

Evaluation of the effects of training methodologies, motivational influences and staff and enterprise development initiatives for livestock industry workers in Scotland, Greece, Spain, Italy and Norway on livestock performance and indices of animal welfare

P. R. English¹, O. McPherson¹, S. G. Deligeorgis², J. M. Vidal³, C. Tarocco⁴, F. Bertaccini⁴ and H. Sterten⁵

¹Department of Agriculture, University of Aberdeen, MacRobert Building, 581 King Street, Aberdeen AB24 5UA

²Agricultural University of Athens, Greece

³Inatega SA, Leon, Spain

⁴University of Bologna, Italy

⁵Felleskjopet Forutvikling, Trondheim, Norway

Introduction

Performance recording schemes in livestock production have always highlighted the very large differences in livestock performance and financial margins between participating farms in all sectors e.g. Meat and Livestock Commission (MLC, 1998) for the pig, sheep and beef sectors and Milkfinder Axiom: Genus (1998) for the milk production sector. In any specific sector, under similar conditions of climate and other influential variables, some of this between-farm variation is due to different genotypes, food resources and building facilities but it is likely that a very large part of this variation is caused by the quality of the human resources — the management and the stockpeople (English, 1996). Each individual has an important influence and how well the stockpeople and managers combine as a team is likely to have an even greater influence. Seabrook (1974) was among the first to quantify the large independent influence of the stockman on the milk production of dairy cows. Hemsworth *et al.* (1981) also demonstrated large effects of the stockperson on the reproductive performance in pig herds in Holland. Ravel *et al.* (1996) quantified similar positive influences of good stockpeople on piglet survival in herds in Quebec. These workers found that the influences of the stockpeople were related to personality differences (Seabrook, 1974, Ravel *et al.*, 1996) and to the quality of the relationship between the stockman and the animals in his care as measured by the degree of fear responses of the animal towards the stockman or the absence of such responses (Seabrook 1974, Hemsworth *et al.*, 1981).

After establishing that a high level of fear in animals was the result of negative handling behaviour of stockpeople, Hemsworth *et al.* (1994) used a comprehensive training scheme designed to change the attitudes, beliefs and behaviour of the individual

stockman responsible for the breeding management of sows on each of 35 farms in Australia. This scheme, which involved on-farm training using instructive guidance on pig behaviour, encouragement to change aversive behaviour towards pigs, training leaflets, videos, posters and regular newsletters, proved to be effective in changing the attitude of these stockmen towards using a much lower percentage of negative behaviours (mild, moderate and forceful hits, slaps, kicks and pushes) and a much higher proportion of positive behaviours (pats, strokes and one hand resting on the back) when moving and handling sows for detection of oestrus and mating. This training scheme resulted in an improvement in pigs born per sow per year of 7% on average, on these farms. The sows also became easier to handle which had a positive influence on job satisfaction and job turn-over rate declined.

Thus, the study of Hemsworth *et al.* (1994) focused on one stockman on each farm who had displayed in the past a high proportion of negative behaviours towards his pigs. There do not appear to be any reports of studies in the relevant literature on comprehensive on-farm training programmes involving the entire team of workers and the impact of training on farm performance. Muirhead (1983) did report increased performance in pig herds following on-farm training but the claimed improvements were not quantified. Many large livestock industry companies operate their own in-house training schemes and some of these are undoubtedly very effective. However, the details and impact of such schemes have not been publicized.

Despite the lack of quantitative data on the impact of on-farm training of the whole team of management and employees, both Segundo (1989) and English *et*

al. (1992) presented firm hypotheses on the likely significant positive impact of well designed and appropriately delivered on-farm training for livestock industry workers. These hypotheses were based on the merits of 'purpose-built' training and concepts of team-working, partnership, motivation, and job satisfaction, and working in unison towards the business objectives of the livestock enterprise. Bennett (1989) claimed that effective in-house training of the workforce can improve the morale of the workers, create better interpersonal relationships and instil in employees a sense of loyalty to the company. Hemsworth and Coleman (1998) have also emphasized the importance and value of 'purpose-built' on-farm training to meet educational and training needs, as well as providing other dividends for livestock industry workers. Thus, on-farm training was the approach employed in the present study.

Material and methods

The details of training materials developed, the training approaches, the courses conducted, the associated motivational initiatives and the evaluation methods used have been described in the previous paper (English *et al.*, 1999). The measurement of on-farm performance in the 12 months before and after

the training and motivational initiatives were applied was monitored using the comprehensive recording systems in operation on each farm. There were no major changes to the farm facilities or to the systems operating on any of the four farms studied in the 12 months after the training initiatives were applied, relative to the prior 12-month period. Neither were there staffing changes apart from the departure from the dairy farm of one senior worker 6 months after the training initiatives were carried out.

