

# Pigs for prosperity

FAO Diversification booklet 15



Diversification booklet number 15

# Pigs for Prosperity

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# Preface

The purpose of the FAO Diversification booklets is to raise awareness and provide decision support information about opportunities at farm and local community level to increase the incomes of small-scale farmers.

Each booklet focuses on a farm or non-farm enterprise that can be integrated into small farms to increase incomes and enhance livelihoods. The enterprises profiled in the FAO Diversification booklets are suitable for smallholder farmers in terms of resource requirements, additional costs, exposure to risk and complexity. The products or services generated by the enterprises are suitable for meeting demand on a growing, or already strong, local market and are not dependent on an export market.

The main target audience for these booklets are people and organizations that provide advisory, business and technical support services to resource-poor small-scale farmers and local communities in low- and middle-income countries. It is hoped that enough information is given to help these support service providers to consider new income-generating opportunities and how these might enable small-scale farmers to take action. What are the potential benefits? What are farmer requirements and constraints? What are critical ‘success factors’?

The FAO Diversification booklets are also targeted to policy-makers and programme managers in government and non-governmental organizations. What actions might policy-makers take to create enabling environments for small-scale farmers to diversify into new income-generating activities?

The FAO Diversification booklets are not intended to be technical ‘how to do it’ guidelines. Readers will need to seek more information or technical support, so as to provide farmer advisory and support activities relating to the introduction of new income-generating activities. To assist in this respect, each booklet identifies additional sources of information, technical support and website addresses.

A CD has been prepared with a full series of FAO Diversification booklets and FAO technical guides, together with complementary guides on market research, financing, business planning, etc. Copies of the CD are available on request from FAO. FAO Diversification booklets can also be downloaded from the FAO Internet site.

If you find this booklet of value, we would like to hear from you. Tell your colleagues and friends about it. FAO would welcome suggestions about possible changes for enhancing our next edition or regarding relevant topics for other booklets. By sharing your views and ideas with us we can provide better services to you.

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## *Acknowledgements for the series*

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# Introduction

Small and medium sized livestock like poultry, sheep, goats, and in particular pigs are a viable and profitable enterprise that can be easily adopted and adapted by small-scale farmers. Pigs require little initial investment; they are prolific and are good feed to meat converters compared to other livestock such as cattle. Pigs produce meat (pork) without contributing to the degradation of grazing lands and pork is particularly suitable for processing. Further pork provides a more varied diet for the farm family and pigs are one of the few livestock animals where nearly all parts of the animal can be consumed by the farm family and/or sold.

Pig products range from primary commodities such as pork, to processed food products such as sausages and smoked hams to cooked salted ears, eaten as snack foods. Different pig breeds have been adapted to the most diverse climatic conditions with a good degree of success.

Production systems vary widely throughout the world, ranging from labour intensive systems to capital intensive systems. Small-scale farmers new to pig enterprises advisably commence the activity with a focus on adequate pig confinement using simple housing structures and prevalently local feed resources.



*FIGURE 1 Pigs in a confined production system in the Philippines  
(Photo by J. Mounsey)*

Practical extension and training enables farmers to raise pigs successfully and to apply simple processing techniques to produce various pork products. This increases the value of the commodity and enables small-scale farmers to sell pig products over and above slaughter time.

Pigs are easily integrated into small-scale farming systems and can be fed with by-products from crops that cannot be consumed or used more efficiently by small-scale farmers. Their manure can be used as fertilizer as well as for energy production systems. Apart from regions with cultural and religious reservations towards pork, pigs are potentially a viable, valuable and important diversification enterprise.

### ■ *Pigs and livelihoods*

A pig enterprise contributes in many ways to improve the livelihood of poor and vulnerable small-scale farmers. Pork and other pig products provide for high value animal protein, the meat is easy to dress and has superior curing and storage qualities. Additional income is earned from the sale of animals and importantly from their products. This additional income can be used to invest in farm assets, pay for school fees and medical treatments.

Pigs provide income for women, strengthening their role in families as well as in local communities. The sick and disabled can participate in pig raising as it does not require excessive labour and is not too complex in its management. The low start-up costs and small investments required for buildings and equipment are recovered fairly quickly as slaughter can take place at about six to eight months from farrowing (birth), pending on breed and feed availability. Pigs additionally can be considered as a store of wealth and a safety net in times of crisis.

The pig, depending on feed and other management aspects, commonly grows rapidly to slaughter age and has a high reproductive rate compared to ruminants, making it a low risk investment with quick returns. Additionally, pig husbandry can be easily integrated with a series of other farming activities within the agricultural and aquaculture sectors (see FAO Diversification Booklet No.13 *Farm ponds for water, fish and livelihoods*). Pig production is a form of livestock keeping that does not necessarily require access to agricultural land and has therefore gained importance in the growing sector of peri-urban and urban small-scale livestock keeping. All these

advantages make the livelihood activity of pig production a valuable diversification option in small-scale production systems, comparable to some degree to small-scale poultry,

sheep and goat production (see FAO Diversification Booklets No.3 *Products and profit from poultry* and No.9 *Sheep and goats for diverse products and profits*).



FIGURE 2 Pigs and poultry on a farm in Brazil  
(Photo: FAO/19281)

### CASE STUDY 1 **The role of pigs in Lao People's Democratic Republic, Cambodia, Viet Nam and the Philippines**

Farmers recognize the importance of pig enterprises as a major source of family income, as a supplementary source of funds for particular purposes, for example to finance children's schooling, to use during the celebration of cultural events, or to pay off a debt, or as a 'savings bank'. In Southeast Asia, pig production has three important functions, namely: (1) the diversification of resources and the reduction of socio-economic risks, (2) the promotion of linkages between systems and resource components (land, water, crops, and animals), and (3) the generation of value added products, for example the recycling of fibrous crop residues to produce meat, and the use of manure.

Source: Adapted from Huynh, T.T.T., et al. 2006. *Pig production in Cambodia, Laos, Philippines, and Vietnam: A review*, *Asian Journal of Agriculture and Development*, Vol.3, Nos.1 & 2

## CASE STUDY 2 Keeping pigs improves livelihoods in the Northeastern region of India

The Northeastern region of India is characterized by a high proportion of tribal people. For these people pig keeping is an integral way of life; over a quarter of all India's pigs are found in the Northeastern region. Assam is the major state in the region, with a population of 27 million and the biggest pig herd of over 1.5 million. The demand for animal-based food sources is increasing in the Northeastern region as well as in India in general. Pig production in Assam is invariably a small-scale, backyard, marketed-oriented enterprise. It is practised mainly by small-scale farmers to generate income, accumulate capital and fulfil socio-cultural obligations. It is a low-external input enterprise dependant on family labour, mainly women, and on other local inputs, particularly feed, that have no or low opportunity costs. Traditional management practices continue to dominate production with two exceptions: scavenging systems have given way to tethering or penning and most indigenous pigs have been replaced by crossbreeds.

Despite being small-scale (generally no more than one to five crossbred pigs), production contributes significantly to the livelihood of the majority of pig-rearing households. The income from pig sales meets essential household and farming expenses, and provides some financial independence for women.

Traders and retailers reported that demand for slaughter pigs and fresh pork had increased significantly over the last five years causing a 20 percent increase in the price of pork in real terms. In addition, pork traders and retailers are confident that sales of fresh pork would continue to grow as a result of the continuing rise in demand. These changes resulted not only in more pigs being produced from the hundreds of thousands of small-scale farms, with evident benefits to livelihoods, but also to the many more people earning a living from the marketing of pigs, piglets and pork.

There are also indications that pig production is gaining a foothold as a source of income generation in communities that do not have a tradition for rearing pigs.

*Source: Adapted from Deka, R., Thrope, W., Lucila Lapar, M. & Kumar, A.2007. Assam's pig sub-sector: current status, constraints and opportunities, ILRI, New Dehli*

The productivity of pigs is determined by the breed and overall husbandry management. Well managed breeding sows (a female pig) of improved breeds will farrow (give birth) twice a year and provide approximately 10 piglets per litter or

20 piglets/year. Weaned piglets can be sold for income generation and/or fattening can be performed on farm, allowing the farmer the option to choose the time of slaughter/selling, for example, when prices are favourable.



*FIGURE 3 Piglets suckling a sow  
(Photo: FAO/22667/J. Spaul)*

### ■ ***Purpose of the booklet***

The purpose of this booklet is to highlight the many opportunities and benefits that pigs can provide to small-scale farmers, reducing their vulnerability and increasing their food and income security as well

as providing a high value animal protein for more balanced diets. The booklet is focused on creating awareness and promoting pigs as a viable diversification enterprise within the context of small-scale farming.

## Benefits of pigs

### ■ *Pig products*

Each pig provides for numerous products and on-farm processing can provide for a wide range of products. The main commodity of pig production is pork. Pork represents high value animal protein and is the most consumed meat in the world. As a result of the great variability between pig breeds, carcasses have differing characteristics ranging from high lean meat percentages (as desired in many Western societies)

to high intramuscular fat and back fat contents (as often appreciated in more traditional societies).

Slaughtered pork that is not destined for immediate marketing, processing and consumption requires a functioning cold chain to avert product spoilage.

Besides traditional meat cuts found locally, many other pig products find their way into the food chain. These include pig fat, brain, feet, ears, blood and organs



**FIGURE 4** *Pork on sale in a market in Hanoi, Viet Nam*  
(Photo by O. Argenti)

(for example, liver and stomach). Commonly other pig by-products are used for many and various purposes. For example, intestines for sausage casings, bone collagen is used in the food processing and cosmetic industry, hairs are used for brushes, etc.

