which makes it less attractive to the pigs whereas suspended items are less likely to get covered in excrement and thus will remain attractive for longer [89].
- Objects placed on the ground are still beneficial as they can be distributed throughout pens and can be removed easily for cleaning purposes.
- Many 'toys' are not acceptable as pigs lose interest in them rapidly or they are unsafe [90] (basic balls, bamboo, chains, tyres with wire). Enrichment that may damage the mouth or is not regularly used will not be effective.
- If 'toys' are used, they should meet most criteria and be hung or mounted in the activity area of pens (usually near drinkers) with a plan for regular rotation of different objects about every 5 days to ensure novelty and use by pigs, or ideally along with bedding.

Optimal enrichment materials:



Photo: World Animal Protection. Sows in enriched group housing with deep bedding in a higher welfare indoor farm in the UK

Straw or edible fibre: Is the most preferred enrichment for pigs in terms of improving comfort and reducing aggression, skin lesions, stereotypies, destructive behaviour (tail, flank, ear, vulva biting) and piglet mortality [91][92]. It can be provided as bedding ideally or scattered on the floor of the pen for daily consumption or in racks or baskets.

- It can occupy pigs for up to 25% of their active time.
- It has thermal, comfort and nutritional qualities, and stimulates rooting and foraging behaviour [93][94][95].
- It can be eaten and provides additional fibre, reducing gastric ulceration and chronic hunger for pregnant sows and reducing constipation.
- Pigs need a sufficient quantity of edible fibrous material to fulfil their needs; 100g/day has been shown to increase pig activity and satisfy exploration, but additional benefits were seen with 300-500g/day including reduced oral manipulation of pen mates, fewer gastric ulcers and increased growth rate [96][97][98][99].
- As pre-farrowing nest-building substrate for pregnant sows, 2 kg of long straw is recommended at least 2 days before farrowing. Such material also helps to dry newborn piglets and keep them warm initially.
- Chopped straw may not be as effective at eliciting manipulation behaviour by pigs [100].
- Baskets or racks for straw (or other edible materials) should have spaces about the size of pig's nose to ensure the system is rewarding, not frustrating

Sub - optimal enrichment materials:

Rice hulls, woodshavings, and other substrates:

Other materials that can be used are hay, silage, other crop byproducts, wood shavings, sawdust, chopped grasses, branches, coconut husks, and peat - some of which have been found to be equal to or better than straw [101][102].

- Use of silage and hay increases activity, foraging and exploratory behaviour, and reduces aggression, oral stereotypies and skin lesions [103], [104], [105]
- Some of these materials are perhaps even more attractive to pigs than straw as they have high ingestible and odorous characteristics [106].
- To consider: These materials are not compatible with slatted floors, but they can be beneficial when added to the pens over solid flooring or as suitable in troughs or racks.



Photo: World Animal Protection

Point source enrichment objects:

- **Rope or jute sacks - suspended or mounted:** Hanging ropes or sacks, made of natural fibres (such as sisal or jute) can be pulled, shaken, chewed, and torn apart and are far more effective than metal chains. It is recommended that ropes should be around 1m in length and should be positioned so that the ends touch the floor, as pigs perform rooting behaviour with their heads down near the ground and are less likely to manipulate a rope when they have to lift their. Additionally, knots can be made in the rope to increase attraction and at the end serve to prolong the use of the rope [107].
- **Toys - Suspended or moveable:** Objects or 'toys' can be homemade or commercially bought but they should meet most of the necessary criteria to engage and be rewarding to pigs.
- **Ice - moveable:** pigs lose interest in many objects as the novelty wears off however the ice blocks keep pigs' interest as they melt and change shape. The blocks hollow out as they melt allowing the pigs to lift them with their snouts.



Photo: Sows occupy themselves with a rope enrichment activity. Dexing Farm near Shantou city in Guangdong Province in China.



Photo: Dexing Farm near Shantou city in Guangdong Province in China. World Animal Protection

- **Wood – suspended, moveable or wall mounted:** Soft wood is recommended over hard wood, however freshly cut branches may be more odorous and easier for pigs to manipulate than a simple wooden block [108]. Branches can also be used by sows for nest building [109].
- **Scratching Brushes – wall mounted:** The end of a stiff floor brush can be attached to the wall at about the sows' head level to enable pigs to scratch and relieve dry, itchy skin. Automatic rotating brushes can also be bought but are more expensive than homemade options.