Results

The farm performance data before and after the initiatives were applied are summarized in Table 1 (pig herds) and Table 2 (dairy herd).

Thus there were increased annual sales of pigs on farms A, B and C of 307 (+12.6%), 866 (+11.7%) and 726 (+13.4%) respectively in the year after the training/educational/certification/motivational initiatives had been applied because of improved sow reproductive performance and reduced mortality. The improvements in performance were achieved with minimal additional capital investment and almost entirely by (1) additional care (hypothermia prevention and sensitive fostering) of new-born piglets, (2) improved care of smaller, less

Table 1 Farm results for 1 year before and 1 year after the training/education/certification/motivational initiatives were applied

	Before	After	Additional pigs sold per year
Farm A (120 sows)			
Pigs weaned per litter	9.25	9.96	
Conception rate (%)	84	92	307
Litters per sow per year	2.2	2.3	(+12.6%)
Pigs reared per sow per year	20.35	22.91	
Farm B (520 sows)			
Litters per sow per year	2.03	2.10	
Stillbirths per litter	0.71	0.52	
Pigs reared per litter	8.84	9.12	1010
Pigs reared per sow per year	17.94	19.15	(+11.7%)
Rearing herd mortality (%)	4.0	2.4	
Finishing herd mortality (%)	4.0	3.2	
Food per sow per year (kg)	1058	985	Other dividends
Sow food cost per tonne (M.Lira)	0.44	0.43	Reduced sow food costs
Daily live-weight gain (g)			
Weaning to 30 kg	299	338	Increased growth rate
30 kg to slaughter	516	647	
Farm C (350 sows)			
Litters per sow per year	1.91	2.08	
Stillbirths per litter	0.80	0.53	
Pigs reared per litter	8.82	9.01	726
Pigs reared per sow per year	16.85	18.74	(+13.4%)
Rearing herd mortality (%)	4.0	3.0	
Finishing herd mortality (%)	4.5	3.6	
Daily live-weight gain (g)			Other dividends
Weaning to 30 kg	307	357	Increased growth rate
30 kg to slaughter	508	585	

competitive pigs, (3) earlier detection of disease and other problems combined with prompt application of remedial treatment and (4) better AI/service management through having a better understanding of the pig's needs and providing for these needs through enhanced stockmanship care. As well as reductions in mortality and enhanced reproductive performance, some economies were achieved in sow food usage on farm B, while pig growth rate from weaning to slaughter was increased substantially on both farms B and C. Thus considerable dividends in terms of enhanced pig survival, reproduction, growth and efficiency of production resulted from the training/educational/motivational/staff and enterprise development initiatives applied.

The main change noticeable in dairy herd performance in the 12-month period after training, relative to the previous 12 months, was substantial improvement in reproductive performance. Pregnancy rate to first insemination increased by 18 percentage points while number of inseminations per pregnancy was reduced by 0.35 per pregnancy. The most likely reasons for these improvements were considered to be more efficient and more timely detection of oestrus, possibly more careful handling of the cows before, during and after artificial insemination, and more timely inseminations so that more cows were inseminated closer to the optimum stage in relation to the timing of ovulation. The improved pregnancy rate to first insemination was expected to reduce calving interval but the main improvement in this parameter was expected in year 2 after the initiatives were applied. A marked reduction was achieved in bacterial count, which

management attributed to improved hygiene both during milking and in the lying areas. The increase in both protein and fat content of milk were considered to be due to dietary improvements.

Discussion

The improvement of livestock performance associated with the initiatives

These results are based on only four farms, three in the pig sector and one in the dairy sector. Such 'before' and 'after' comparisons are currently in progress on many pig, dairy and sheep milk and lamb production enterprises in all participating countries.

On all four farms for which data are available to date, substantial improvements were achieved in production parameters. These were attributed to the education/training/motivational initiatives applied because no other major changes took place on these farms over this 2-year period.

While all stockpeople demonstrated great interest in education and training and in the motivational initiatives, achieved substantial increases in post-course test scores relative to pre-course tests scores and in general were extremely positive about all the initiatives, (see previous paper: English *et al*, 1999), the magnitude of some of the improvements achieved in year 2 were none the less surprising.

On the basis of the earlier supposition (see **Introduction**) that a large proportion of the variation in performance between livestock enterprises of the same type under similar conditions is largely due to differences in the 'quality' of the management-stockpeople team, it is interesting to examine the differences between pig herd performance categories in the MLC recording scheme (MLC, 1998) (see Table 3).