Pork processing can lead to a great variety of products meeting the demand of specific consumption patterns. The number of processed products can be extensive, ranging from simple salted and sun dried pork, to cured sausages to smoked ham. Mainstream processed pork products are commonly accompanied by some

local specialties that may include more traditional recipes and herbs or spices (see FAO Diversification booklet No. 20 *Spices and herbs for home and market*). Pork can be processed on-farm provided that appropriate training has been given, especially in terms of food hygiene and safety.

#### ■ *Pigs at household level*

At household level pig production provides access to animal protein for farm families, contributing to an improved diet for family members. Pork with its beneficial components like essential amino acids, vitamins and iron, facilitates a balanced



*FIGURE 5 Pork products: cured sausages*  
(Photo by P. Hautzinger)

### CASE STUDY 3 Pigs at household level in Kaduna State, Nigeria

Pig enterprises are commonly used for food for the family as pigs grow at a fast rate and are prolific. They provide a good source of animal protein representing one of the fastest ways of increasing animal protein consumption in households in Kaduna State. Pigs can be considered as potential protein deficit gap-fillers.

Pigs are importantly also raised as a source of additional income and investment in case of hard times. The additional income is especially important for women. Incomes derived from the sale of pigs are usually spent on the acquisition of household goods and in meeting social and cultural obligations.

*Source: Adapted from Ajala, M.K., Adesehinwa, A.O.K. & Mohammed, A.K. 2007. Characteristics of smallholder pig production in Southern Kaduna area of Kaduna State, Nigeria, American-Eurasian Journal of Agriculture and Environmental Science, 2, pp. 182-188*

nutrition which is especially important for young children in food insecure regions. On-farm processing of pork can produce products with improved storage characteristics, enabling meat consumption throughout the year regardless of when slaughter occurs.

In many societies women are traditionally responsible for raising, feeding and caring for animals. Commonly when pigs are sold, men get involved, often curtailing women's access to income. The development of a smallholder pig sector thus needs to consider gender issues and this can be supported by extension services and appropriate training. Pigs can contribute positively to the empowerment of women and enhance their equal participation in local markets. It

can give women a better say in family matters, allow for their own income to be earned and in case of widowhood or abandonment can provide a safety net. It can also give women a greater role in their local communities. Activities in small-scale pig production often require additional labour. Family members participate in the enterprise and this provides more employment opportunities for the farm family.

The level of technical skills and physical strength needed to succeed in small-scale production are minimal and routines required can easily be understood. Tasks can be split among all family members including people suffering from disabilities or suffering from illnesses such as HIV/AIDS. Pig management does not commonly involve excessive labour.

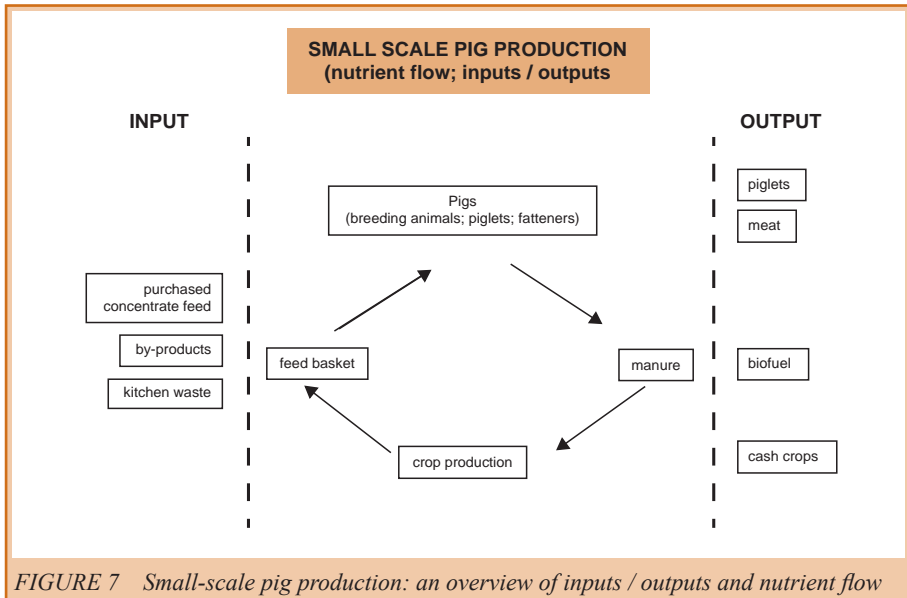


On-farm processing enables new skills and knowledge to be learnt and provides for more varied products to be sold and further employment opportunities for the farm family. Women that are involved in the raising of pigs can also get involved in processing of pork giving them yet another source of income deriving from pig enterprises. Kitchen processing is easy to set up, has very few start-up costs and can be a first step towards a more formalized operation where appropriate equipment is bought and a room in the farm household or a small building on the farm is devoted to processing operations. However before any such progress is made there has to be a corresponding market demand and importantly sales to make such investments feasible.

In poor rural but also peri-urban areas, pig production often functions as a banking system where the animal is a source of wealth that can be accessed when additional income is needed. This might be the case when school fees need to be paid, household members seek medical assistance or cash is needed for further investments. In this regard, pigs represent an attractive intermediate between poultry production (see FAO Diversification Booklet No 3 *Products and profit from poultry*), which can be initiated with very little money and the more long term oriented cattle production option requiring far higher cash outlays (see FAO Diversification Booklet No 6 *Milk for health and wealth*).



*FIGURE 6 A woman feeding her pigs in Myanmar  
(Photo: FAO/19759/ G. Bizzarri)*



### ■ *Pigs and the farming system*

A small pig enterprise relying on little or no external inputs fits well in to a small-scale farming system. Basic forms of production are easy to incorporate into existing farming activities; they do not require large investments or technical skills that would make the initial hurdle too high to overcome as a result of limited access to financial and natural resources by small-scale farmers.

Introducing pigs to a farming system can be beneficial for a series of agricultural activities. Pigs produce meat without interfering with grazing lands. The animals can feed off by-products from cash crop production or kitchen leftovers and therefore add value

to nutrients that would otherwise have been lost to the farming system. Pigs can roam on crop fields after harvest and while searching for food they loosen soil structures without disrupting them.

Their manure is a valuable fertilizer that can contribute to increased agricultural productivity and/or it can be used as a source of fuel when processed in a bio-digester. Methane production from pig manure collected in small-scale pig holdings can be sufficient to cover the demand for household cooking stoves and therefore reduce the dependency on external energy sources like wood or fossil fuels (see Figure 8). Incorporated in aquaculture systems, their manure can fertilize ponds which in turn feed fish – a common practice



*FIGURE 8 A kitchen stove in rural Sichuan, People's Republic of China, where a woman is cooking with biogas which she produces in her yard with the waste from her pigsty and family latrine.*

*(Photo: FAO/9941/F. Botts)*

in Southeast Asia that can be adopted in other regions of the world (see FAO Diversification Booklet No.13 *Farm ponds for water, fish and livelihoods*).

#### ■ ***Pigs and rural development***

A functioning small-scale pig sector in rural areas has proven to be very beneficial for rural development. Pig production brings fast returns to the farmer from relatively small investments and can therefore improve livelihoods within a relatively short time frame. Following the supply chain, starting from feed production over the breeding process all the way

to slaughter and processing, a series of activities can be developed that all contribute to high local engagement in livestock production. Developed local markets will improve food security of the rural population; increase economic development and therefore avoid further urbanization. With this potentially high degree of engagement by a series of stakeholders, rural farmers can be encouraged to develop producer-managed organizations that will improve their standing within the marketing chain and increase solidarity within the community. At the same time these developments



*FIGURE 9 Pig pens around a 'feed-crop garden' – pig manure is used as fertilizer  
(Photo by K. Dietze)*

can represent the impulse needed for further investments in infrastructure and marketing structures beyond the pig sector alone.

## Feasibility of the livelihood activity

### ■ *Starting the business*

Importantly every small-scale farmer's situation and context is different and this requires that any development project for promoting pigs as a diversification enterprise highlights the necessity that all small-scale farmers, involved in such a project, carry out a feasibility study.

In a feasibility study the primary factor to consider is local market demand for pigs, piglets, pork and related products. If an active demand is found, as a result of the market information obtained, an appropriate pig breed needs to be chosen. In the choice of pig breed local conditions, animal adaptability, suppliers of such breeds and feed and water supplies need to be

taken into consideration. Estimates will have to be made if feed can be grown and/or bought and which option is the most feasible in terms of costs, labour time, etc. The production system to adopt needs also to be considered as this relates to market demand as well as to the farmers resources and access to credit. Production systems can be free roaming, semi-intensive and intensive. Commonly for market purposes semi-intensive and intensive production systems are adopted at small-scale level. Housing and equipment will need to be taken into account, such as feeders, water troughs, fencing, housing materials, etc. Credit and its availability will also need to be considered.



*FIGURE 10 Piglets in a sty near Bouaké, Côte d'Ivoire. A good foundation to build a business enterprise is piglets of an appropriate breed*

*(Photo: FAO/10222/J. Van Aker)*

## **BOX 1 Main areas of consideration in a pig enterprise feasibility plan**

- Markets and market demand
- Pig breed
- System of pig production to adopt
- Housing and related equipment
- Feed and feed sources and access to them
- Water sources and quantities locally available
- Health care and veterinary assistance
- Credit and access to credit

Farmers also need to evaluate the opportunity of moving downstream in the supply chain by adding value to pork with a small-scale processing enterprise. Even for this type of enterprise farmers need to consider such aspects as market demand, estimate what prices can be made and work backwards from this information to verify if there is a potential business. A small-scale processing business can range from 'kitchen' processing to a more formal small building on farm for processing operations. In this case also equipment costs, access to credit, processing operations and throughput will need to be estimated prior to commencing the business operation.

Overall small-scale farmers require assistance and support in planning such a business enterprise.

Whatever support is provided it is critical that the final decision of whether to start the business is based solely on farmers' evaluations alone.