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Annex: Enrichment (page 1) – resource examples for indoor pig farming systems.








































These are some suggested examples of enrichment drawn from materials used in different contexts globally. It is up to farms to consider what materials are suitable for them that best meets the 4 key properties (rootable, edible, chewable, destructible). In the table below, optimal resources are noted with ticks / the colour green ✓; sub-optimal resources are noted with the colour orange ? and resources with marginal impact are noted with the colour red ✗. Continuous daily access to enrichment is recommended for best results.

Resource Type		 Rootable	 Edible	 Chewable	 Destructible	Summary
Straw		✓	✓	✓	✓	Meets behavioural, some hunger and physical comfort needs - reduces gastric ulcers, tail biting and aggression OPTIMAL - CAN BE USED ON ITS OWN, AS BEDDING
Hay		✓	✓	✓	✓	Meets behavioural, some hunger and physical comfort needs - reduces gastric ulcers, tail biting and aggression OPTIMAL - CAN BE USED ON ITS OWN, AS BEDDING
Silage		✓	✓	✓	✓	Meets behavioural, some hunger and physical comfort needs - reduces gastric ulcers, tail biting and aggression OPTIMAL - CAN BE USED ON ITS OWN, AS BEDDING
*Rack		?	✓	✓	✓	*Compatible with straw, hay, silage, cabbages or other root vegetables etc. - place in activity area. GOOD IF REPLENISHED DAILY
*Basket		?	✓	✓	✓	*Compatible with straw, hay, silage, cabbages or other root vegetables etc.-place in activity area GOOD IF REPLENISHED DAILY
*Tray		?	✓	✓	✓	*Compatible with peat, bark, sawdust etc - bolt down in activity area GOOD IF REPLENISHED DAILY
Peat, soil or compost		✓	?	?	✓	Only some behaviours met. May contain edible components such as plant roots SUB-OPTIMAL
Sawdust		✓	?	?	✗	Only some behaviours met. Can be ingested but has risk of enteric diseases. SUB-OPTIMAL
Wood Shavings		✓	?	?	✗	Only some behaviours met. Can be ingested but has risk of enteric diseases. SUB-OPTIMAL

Continuous daily access to enrichment is recommended for best results.

Enrichment (page 2) – object examples for indoor pig farming systems.

The aim of this poster is to encourage farms to consider what is available to them that best meets the 4 key properties of enrichment (rootable, edible, chewable, destructible). Continuous daily access to enrichment is recommended for best results. Hanging objects are better than those placed on the floor as they remain cleaner and can be placed in the right location to attract pigs. The more ticks the better but these objects should not be used on their own, especially marginal objects.

Object Type	 Rootable	 Edible	 Chewable	 Destructible	Summary
Ice 					Some rooting possible as can be manipulated by snout – seasonal. NOT RECOMMENDED for USE ON ITS OWN
Edible Branches 					Rooting and nest building behaviour possible if provided at ground level – place in activity area and farrowing crate NOT RECOMMENDED for USE ON ITS OWN
Hessian Sack 					Some rooting possible if sacking left at floor level – place in activity area and farrowing crate (if room). NOT RECOMMENDED for USE ON ITS OWN
Non-Toxic Cardboard 					Not edible if recycled cardboards contain toxins - place in activity area. NOT RECOMMENDED for USE ON ITS OWN
Natural Fibre Rope 					Some rooting behaviour possible if long enough to trail on floor - place in activity area. Tie in activity area – ideally between pens for pig ‘tug of war’. Knotted end will last longer. NOT RECOMMEND for USE ON ITS OWN
Non-Toxic Wood 					Soft wood should be used rather than hard wood – place in activity area. It can also be attached to side of pen. NOT RECOMMEND FOR USE ON ITS OWN
Food Ball 					Food rewards encourage rooting behaviour – more than one required per pen to avoid competition. Hanging versions also possible – place in activity area. NOT RECOMMENDED FOR USE ON ITS OWN

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