### ■ ***What products?***

The first step in starting any pig enterprise is to ascertain market demand as well as finding out as much as possible about markets. Market research involves such aspects as finding out what is demanded by markets, what prices can be obtained, how much markets take in terms of supplies, how can markets be accessed, what transport is available, etc.

The type of market research to undertake will clearly depend on the farmer's objectives and vary accordingly. For example, if piglets are supplied to other

farmers then a simple investigation on when such farmers demand piglets, what prices they are willing to pay and when supply is required may well be sufficient. If on the other hand a farmer wants to sell pigs to the local butcher, then the investigation may be more complex. For example it will be necessary to find out if others are supplying the butcher, what prices are paid, what quantities are being supplied, how often do pigs need to be supplied, when are payments made, etc. This type of market research may be beyond the reach of the small-scale farmer and time spent and costs can be reduced when small-scale farmers are part of a marketing association. Marketing associations as well as producer association can provide more knowledge about existing markets, their potential and prices.

Market research also needs to be conducted for processed pork products. This may involve, as above, finding out market prices, suitable market outlets and quantities that can be supplied. However additional research is advisable in terms of testing the various products. This involves setting up a tasting investigation. For example a small batch of sausages with added spices and

herbs can be made. Friends, neighbours and the local butcher can be asked to taste them and give their opinion on them. If the majority of responses are positive then the pig product has a greater likelihood of being successful. If the majority of responses to the tasting study are negative, small-scale farmers can avert large and costly supplies of pork meat being processed into a product that seemingly has little or no demand.

Information that is related to markets can be very helpful in decision-making and guides production decisions, for example timing schedules for selling piglets for fattening, how many pigs to raise in a season, optimal herd number, etc. Information on markets is also useful for marketing planning reasons, for example finding out what products are in most demand, when to sell, who to sell too, what prices can be obtained, etc. Importantly market research cannot guarantee success and cannot eliminate commercial risk. Market research can only reduce risk by supporting decision-making with pertinent information. Further information sources on market research can be found in the '*Selected further reading*' section of this booklet.



*FIGURE 11 Pigs sold on hoof. In this market in Baoshan, Weishan County, Yunnan Province, People's Republic of China, pigs are weighed to determine their selling price (Photo: by courtesy International Livestock Research Institute)*

#### **CASE STUDY 4 Demand for pork in Cambodia**

Local pig breeds in Cambodia usually have lower productivity than exotic and cross breeds. Consumers in a survey gave higher scores for pig meat from local breeds more than from exotic and cross breeds. One of the reasons for giving a higher rating for meat from local breeds was that local breeds were perceived by consumers as being raised without hormones or antibiotics.

*Source: Adapted from ILRI. 2008. Pig systems in Southeast Asia-The case of Cambodia, Nairobi*

#### ■ **Credit**

Entry into a small-scale pig enterprise is not very costly in terms of money, materials and required equipment, however the more commercially-oriented the operation the more inputs will be required. The size of the pig enterprise and level of commercial

activity are not easy to estimate exactly, however the terms of credit, payback periods and interest rates, and importantly access to credit need to be considered.

Semi-intensive and intensive pig production entails an initial investment which not all small-scale farmers may have. Commonly





*FIGURE 12 Semi-intensive pig production: iron fencing and a sty made of bricks can be fairly expensive for some small-scale farmers*

*(Photo: by courtesy International Livestock Research Institute)*

buildings, fencing, water troughs, other equipment, feed, medicines and some labour are needed. Buildings can be particularly expensive for small-scale farmers as fencing and other equipment required to confine pigs. Feed, vaccinations as well as medicines and other inputs, can also be costly for small-scale farmers and they may not have the necessary funds to be able to finance such an operation. During the marketing period of a pig enterprise inputs are required, for example paying for slaughter services, transport, market fees, etc.

The above implies making a detailed estimate of the money required, the period of the year when money is required, the various options of where the money can be sourced from and understanding interest rates involved as well as the period of loan repayments. Commonly it is difficult for small-scale farmers in rural areas to obtain loans from the formal banking system. Alternative sources of finance could be from donor organizations, donor projects and other microfinance initiatives.

### ■ *Costs and profits*

In the estimation of pig enterprise feasibility small-scale farmers need to calculate all production and marketing costs, as well as processing costs if this is an option taken. Start-up costs are such matters as capital costs; housing, equipment such as buckets, fencing, housing materials needed, as well as buying piglets, etc. Production costs relate to labour, feed, water and veterinary costs and medicines. Marketing costs typically involve transport, market fees, etc. If processing on-farm is taken as an option costs will involve tables for cutting meat on, knives, small equipment for mincing and preparing sausages, etc., as well as storage space for curing, and so forth.

Once costs have been estimated they will need to be compared against market prices of pig products and this will provide an estimate of the profit potential for such an enterprise.

### ■ *Evaluation of the livelihood activity*

Clearly profit potential is the critical and important indicator for evaluating if a pig enterprise is feasible or not. However other factors also need to be considered: for example, the true willingness of small-scale farmers to start a pig enterprise; their motivations;

required changes to the current farming system; increased work load on the farm family; women and social factors constraining business operation; social status of pig herding, etc. All in all the final evaluation of the feasibility of the enterprise needs to consider all pertinent factors discussed so far. The final decision though of whether or not to start a pig enterprise needs to rest in the decision realm of small-scale farmers.

# The livelihood activity

## ■ *Essential elements of the activity*

Pig enterprises at small-scale farm level have five main elements that need to be considered: breeds, housing, feeding, health and slaughtering. However particular attention also needs to be given to public health issues as well as environmental issues and animal welfare concerns.

### **Selecting the right breed and breeding**

There is a temptation at the small-scale level to consider breeds commonly found in intensive industrialized pig production. These few breeds are highly productive in terms of outputs, can be efficient in feed utilization, but are very resource demanding and access to breeding stock can be costly. Many attempts in the past have been carried out to use such pure breeds at small-scale farm level, but with varying levels of success. Crossbreeding with local stock has been found to be successful.

The selection and choice of breeds needs to primarily consider

market demand, the available feed and water resources, housing and the overall local climatic conditions. Commonly local and cross breeds (local breeds crossed with exotic breeds) are better adapted to the climatic conditions, local feed resources and have a tendency to deal better with predominant animal diseases. These benefits commonly come at the price of fewer piglets per litter and decreased growth rates.

Carcass composition of slaughtered animals also varies significantly between pig breeds. The high lean meat content of breeds used in industrialized holdings commonly meets the demands of urban consumers, prevalently in developed countries. Commonly pork meat with intramuscular fat is preferred in many urban, rural and local areas in developing countries. In some areas with longer traditions in pig production, pork deriving from local breeds can receive higher prices since it meets local market expectations and is naturally attributed as safe by consumers.

## CASE STUDY 5 Use of exotic pig breeds in Nepal

Mr Bom Bahadur Thapa, a Nepali pig producer from Purani Silanijan village, reared Large Black, Hampshire and Large White Yorkshire pigs in the tethered/stall-fed system as his primary source of livelihood. He had 11 parent stock and 21 piglets. Despite keeping the three breeds, he preferred Large Black pigs to Hampshire or Large White Yorkshire. According to him, the Large Black has larger litters and grows faster (9 to 10 piglets per litter and 70 to 80 kg body weight at 10 months) than Hampshire (6 to 8 piglets per litter and 40 kg at 10 months). While the Large White Yorkshire has a similar litter size to the Large Black, its growth is slower (60 to 70 kg at 10 months). He stated that his fellow farmers shared his preferences, which were reflected in the demand and price of piglets; Large Black and Large White Yorkshire piglets cost Nepali Rupees NPR.800 to 1 200 (US\$11 to US\$16) while Hampshire piglets cost NPR.600 to 700 (US\$8 to US\$9).

*Source: Adapted from Deka, R., Thrope, W., Lucila Lapar, M. & Kumar, A.2007. Assam's pig sub-sector: current status, constraints and opportunities, ILRI, New Dehli*

The gestation period of sows commonly lasts about four months followed by a suckling period that should not be shorter than three to four weeks. Piglets are then easy to handle once they have overcome weaning stress. Marketing of animals at around 20 kg is not unusual and gives other small-scale farmers the option to enter the pig business with fattening operations. Entering at this later stage of production avoids the reproduction phase, which is linked with the highest losses of young animals. It is important that small-scale farmers involved in pig enterprises keep accurate records of breeding, piglet numbers, piglet sales, etc. Records will support decision-making in terms of improved herd management and breeding. Sows

raising more healthy piglets can be used longer for breeding and the next generation of breeding animals should be recruited among the best performing animals

### **Housing**

The least resource demanding form of pig husbandry is scavenging where pigs roam freely, receive little if any supplementary feed and are not provided with a permanent shelter. The negative implications of this production type in terms of public health and animal disease control make it an unacceptable form to be promoted. However this does not need to be confused with accepting this form of pig production under certain cultural and economic backgrounds. Many countries will



*FIGURE 13 In Karchia Village, near Sonapur, Assam State, India, a labourer provides assistance to a piglet in 'suckling operations'*

*(Photo: by courtesy International Livestock Research Institute/ S. Mann)*

have legislation specifying the requirements for pig farming, usually demanding confinement.

Commonly confinement has a series of advantages over scavenging. Animal identification is easier leading to better health control; feed intake and the frequency of feeding can be controlled more appropriately and animals can fatten faster as they do not waste energy looking for food. Farrowing can be carried out more successfully within a protected environment for sows and piglets, ensuring a higher survival rate of the newborn.

Minimum standard housing facilities for pigs should therefore result in confinement, restricting access of the pigs to a defined area only. The minimum area available per confined pig, which is usually kept in a group, is defined by the pig's age and weight – about 1m<sup>2</sup>/fattening animal needs to be considered. The confinement area needs to include shelter, protecting the animals from rain, direct sunlight and wind as well as temperature extremes. In hot climates, shelter is as important as mud, puddles or pools. If pigs are protected from

excessive climatic variations this will contribute positively to herd productivity and health.

The type of pens built depend primarily on building material availability and the small-scale farmer's resources as well as production objectives along with market demand for pig products. The building site will have to consider local climatic conditions, exposure to sun and wind and provide for appropriate ventilation. Pens should be built so that they are easy to clean and provisions need to be taken for easy collection of manure and run-off. Flooring

should be elevated above ground level, where this is not possible it needs to have a gentle slope.

If given the chance, pigs differentiate between areas of resting, feeding and defecation and show a natural drive of exploring their environment. These criteria, despite their apparent complexity, can all be taken into account with fairly simple and little resource demanding setups. At the same time it can assure simple standards of good husbandry practices, have the necessary disease prevention potential and acceptable animal welfare implications



*FIGURE 14 Housing and pig pens in El Salvador  
(Photo: FAO/21502/ G. Bizzarri)*

Housing for sows and piglets needs additional consideration. Importantly piglets need to be provided with a secure and warm area in the housing, keeping the sow at a distance to prevent crushing. The use of a farrowing crate can usually avert this threat but should only be applied for the days around farrowing for animal welfare reasons.

Housing for fattening should not keep pigs fully confined and to close together. Access to a free roaming area within the confinement area should be provided. This will avert pigs becoming stressed, nervous and attacking each other, and allows access to feed materials that may not be present in the feed provided. Further animal exercise and movement is good for the overall condition of the animal in terms of muscles and skins.

Feeding and water supplies should be provided outside of the pen and need to cater for the number of animals in confinement. Importantly pigs of different ages and sizes should not be kept in the same confinement or fed at the same time. Small sized animals will be at a disadvantage toward larger sized animals and this will lead to different fattening patterns.

## **Feeding**

Pigs feed on both vegetable and animal products, and can compete directly with humans in this regard. Careful consideration needs to be given to this factor in local areas where foodstuffs are scarce and it is advisable that in such circumstances pigs are given feed that is not useful to humans. This commonly means by-products and other waste from crop and animal production or swill. However it is important to note that pig feed needs to contain a good balance of protein, energy, minerals and vitamins. An appropriate balanced ration will keep a pig in good health, develop its weight, and maintain its reproductive capacities. The type of feed administered will also directly affect meat quality at slaughter. For example if a pig is fed with maize, which contains oily fats, this will make the meat tender. Feeding in very hot or very cold conditions can reduce the feed intake and thus feeding times need to adapt accordingly.

Sufficient local feed and water resources have to be available in areas where smallholder pig production is to be promoted. One of the challenges is the availability of adequate feedstuffs despite seasonality.



*FIGURE 15 Confined pigs being fed with local feed resources in Benin  
(Photo: FAO/21689/ K. Pratt)*

### **CASE STUDY 6 A landless farmer in India**

Mr Sadanda Deka, a landless farmer from the Manja area, occupies a small plot of government land. His breeding stock of six pigs is a major source of livelihood for his family of three. To reduce feed costs and to overcome feed scarcities, he cultivated a popular variety of Colocasia, known locally as Nal Kachu, on a small plot of land adjacent to a stream. He said that because he transplanted the Colocasia in the stream, it did not dry up during winter, increasing the availability of Colocasia in that season.

*Source: Adapted from Deka, R., Thrope, W., Lucila Lapar, M. & Kumar, A. 2007. Assam's pig sub-sector: current status, constraints and opportunities, ILRI, New Dehli*

### **CASE STUDY 7 Waste products as feed in Uganda**

An initiative in Kampala shows the potential of waste products to make pig feeding affordable and creates employment opportunities along the supply chain. From the observation that free-roaming pigs eat banana leaves thrown away by humans, the idea arose to test banana-bran as pig feed. Nowadays, a local business has been set up with a feed mill buying banana peels from local urban collectors. The produced banana peel bran replaces maize bran which increased in price over the last years, and leads to an overall reduced price of pig feed with similar dietary characteristics.



The use of purchased concentrate feed is only feasible if market prices can cover the costs. Purchasing of feed represents a dependency on national as well as international feed market prices that have shown to be volatile reaching price peaks that make most small-scale, but input dependant production, unprofitable.

In commercial fattening holdings, feed costs makeup usually 60 to 70 percent of the total production costs related to the commodity. This value does certainly not apply to small-scale, low input production systems, but shows the importance of considering the availability of adequate local feed resources prior to promoting pig enterprises. The available feed quality and quantity determines the length of the fattening period (about six months in commercial settings). If feed availability is assured, the fattening of pigs is not very time consuming and does not require special expertise. It can therefore be easily promoted as an additional activity leaving enough labour-time for another major farming or off-farm activity.

Pig production of any scale has shown to be more profitable when annexed to agricultural production that makes by-products of nutritional value to pigs available. These by-products can usually be purchased at low prices or are freely available and replace

costly feed components of similar nutritional value.

### **Health**

Animal health is a key factor for sustained pig production. Unhealthy animals provide for losses in terms of animal weight, money invested, feed, equipment as well as potential income. The potential threat to public health deriving from diseases that can affect animals as well as humans (zoonoses) deserves attention. It is essential to have an overview on the spectrum of diseases present in a geographic area and to adapt pig husbandry practices accordingly. Preventive measures that reduce the probability of health problems and allow better control of diseases once they occur should be promoted actively through training and extension. Among others, this includes vaccination protocols and on-farm biosecurity measures. Confinement of animals and limiting their access to waste, human defecations, other livestock or wildlife will reduce the possibility of disease spreading and allow a better control of the animals performance – making timely disease detection more likely to happen.

When bringing in new stock to the herd enclosure, a period of quarantine should elapse before actual inclusion in the herd, so as to avert overall herd contamination.

## CASE STUDY 8 Madagascar: Cysticercosis in pork meat

Mr Rakotondravony raises pigs around his farm. The pigs used to scavenge in the village to find their daily food. Two years ago, he lost all his animals because of the African Swine Fever so he decided to enclose the new animals in a pen and to give them rice bran and cassava for feed. Even if he had to pay for the feed at market, his income increased with no animal loss. Last year, the abattoir refused to give a good price for two of his pigs because they were infested by cysticercosis; the carcasses were full of small cysts, rice-looking, in muscles and the meat was destroyed. This year, he decided to build a toilet for his family to stop worm eggs infecting pigs and other people. Good hygiene and sanitation as well as enclosed pigs are essential measures to prevent loss in profits and public health problems.

*Source: Adapted from Porphyre, V., Costard, S. & Messad, S. 2010. Regional differences in management and biosecurity practices in Madagascar; Cirad*



**FIGURE 16** *Vaccinating a piglet in Cambodia*  
(Photo: FAO/22106/J. Koelen)

The common practice of swill feeding in small-scale pig production has to be seen as a major concern regarding the spread of animal and zoonotic diseases. If considered, the swill should be thoroughly cooked prior to feeding.

### **Slaughtering**

Slaughtering operations are another of the key components in upholding enterprise profitability and product quality. Slaughtering should occur in central slaughterhouses that have the necessary arrangements

that provide for hygiene and safety in all operations, employ trained personnel and provide for veterinary inspections. However such settings are not always available in rural and remote areas. Promoting small-scale slaughterhouses in rural areas is an option. There are also butchers (retailers) who slaughter animals, which they buy from producers or rural traders. Promoting appropriate slaughtering practices within such a setting is also a viable alternative.

Itinerant slaughterhouses, for example placed on refrigerated trucks are a possible alternative also, as well as itinerant specialized slaughterers who visit areas when slaughtering is required. These types of slaughter services can provide for a private business enterprise initiative as operations will not only concern pigs, but all livestock and hence markets for such services may be considerable in

many areas. Other options are on-farm slaughtering, but this concerns mainly the informal sector and traditional and culturally adapted slaughtering methods. Some of these methods are well adapted and can provide for safety; though the real challenge of veterinary inspection remains.

Inappropriate slaughtering and handling of pork can endanger consumers' health and result in loss of profits for the small-scale farmer. Pigs that have been put under stress, felt pain, have been injured and bruised prior to slaughter provide low pork quality. This low meat quality also jeopardizes processing. Assistance should be given in terms of training and extension in appropriate handling and slaughtering practices on-farm by building on traditional knowledge and culture.

### **BOX 2 Pork spoilage: bruising and injury**

Animals should be stress and injury free during operations prior to slaughter. Bruising in pigs damages the blood vessels and releases blood in the surrounding muscle tissue. This is especially damaging to pork quality in that consumers will not accept such pork, further it cannot be processed, and it decomposes and spoils more rapidly as blood in pork is an ideal medium for growth and contamination. Injuries to pigs such as cuts, torn muscles and broken bones will considerably reduce the carcass value. This reduction in value will be increased if infection occurs and may compromise the entire carcass that will not be fit for human consumption.

*Source: FAO. 2001. Guidelines for humane handling, transport and slaughter of livestock, Regional Office for Asia and the Pacific, Bangkok*

Meat inspection is one of the key tools to avoid public health threats derived from pork consumption, since it enables the detection of diseases with minor impact on the pigs' health but with possible severe or even fatal consequences for consumers. Since small-scale pig

production in many countries is often closely linked with the informal/unregulated part of the meat sector, promotion of this form of production should be accompanied with respective investments in extension and training as well as in veterinary health services.

# Strategies for successful market participation

Traditionally only when pigs and piglets are ready for sale (appropriate weight) are marketing operations considered. But marketing really starts when farmers are breeding pigs for production. In this regard the pig enterprise needs to have a destination market that is assured or the likelihood of selling in the destination market is very high.

Marketing is a set of operations and tasks that enable a farmer to sell

pigs and their products. Small-scale farmers have numerous options for marketing a pig enterprise: piglets can be sold to other farmers for fattening; pigs can be sold live weight; pigs can be sold to butchers; pork can be sold directly to consumers on farm and/or in a market; pork can be processed into various products and then sold; and by-products can be sold to processors, butchers and consumers.



*FIGURE 17 A young pig farmer showing his pen to an extension worker seeking advice on how to improve husbandry and in particular marketing practices  
(Photo by K. Dietze)*

## **CASE STUDY 9 Pig marketing in the Zango-Kataf area, State of Kaduna, Nigeria**

Pig producers in southern Kaduna are widely dispersed, are not overly organized among themselves and little coordination occurs in terms of marketing. They mostly dispose of their pigs at village level. They have no transport to take them to larger markets located commonly between 15 to 50 km away from production areas.

At village level, itinerant traders visit pig farmers and buy one or two pigs. In turn the traders re-sell at local village markets to intermediate traders who are assemblers with more funds and capacity for bulking larger numbers. These intermediate traders visit similar smaller markets, and gradually build up a herd for sale in the urban market of Katsit. Ownership of pigs may in some cases change hands two or three times before reaching Katsit, with each new owner taking a small mark-up in price.

Traders themselves rarely own vehicles for transport and use available transport services of varying sizes and capacities depending on distance and number of animals involved. In some cases pigs are trekked from neighbouring villages directly to market. Two principal buyers in the Katsit market are wholesale traders who take animals to the south and local butchers (retailers) who slaughter for fresh pork sales in open markets both in Katsit and in the neighbouring villages of Zonkwa and Samaru-Kataf. In addition to these, some traders buy for resale either immediately or after some minor fattening operations. Direct purchases by some hotels/ restaurants for slaughtering also occur. Some pork consumers purchase pigs cooperatively for slaughter and distribute the resulting products among group members.

*Source: Adapted from Ajala, M.K. & Adesehinwa, A.O.K. 2007. Roles and efficiency of participants in pig marketing in the northern part of Nigeria, Journal of Central European Agriculture, Vol.8 No. 3, pp.311-326*

### ■ **Market appraisal**

Before embarking on small-scale pig production with the aim to participate in local markets, a number of factors need to be considered. The first element to consider is appraising local market demand in terms of pigs, pork and/or processed products, not only in terms of quantities sold, but also quality required. Besides quantities of products and their quality it is essential to evaluate the prices that can be received for such products, considering also the potential effect

of market saturation once more community members move into the same business.

Under optimal marketing conditions products can be sold through different channels and the producer has the option to negotiate prices from a stronger position than in cases of single marketing opportunities. The overall marketing environment regarding transport infrastructure, market information availability as well as consumer acceptance and purchasing power

will have an influence on marketing decisions taken.

### ■ ***Planning and managing production***

Marketing information and knowledge enables estimates to be made regarding production planning for the pig enterprise. Small-scale farmers will be able to estimate better such aspects as how many sows need to be mated, timing of fattening operations, slaughtering times, what costs will be incurred, what credit may be needed, etc. This will enable the production process to be more efficient and effective. Importantly marketing information will also enable more appropriate management practices for the pig enterprise. The quality, hygiene and safety requirements of markets will signal to small-scale producers the necessity to uphold quality of pork, along with hygiene and safety. This can only but contribute positively

to marketing operations and facilitate them.

Small-scale farmers should recognise that production and planning aspects must be seen from a business perspective. This involves such aspects as keeping records about the pig herd, finding the appropriate cost/feed ration, estimating money requirements for the production season and coming up with risk strategies, for example to avert sickness in the herd.

### ■ ***Marketing channels***

Options for market participation are numerous as shown in Box 3. Pigs that are marketed on hoof (live) and piglets sold for fattening to other farmers tend to have less marketing risks, as long as handling and transport operations are conducted appropriately. Slaughtered fresh pork however is the riskiest in terms of marketing, for it commonly requires refrigeration and if this is not available fast marketing needs to occur.

#### **BOX 3 Marketing options for small-scale pig producers**

##### *Live animals:*

Female offspring	sold as breeding animal
Boars	sold as breeding animal / charge of mating fee
Piglets	sold for fattening
Fattening pig	sold for slaughter

##### *Slaughtered Animals:*

Carcass	sold to butchers / processors / retailer
Meat	sold at market / to processors / to retailer
Non-meat tissues	sold to processors
Processed products	sold at market / to retailer

Deciding where to sell involves the choice of location, the prices received for pig products and the costs involved in reaching such a location. For example selling to

a local butcher may imply lower transport costs but also lower prices received for the product as compared to marketing to urban butcheries.



*FIGURE 18 Retailing pork in a busy market  
(Photo by O. Argenti)*

### **CASE STUDY 10 Butchers in the Zango-Kataf area, State of Kaduna, Nigeria**

Retailers (butchers) slaughter and dress live animals. Pork is sold fresh after slaughter as there are no refrigeration facilities. In general pork is used fresh, but occasionally meat is cut into small pieces and roasted as Suya (roasted skewed meat with peanut and spices) or Tsire (meat marinated in spices and peanuts). Most of the gross returns to butchers come from pork sales but a substantial portion (17 percent) is received from by-products such as head, legs and offal.

*Source: Adapted from Ajala, M.K. & Adesehinwa, A.O.K. 2007. Roles and efficiency of participants in pig marketing in the northern part of Nigeria, Journal of Central European Agriculture, Vol.8 No. 3, pp.311-326*



When to sell is also another important factor to consider in marketing. Small-scale farmers that sell fresh pork will be obliged to sell shortly after slaughter time and this may not always provide for the best prices. When to sell requires two issues to be addressed: i) choosing the right time to sell so as to earn the most money, ii) reducing the risk of being unable to sell a fresh perishable product.

In some cases small-scale farmers can sell prior to actual fattening within the context of contract farming. In this way small-scale farmers reduce the risk of not being able to sell, reduce price risk and ensure income.

When to sell processed pig products depends on buyer demands and the farmer's ability, to some degree, to be able to bargain for a better price. For example sales can be made throughout the year, with little risk of the products perishing. The possibility of storage will enable more time to market the processed pig products and farmers have more of a choice on when and where to sell, based on buyer demands.

### ■ *Hygiene and safety*

Pigs can suffer from sicknesses related to bacteria, viruses and parasites and this can seriously

jeopardize their marketing value. Pigs, pork and processed pork products that are infected can have serious consequences on public health and can result in fatal death for consumers in some circumstances. Preventative measures are required to ensure minimum safety and hygiene. Good Agricultural Practices (GAP) for pig enterprises and Good Hygiene Practices (GHP) need to be implemented, not only at farm level, but all along the supply chain.

Good Agricultural Practices (GAP) address environmental, economic and social sustainability of farm processes. It is based on four main pillars: economic viability; environmental sustainability; social acceptability and food safety and quality. In terms of a pig enterprise GAP considers such aspects as adequate and appropriate feed, veterinary care and space for each pig in a pen, and so forth. Application of Hazard Analysis and Critical Control Point (HACCP) principles are another essential element to uphold hygiene and importantly safety in the pig enterprise, as well as along the supply chain. The HACCP is a system where pigs and pork products are addressed in a sphere of three main possible hazards: physical, chemical and biological. This is done so as to encourage prevention rather

than finished product inspection. For example, in live pigs, vaccinations will be administered so as to avert hazardous contamination of pork.

Good Hygiene Practices (GHP) cover such aspects as appropriate hygiene practices during pig production, slaughtering, handling of pork and so forth. In terms of pig production for example GHP focuses on the overall health and hygiene of animals, track records of treatments administered to pigs, the type of feed and composition of feeds as well as environmental factors. In terms of

slaughtering GHP looks at all the measures that are required to ensure safety, for example slaughtering tools and equipment need to be clean and sanitized. Particular attention to hygiene and safety needs to be taken while slaughtering as this in traditional societies commonly occurs on farm and on the ground. Training and extension are essential ways of supporting small-scale farmers with preventing pork meat contamination. Hygiene and safety are essential elements in marketing pigs and their products.

#### **BOX 4 Principles of meat hygiene in primary production**

1	Primary production should be managed in a way that reduces the likelihood of introduction of hazards and appropriately contributes to meat being safe and suitable for human consumption.
2	Whenever possible and practicable, systems should be established by the primary production sector and the competent authority, to collect, collate and make available, information on hazards and conditions that may be present in animal populations and that may affect the safety and suitability of meat.
3	Primary production should include official or officially-recognised programmes for the control and monitoring of zoonotic agents in animal populations and the environment as appropriate to the circumstances, and notifiable zoonotic diseases should be reported as required.
4	Primary production should include official or officially-recognised programmes for the control and monitoring of zoonotic agents in animal populations and the environment as appropriate to the circumstances, and notifiable zoonotic diseases should be reported as required.
5	Animal identification practices should allow tracking systems (to original location of production) to the extent that it is practicable, so as to allow regulatory investigation where and when necessary.

*Source: FAO. 2005. Codex codes of hygienic practice: Meat, Rome*

### ■ *Processing*

Pork meat is a highly perishable product and if not consumed immediately after slaughter it deteriorates quickly if no refrigeration is available. Commonly pork meat deteriorates quicker than other meat such as that of beef, poultry, lamb and goat. Processing is a form of storage and enables pork to be kept for a longer time, provide for sales over a longer period as well as enabling the farm family to have at disposal a supply of meat over and above the slaughter period. Importantly pork can be processed into many diverse products, increasing the small-scale farmer's product portfolio, obtaining higher returns and enabling access

to different destination markets and importantly fulfilling diverse consumer tastes.

Pork products range from dried pork, through sausages to hams. The simplest processing is drying, where for example pork is set in a salt solution and then left in the sun to dry. Sausages require a slightly more complex process and they can be either fresh (need to be cooked prior to consumption) or cured. Sausages can also be fermented and ripened. Hams can be cured and cooked and require more complex processing and importantly careful management when in ripening, which normally can take many months, depending on the final product.



*FIGURE 19 Dried pork skins for sale in a market in Mexico  
(Photo by O. Argenti)*

Setting up a kitchen processing operation or a more formal small-scale processing operation on-farm requires careful assessment of various matters. The first issue to address is market demand for the intended processed product and importantly prices and quantities required. Once this has been ascertained it is important to verify the supply side of matters: quantities of pork meat available for processing; equipment required, as well as their cost, and maintenance costs; other raw materials needed, such as salt, spices and herbs; hygiene measures that are required;

skills and training needs; and credit. The overall costs of the operation needs to be compared to the expected prices received and profitability evaluations made.

Hygiene in pork processing is of paramount importance and commonly is regulated by compulsory national legislation. It is essential that hygiene is upheld at slaughter, in meat cutting, handling and transport as well as with any possible additives that may be used, for example spices. Hygiene and safety schemes in processing have been developed, yet their implementation is often challenging for small-scale on-farm operations.



*FIGURE 20 Making sausages*

*(Photo: FAO/18339/ P. Cenini)*

### ■ *Transport*

Transport is a key factor in market access for small-scale farmers as well as for rural traders who buy on farm. Transport can be the most costly component of all marketing activities. The overall objective of transport is not only to move pigs and pig products to market, but importantly ensure that quality is upheld and loss of income does not occur. Transport needs to be planned in terms of when it will occur during the day and the duration of the journey.

Poorly transported animals inevitably result in poor quality meat and loss of income. During transport pigs can suffer injuries from trampling and fighting, suffocate if packed too

tightly, have heat stroke, exhaustion, dehydration and stress.

In transporting carcasses and pork meat refrigerated transport is required. However this is not always available, hence transport either must provide for quick consignment to destination markets, as the risk of product deterioration will increase, or pork meat must be sold in markets in the vicinity of point of slaughter. With regard to processed pork products depending on their nature, differing speeds of transport and type of transport are required, for example fresh sausages will require faster transport if there is no refrigeration then cured sausages, which do not require refrigerated transport.



*FIGURE 21 Transport of live pigs in Mongolia  
(Photo: by courtesy International Livestock Research Institute)*

### ■ ***Production and marketing associations***

Small-scale pig farmers commonly benefit from joining together into organizations that combine their production and/or marketing resources and capacities. By associating together small-scale farmers can increase their income and efficiency. Organizations can range from informal arrangements to fully registered and recognised cooperatives and associations.

Collective action commonly brings about several advantages: collective bargaining; increases in business opportunities; an increase in production and marketing activities; more reliability in constant supplies and in quality; lower costs in transport and processing; improved access to credit; more opportunities to receive training as groups can be trained at a lower costs; and new skills are developed among farmers as a result of shared information and knowledge.

Organizing pig farmers into an association needs to be based on specific objectives and goals. For example an organization can be set up to provide veterinary, credit and transport services. Importantly the organization must not have too many goals and objectives and its

functions must be well designed and carried out. Organizations also need to be managed appropriately to be successful and provide the intended benefits. Importantly the rights and responsibilities of all members need to be spelled out clearly as well as the role each member needs to cover.

### ■ ***Building trust and linkages***

Buyers need to trust small-scale farmers and small-scale farmers need to trust buyers. On the one hand buyers need to be assured that whatever pig product they are buying is of quality and will live up to their expectations. On the other hand farmers need to know that they will get paid for their efforts in providing pig products. In this regard trust and linkages between small-scale farmers and buyers need to be supported by promoting and improving marketing as well as making the supply chain more transparent and easy for both farmers and buyers to understand.

Typically traders (middle men) are seen as people who take advantage both of farmers and of consumers. However traders in marketing channels perform a number of operations that are important and contribute to providing consumers with food and farmers with income. For example traders collect pig products from

## CASE STUDY 11 Marketing in Lao People's Democratic Republic and Viet Nam

The overall marketing system for pigs includes four components, namely, traders, wholesalers, slaughterers, and retailers (Lapar *et al.*, 2003; Knipps 2004). Village pig keepers sell their pigs either to traders or slaughterers, or directly to consumers (Knipps, 2004). Smallholders in Lao People's Democratic Republic and Viet Nam usually sell their pigs in other villages or provinces and have to obtain a load of paperwork, for example, a license and health quarantine certificates. Certain factors such as the restricted movement as a result of disease control, high transport fares, inaccessible market information, and the absence of refrigerated lorries serve as restraints that prevent remote smallholders from getting a fair market price for their pigs. The region in general has no organized market or auctioning system for smallholders who want to sell pigs or pig products.

Pig farmers are often price takers but not price makers (Lapar *et al.*, 2003). Insufficient marketing outlets, and limited market information, coupled with the lack of guaranteed prices, are major deterrents for small-scale farmers (Sovann & San 2002). However, smallholders who are perceived to employ backward technology by virtue of their being labelled as 'backyard' producers are actually quite competitive, i.e., they can manage to be as efficient as larger farms in earning profits from pig production. They are in fact, market- oriented and grow an average of at least 20 to 200 slaughter hogs per year. Despite this, however, the smaller scale producers bear more greatly the adverse impact of the transaction costs related to pig production and marketing than do larger producers (Costales *et al.*, 2006).

*Source: Huynh, T.T.T., Aarnink, A.J.A., Drucker, A. & Verstegen, M.W.A. 2006. Pig production in Cambodia, Laos, Philippines, and Vietnam: A review, Asian Journal of Agriculture and Development, Vol.3, Nos.1 & 2*

widely distributed small-scale farms in an area, organize the physical distribution of these products, find markets in which to sell them, and so forth. Without traders, farmers would not be able to make a living and consumers would not be fed. Traders in marketing channels also need to be promoted and encouraged and this contributes to building trust.

### ■ *Sustainable business enterprise*

A viable livelihood activity requires profits. Profits ensure that a farmer has enough money to re-invest in the enterprise, ameliorate it and have enough money for the farm family. Profits also contribute to making the pig enterprise competitive: the greater the returns the more the

farmer will be willing to become more skilled in production and marketing. Moreover if farmers understand that marketing quality pig products brings higher prices and makes products more competitive, the more small-scale farmers will be inclined to provide quality pig products. Further improved production and marketing skills reduce costs and consequently increase profits.

It is important to note that improved prices on current quantities sold have a greater impact on profitability than increases in yield of pig enterprises. Simply increasing production without additional sales being made is a perilous situation as it can create a reduction in price. However this situation shows that improved marketing skills are required along side improved production skills and knowledge.



# Support services to promote pig enterprises

## ■ *Legislation*

The majority of legislation found today is lacking pro-poor initiatives that can support small-scale pig enterprises. This entails a series of problems, among which, for example the ability to participate in more formal supply chains. There is also the question of food safety regulations that commonly do not consider the needs, necessities and practicalities required for small-scale pig farming. The role of production, health and food safety standards is often the bottleneck for small-scale farmers to access any type of more formalised marketing chain and forces them to remain in the informal – and therefore uncontrolled sector. The development of standards that consider small-scale farmers along with institutionalised support structures result in more secure livelihoods. Similar approaches have succeeded in the dairy sector of many countries. Pro-small-scale producer policies strengthen and develop local markets with adequate product quality assurance, without undermining the development of industrialized production settings

since they usually target different destination markets.

There is also a need for legislation that facilitates doing business, in other words provides an enabling business environment. This not only needs to be applied on an overall national level, but specific legislative acts aimed at developing the agricultural sector and in particular that of livestock and pig enterprises in rural areas. This requires looking at such legislative aspects as land tenure, trade, facilitation of private sector credit institutions as well as training services. A national agricultural development plan aiming at promoting a sustainable small-scale pig sector is an example. Importantly though such a plan needs to include all stakeholders in the sector, ranging from input suppliers to large retailers.

## ■ *Extension services*

Investments in the public service sector, as well as encouraging private services, are essential if pig production is meant to have a positive impact on small-scale farming systems. In order to improve overall husbandry practices that lead to increased production of safe pork and pork products, agricultural extension work

needs to be supported. The service provided in this field must assure knowledge transfer on good pig production practices adequate to local settings. Farmer Field Schools (FFSs) have been developed for livestock and have provided for successful knowledge transfer on production matters. The method developed by FAO is based on a 'learning-by-doing' approach where small-scale farmers learn directly from field experience.

Extension needs to combine production knowledge and skills importantly with training in marketing and other business skills. Sustainable pig enterprises can only be started if there is a market for pig products and it can only prosper if small-scale

farmers know about marketing, understand their local markets and are able to sell their pig products. Further small-scale farmers need to know how to calculate costs, estimate yields and evaluate potential profit, this requiring knowledge about business practices, such as keeping farm records, cash flow, gross margin, etc. Additionally, extension needs to contribute to improving overall pig health as well as hygiene and safety issues related to pork products. With appropriate training small-scale farmers learn about safe and hygienic practices in pig production, but also and importantly that prevention is better than curing sick animals.



*FIGURE 22 Trainers in a tribal village of Assam State, India, during training on pig production (Photo: by courtesy International Livestock Research Institute/ D. Rameswar)*

The role of the extension worker in supporting small-scale farmers in the realm of pig enterprises covers many areas. This can range from ascertaining opportunities and challenges in the pig sector and related sectors, to input supply of feed, availability of credit, to marketing improvements, and to encouraging farmer associations.

### ■ *Veterinary services*

There are many ways in which veterinary services can be delivered to pig enterprises. It has been noted, over the years, that veterinary services which provide a top-down approach, for example regional veterinary districts within a country, are unable to deliver the required services. Private services can be involved, as well as the use of community animal health workers, para-vets and pharmacy-based services. Para-vets, who have been trained in basic pig health care, can deliver effective preventive training in their local areas of reference as they are commonly embedded in local communities. This enables not only access on behalf of small-scale farmers to veterinary services, but importantly familiarity with them. Clearly the coverage of veterinary services in remote

areas and the access to veterinary inputs like vaccines and medicine at acceptable prices is challenging. However such services do not require a pig-specific setup. The services fall under the more general support structure required anyway for livestock production.

Further with the presence of a large-scale industrialized pig sector, veterinary authorities have to work out animal health schemes that permit the co-existence with small-scale producers without marginalising them and at the same time without threatening large-scale producers' interests.

In order to fulfil its mandate of supporting public health, the public sector needs to control non-industrialized slaughter facilities and slaughter operations providing adequate meat inspections. In this manner the informal meat sector can be kept at minimal levels, increase food safety and build confidence and trust in consumers in local markets. With this gain in confidence a local market can develop and support livelihoods at farmer level as well as along the supply chain. Promoting adequate slaughter facilities also contributes to the reduction of live animal transport and increased animal welfare.



*FIGURE 23 In Honduras an extension worker teaching farmers how to vaccinate pigs  
(Photo: FAO/18897/ G. Bizzarri)*

### ■ **Financial services**

Small-scale pig farmers often fail to move from subsistence to market oriented production because they do not have access to financial services. The public sector needs to promote and create an enabling environment that allows financial institutions to provide credit profitably even to small-scale pig farmers. In parallel to this saving programmes need to be promoted. This will relieve livestock from being used as a 'savings account' and producers will develop a clearer focus on productivity of their business and the respective marketing options. Further to overcome capital constraints in the start-up phase, a scheme of providing pregnant female

animals to beneficiaries that have to pass on the female offspring to other beneficiaries, as successfully performed in the dairy sector, has shown to be a viable tool to promote small-scale pig production.

### ■ **Input supply chains**

An enabling business environment needs to be in place to assist input suppliers that are required for pig enterprises. Inputs for pig enterprises are feed, medicines, and equipment for slaughtering and processing, for example. These can be found locally, most often, and feed is one of the paramount inputs. Suppliers need to be encouraged also to serve small-scale farmers and not only

focus on large-scale industrialized organizations.

In order to promote small-scale pig production successfully, the availability of concentrate feeds or feed components for on-farm mixing at fair prices is required. Small-scale farmers who cannot afford increasing feed prices and who do not have access on a regular basis to feeds suffer the most and may well be driven out of improved production practices and either revert to local feed resources or be driven out of the pig sector completely.

#### ■ *Access to markets*

The biggest constraint is often the genetic material used in pig production. Large industrialized holdings aiming at urban and export markets have a very narrow window of meat quality they can incorporate in their marketing chain. Usually, native breeds do not meet the required criteria and cannot be taken into this marketing chain on a profitable basis. On the other hand, access to genetic material alone would be too demanding for small-scale producers with limited access to high value feeds and inputs.

Promoting market linkages is an important element for small-scale pig enterprises. Very often small-scale farmers have difficulty in entering

formal supply chains and need to be supported in this. Supporting farmers' organizations, commodity associations and the like can be one effective way of enabling market access.

Contract farming is one model that allows small-scale farmers to participate in markets. This tool has been implemented in many countries but has to be treated with care since the types of contract might fail to have a clear pro-poor benefit. Market information services that provide information on opportunities, prices and quality requirements, transaction mechanisms, transport information, etc., are also another way of enabling access to markets. Promotion of pork consumption and its related benefits to the general public is also an effective method of supporting small-scale farmers' access to markets. Importantly infrastructure, in terms of transport, as well as transport services, especially run by the private sector is yet another way to allow small-scale farmers to access markets.

#### ■ *Transport*

Transport and its infrastructure are a critical element for pig enterprises. This is not only related to marketing issues, but importantly for enabling inputs for pig enterprises to reach rural

and remote areas. Local transport system may or may not be adequate for supporting pig enterprises, and this commonly requires the use of refrigerated transport for pork as well as vehicles that are apt to transport small livestock. Encouraging and promoting the private sector in furnishing transport services is important and can become a viable business also for small-scale farmers (see FAO Diversification booklet No.10 *Rural transport and traction enterprises for improved livelihoods*).

#### ■ **Organizational options and gender**

Promoting and facilitating producer and marketing organizations is beneficial for small-scale pig enterprises. They provide a number of advantages that cannot be underestimated at policy level. Importantly it gives them voice and enables them to tackle complex formal supply chains and distant national markets, among many of the advantages such organizations provide.

Further commodity associations that include all interested parties in a supply chain, farmers, processors and retailers (butchers, supermarkets, etc.), can elaborate their interests and contribute to

market development and voice their concerns and proposals in a more holistic manner. On a national basis these activities should be supported by an umbrella organization like a national pork (or meat) association that assures the different stakeholders are heard within decision-making processes influencing the sector. The composition of such national (or even regional) umbrella organization needs to represent stakeholders of all scales of production and trade and can therefore play an essential part in assuring co-existence.

A particular focus needs to be given to gender issues when promoting small-scale farmer organization. Women are commonly responsible for pig production, but may face cultural and social barriers affecting their participation in commercial matters. Women's groups can provide a wide range of benefits that can help them not only improve production know-how, but importantly also marketing know-how.

# Opportunities and challenges

## ■ *Opportunities*

### **Adding nutritional value to the diet**

Pig production increases the availability of high value animal protein; minerals, vitamins and trace elements in the diet of the rural population and can therefore contribute significantly to a more balanced diet. In food insecure areas this can be of high importance especially for children and pregnant or breast-feeding women.

### **Easy entry with fast returns**

Investments to start pig production as a way to diversify the livelihoods of small-scale farmers are low and returns relatively fast compared to other livestock enterprises. Even though initial spending on support structures, for example extension and training, veterinary services, transport infrastructure, etc., may seem high, this form of production has a positive long term effect on development and the returns far outweigh the costs. Importantly not all supportive structures are required at once and can be developed along the way.

### **Everybody can join in**

Few inputs are needed to start a small-scale pig production as it has the potential to make value of farm resources that would otherwise be 'lost' or have little commercial value, such as crop shrubs. This diversification option is open to all members of society. It has a potential for marginalized and underprivileged people to improve their livelihoods and allow them to be respected members of a community by participating actively in markets.

### **Diversifying through different types of production**

Pig production practices selected for diversification need to cope well with local conditions and be based on the available assets and resources found in the area. Pigs offer a variety of options and opportunities. For example small-scale farmers can breed their own piglets, fatten them and sell them. Small-scale farmers can also leave breeding to more specialized farmers and / or commercial firms and provide fattening services.

## CASE STUDY 12 Pig rearing in India

Mr Chandra Mohan Boro, a progressive pig farmer from Dumukhi Jal Juri Village, Howraghat has a Large Black breeding unit of three sows and one boar. Pig rearing is the primary source of livelihood for his family of five. The income maintains his family and, during the last five years, he has bought 1 ha of cultivable land and a rice huller mill. He weans his piglets at one to one and half months of age in response to the high demand for piglets in the village. On many occasions he is paid in advance for the piglets. He also gets income from providing his boar for mating neighbours' sows.

*Source: Deka, R., Thrope, W., Lucila Lapar, M. & Kumar, A. 2007. Assam's pig sub-sector: current status, constraints and opportunities, ILRI, New Dehli*

A more socially oriented community level diversification in pig enterprises can be found in harmonious village communities. In these settings different steps of pig production can be performed in a joint effort. Keeping boars used for mating can be the separate activity of one group of community members; reproductive sows and their offspring a second group of community members and a third group can raise the animals until they reach market/slaughter weight. This way all community members have only a limited number of animals they have to take care of but can, as a group, influence all steps from breeding to fattening.

### **Enterprise integration: pig-aquaculture**

The combination of pig husbandry and aquaculture is very common in some parts of Asia. This integration of enterprises is an example of

optimized nutrient flow within a farming system to increase its productivity. A small number of pigs are kept in the vicinity of a fish pond and the manure is used to either directly feed the fish kept in the pond or to fertilize the pond and increase the growth of algae the fish can feed on.

### **Peri-urban production**

The ability of pigs to feed on leftovers and by-products make them suitable for landless production systems in peri-urban areas where the producer can be linked to larger markets. With this characteristic it becomes an interesting option for diversification for communities with little access to land. Landless production does require adequate manure management if droppings cannot be used in vegetable gardens or similar settings in order to avoid pollution.



## CASE STUDY 13 Pigs and farm ponds in Viet Nam

Mrs Van Thi Viet lives in the Red River Delta in northern Viet Nam. She raises two pigs in a building on the edge of a small fish pond of 360 m<sup>2</sup> (1 sao in Vietnamese local unit); this ratio of 60 pigs raised per hectare of ponds brings enough nitrogen to fertilize the pond and nourish the carps without risking water pollution or anoxia in fishes. The traditional fish species are Grass carp (*Ctenopharyngodon idella*), Common carp (*Cyprinus carpio*), Silver carp (*Hypophthalmichthys molitrix*) and various other fishes that use different trophic environments in the pond. This pigs-fish combination gives the highest yields of fish and pig effluents are thus considered as a real by-product and not a source of environmental pollution.

*Source: Porphyre, V., Costard, S. & Messad, S. 2010. Regional differences in management and biosecurity practices in Madagascar, Cirad*

### Processing – moving on along the supply chain

The processing of edible livestock parts brings a series of benefits to the producer and can be achieved even in small-scale settings. Not only does processing contribute to the integration of animal tissues that would otherwise not enter the food chain, but it can extend shelf-life and make animal protein available beyond slaughter and functioning cold chains. After all, this adds value to the commodity and can significantly raise profit margins. Processing usually requires further investments and therefore market opportunities need to be assessed carefully before such steps are taken.

#### ■ Challenges

#### Technical know-how and training

Even though pig production at small-scale level is not the most complex

farming activity, the technical knowledge on the basics is crucial and often not available in rural communities. This knowledge gap needs to be seen as a major constraint preventing such an enterprise from contributing to poverty alleviation.

#### Market knowledge

Promoting pig production can only be recommended if the market situation and outlook have been assessed properly. Public investments in pig market development as well as the promotion of private investments of small-scale farmers must be based on sound knowledge of the actual and potential contribution of this sector to the livelihoods of small-scale farmers and overall rural development.

#### Market access

Unlike the dairy sector, the commodity pork shows crucial

differences between what the small-scale sector usually produces and what the extremely specialized urban/international markets demand. The ability to deliver the required product quality of growing markets is defined by the genetic material used in production, but this material is too input-intensive for the vast majority of small-scale producers. This major constraint needs to be tackled either by enabling small-scale farmers to participate in the more demanding production process of urban pork markets or by strengthening local markets with the promotion of consumption patterns these farmers can cope with. There is also the potential of improving local genetics, provided that they are feasibly adaptable.

### **Quality and safety at smallholder level**

This is another challenge and has to be overcome for small-scale pig enterprises to develop and prosper. Quality criteria, food safety and hygiene are all issues which small-scale farmers find difficult to address when confronted with standards and regulations developed for large-scale and more industrially developed pig organizations. Regulations devoted to the small-scale sector need

to take into consideration such aspects and need to deal with the particularities involved.

### **Resource availability**

Except for the no-input production systems, where pigs roam freely and receive little to no attention, all forms of pig production require resources and at least minimal investments. Access to financial resources as well as access to adequate feed and water forms the fundamental pillars for successful small-scale pig production.

### **Supportive structures**

Pig production requires essential supportive structures like most agricultural systems. Research and development needs to fill the region-specific knowledge gaps that can help to make this enterprise beneficial for rural communities. At the same time the public sector must fulfil its role in supporting and regulating the market and prevent an overall dominance of the large-scale industrialized pig production sector.

## Selected further reading

**Ajala, M.K., Adesehinwa, A.O.K. & Mohammed, A.K.** 2007. Characteristics of smallholder pig production in southern Kaduna area of Kaduna State, Nigeria, *American-Eurasian Journal of Agriculture and Environmental Science*.

**Ajala, M.K. & Adesehinwa, A.O.K.** 2007. Roles and efficiency of participants in pig marketing in the northern part of Nigeria, *Journal of Central European Agriculture*.

**Deka, R., Thrope, W., Lucila Lapar, M. & Kumar, A.** 2007. *Assam's pig sub-sector: current status, constraints and opportunities*, ILRI, New Dehli.

**DFID.** 2003. *Guide to rural economic and enterprise development*, DFID, FAO, GTZ, CTA, Eschborn.

**FAO.** 2010. Good practices in the feed industry, *FAO Animal and production health manual* No. 9, Rome.

**FAO.** 2009a. Rural transport and traction enterprises for improved livelihoods, by P. Crossley, T Chamen & J. Kienzle, *FAO Diversification booklet* No. 10, Rome.

**FAO.** 2009b. Farm ponds for water, fish and livelihoods, by J.W. Miller, *FAO Diversification booklet* No. 13, Rome.

**FAO.** 2008. *Abattoir development, options and designs for hygienic basic and medium sized abattoirs*, by G. Heinz, Regional office for Asia and the Pacific, Bangkok.

**FAO.** 2007a. *Meat processing technology for small-to medium-scale producers*, by G. Heinz & P. Hautzinger, Regional office for Asia and the Pacific, Bangkok.

- FAO.** 2007b. *Farm Management and planning in Africa*, Rome.
- FAO.** 2006. *Farm Management and planning in Asia*, Rome.
- FAO.** 2005a. *Talking about money*, by J. Heney, Rome.
- FAO.** 2005b. *Codex codes of hygienic practice: Meat*, Rome.
- FAO.** 2004a. *Good practices for the meat industry, FAO Animal and production health manual No. 2*, Rome.
- FAO.** 2004b. *Farm management and planning in the Caribbean*, Rome.
- FAO.** 2001a. *Guidelines for the humane, handling, transport and slaughter of livestock*, by P.G. Chambers & T. Grandin, Regional office for Asia and the Pacific, Bangkok.
- FAO.** 2001b. *Manual of African swine fever for pig producers*, Rome.
- FAO.** 2000a. *Manual on meat inspection for developing countries*, by D. Herenda, *FAO Animal production and health paper No. 119*, Rome.
- FAO.** 2000b. *Understanding and using market information*, by A.W. Shepherd, *FAO Marketing Extension Guide No.2*, Rome.
- FAO.** 2000c. *Enhancing farmers' financial management skills*, by J. Heney, *Agricultural Finance Revisited No.6*, Rome.
- FAO.** 1998. *Food quality and safety systems - A training manual on food hygiene and the Hazard Analysis and Critical Control Point (HACCP) System*, Rome.
- FAO.** 1997a. *Feeding pigs in the tropics*, by R. Pérez, *FAO Animal production and health paper No. 132*, Rome.

**FAO.** 1997b. *Principles for rational delivery of public and private veterinary services with reference to Africa*, Rome.

**FAO.** 1997c. *Agricultural and food marketing management*, by I.M. Crawford, *AGS Marketing and Agribusiness Text*, Vol. 2, Rome.

**FAO.** 1997d. *Marketing research and information systems*, by I.M. Crawford, *AGS Marketing and Agribusiness Text*, Vol. 4, Rome.

**FAO.** 1995. *The group enterprise book*, Rome.

**FAO.** 1994a. *A manual for the primary animal health care worker*, Rome.

**FAO.** 1994b. *The group promoter's resource book*, Rome.

**FAO.** 1994c. *Management of rural income-generating activities*, Rome.

**FAO.** 1994d. *Simple bookkeeping and business management skills*, by R. Meijernik, Rome.

**FAO.** 1993. *A guide to marketing costs and how to calculate them*, by A.W. Shepherd, *FAO Marketing Extension Guide*, Rome.

**FAO.** 1992. *Meat and meat products in human nutrition in developing countries*, by A. Bender, *Food and nutrition paper* No. 53, Rome.

**FAO.** 1991a. *Guidelines for slaughtering, meat cutting and further processing*, *FAO Animal and production health paper* No. 91, Rome.

**FAO.** 1991b. *Manual on meat cold store operation and management*, by G. Cano-Muñoz, *FAO Animal and production health paper* No. 92, Rome.

**FAO.** 1990. *Manual on simple methods of meat preservation*, *FAO Animal production and health paper* No. 79, Rome.

**FAO, OIE & WB.** 2010. Good practices for biosecurity in the pig sector – issues and options in developing and transition countries, *FAO Animal Production and Health Paper* No. 169, Food and Agriculture Organization of the United Nations/World Organisation for Animal Health, World Bank, Rome.

**Hasheider, P.** 2008. *How to raise pigs*, Voyageur Press.

**Holness, D.H.** 1991. *Pigs*, Macmillan.

**Huynh, T.T.T., Aarnik, A.J.A., Drucker, A. & Verstegen, M.W.A.** 2006. Pig production in Cambodia, Laos, Philippines, and Vietnam: A review, *Asian Journal of Agriculture and Development*, Vol.3, Nos.1 & 2.

**ILO.** 2000. *Rapid market appraisal*, ILO, Geneva.

**ILRI.** 2008. *Pig systems in Southeast Asia- The case of Cambodia*, Nairobi.

**ILRI.** 2006. *Livestock farmer field school, guidelines for facilitation and field manual*, by G. Buyu & D. Romney, Nairobi.

**Klober, K.** 2009. *Storey's guide to raising pigs*, Storey publishing.

**Muys, D. & Westenbrink, G.** 2004. *Pig husbandry in the tropics*, CTA, Wageningen.

**Porphyre, V., Costard, S. & Messad, S.** 2010. *Regional differences in management and biosecurity practices in Madagascar*, Cirad.

**Serres, H.** 1992. *Manual of pig production in the tropics*, CABI.

**Uhl, J.N. & Kohls, R.L.** 2001. *Marketing of agricultural products*, 9th edition, Prentice Hall.

# Sources of further information and support

## **Food and Agriculture Organization of the United Nations (FAO)**

Domestic animal diversity information system (DAD-IS):

<http://dad.fao.org>

FAO Animal production and health division

<http://www.fao.org/ag/againfo/home/en/index.htm>

FAO Animal welfare web-portal

<http://www.fao.org/ag/againfo/programmes/animal-welfare/en/>

Good agricultural practices (GAP)

[http://www.fao.org/prods/gap/index\\_en.htm](http://www.fao.org/prods/gap/index_en.htm)

Nutrition and consumer protection

[http://www.fao.org/ag/agn/agns/foodcontrol\\_assurance\\_en.asp](http://www.fao.org/ag/agn/agns/foodcontrol_assurance_en.asp)

## **World Organization for Animal Health (OIE)**

[http://www.oie.int/eng/en\\_index.htm](http://www.oie.int/eng/en_index.htm)

## **International Livestock Research Institute (ILRI)**

<http://www.ilri.org/>

## **Information center about pig production in developing countries (CIRAD)**

<http://pigtrop.cirad.fr/home>

## **The American Association of swine veterinarians**

<http://www.aasv.org/>

**The pig Site – the website for the global pig industry**

*<http://www.thepigsite.com/>*

**Pig Progress – portal on global pig production**

*<http://www.pigprogress.net/>*

**Pig 333, Pig to Pork**

*<http://www.pig333.com/home/>*



Notes

Notes

This booklet promotes pig production and marketing as a viable diversification enterprise for small-scale farmers. The potential of pigs provides a multitude of opportunities and benefits that can support small-scale farmer development with improved diets, increased food and income security as well as reduced vulnerability. The booklet targets those who are involved in developing and enhancing revenue-generating enterprises for small-scale farmers, working for public, private and donor institutions.



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