When the differences in a commonly accepted major efficiency parameter such as 'pigs weaned per sow

Table 2 Farm results for 1 year before and 1 year after the training/education/certification/motivational initiatives were applied

Farm D (340 dairy cows)	Before	After
Milk yield per cow (l)	7097	7127
Milk protein (g/kg)	33.0	33.5
Butter fat (g/kg)	36.2	39.1
Hygienic quality		
Cell count (,000)	260	272
Bacterial count (,000)	6	4
Pregnancy rate to first insemination (%)	33	51
No. of inseminations per pregnancy	2.65	2.3
Lactation length (days)	310	310
Calving interval (days)	409	403
Calf mortality (livebirths) (%)	1.0	0.3

Table 3 UK breeding herd results (MLC, 1997)

	Bottom third	Average	Top third	Top 10%
Herds	85	254	85	25
Sows per herd	217	277	338	249
Weaning (days)	26	25	24	24
Pigs reared per sow per year	19.2	21.7	23.4	25.0
	Base	+13.0%	+21.9%	+30.2%
		Base	+7.8%	+15.2%
			Base	+6.8%

per year' is examined, it can be seen that the top 10 per cent is 6.8% better than the top third, the top third is 7.8% better than the 'average' while the average is 13.0% better than the bottom third. The difference between the average and the bottom third is similar to the 'before' and 'after' differences between the farms in the present study. This helps to put the 'before' and 'after' differences in the present study into perspective and the percentage differences between the categories in Table 3 help to make the point that the poorer the initial performance level, the easier it is to make substantial improvements. Apart from herd A (Table 1), which was on a small family farm in Spain, the other two pig herds had fairly low performance levels in year 1. In addition the reproductive performance in the dairy herd was also relatively poor.

The enhancement of the knowledge and understanding of the stockpeople, the improved basis of their skills (including handling), their enhanced motivation and team working, or some combination of these and other associated factors, appeared to be effective in achieving substantial improvements in important performance parameters.

As more 'before' and 'after' data are collected from other herds and flocks, it is likely that the improvements achieved on some farms will be much smaller than in the four farms monitored to date. On other farms, perhaps those with very high levels of performance and which already have a very knowledgeable, highly skilled and very motivated management-stockpeople team operating the enterprise, no improvements may be noticeable. A small proportion of farms may well suffer depressed livestock performance following a training-motivation exercise for reasons which may be obvious, such as an unexpected outbreak of disease, or for reasons which are less obvious.

It will be important, therefore, that as this study proceeds and data are obtained from more farms, an increased awareness is acquired of the factors which influence the variable responses which may be obtained from different farm situations. This may help to predict in advance the farm situations in which similar educational/training/motivational initiatives to those employed in this study may be cost-effective and those farms in which these approaches are unlikely to be cost-effective.

At this stage one can only speculate on the most influential components of the current initiatives which are contributing to improvements in animal performance. Among these possible influences are (1) enhanced knowledge and understanding of the

animals' requirements and of how best to provide for these needs on the farm in focus, (2) an improved basis for skills including correct handling procedures (maximizing the positive and minimizing the negative or aversive influences as described by Hemsworth and Coleman (1998)), (3) better team working, (4) enhanced motivation and (5) better job satisfaction. Undoubtedly the synergistic influence of these complementary components is greater than the sum of the individual influences. In other words, the combined 'package' is likely to be the influential element in the improvements monitored to date.

Positive interactions of the elements of the overall initiatives

Several human psychologists, animal scientists and experienced livestock managers have contributed to our understanding of the interaction of the elements contained in the current package. Lloyd (1975), in highlighting the lack of training and of trained staff in the poultry industry, contended that training to improve understanding of the birds' needs and associated skills would not only enhance animal care but would also have positive influences on job satisfaction, work performance and employment stability, thus reducing staff turn-over and helping to keep a good working team together. On the basis of experience, Bennett (1989) claimed that training can improve workers' morale, create better interpersonal relationships, instil in employees a sense of loyalty to the organization as well as providing other intangible benefits. Grusenmeyer (1992) reported similar associated influences of well designed training in the USA dairy industry. Hemsworth *et al.* (1994), in using appropriate training to change faulty attitudes of stockpeople towards using more positive behaviours and fewer negative behaviours when handling breeding sows, succeeded in this objective. This was shown to result in better reproductive performance and in the ease of handling of the animals. This enhanced behaviour and performance of the animals in their care proved to have a motivating influence on the stockpeople and enhanced job satisfaction and also appeared to reduce job turn-over.

Vroom (1964), in the non-agricultural sector, found significant correlations between job satisfaction and the incidence of on the job accidents, absenteeism, staff turn-over and even better mental and physical health. Thus, a combination of influences from the application of the entire education/training/motivation package in the present work are likely to have contributed to the enhanced performance in the livestock enterprises in the study. The feeling of achievement in reducing mortality and improving breeding performance, in turn, is likely to provide further motivation and job satisfaction.

Improvement in indices of animal welfare

Among the major objectives of these initiatives are the enhancement of livestock performance and business efficiency through improving animal health and welfare. It is clear from the results to date that some obvious indices of welfare, such as survival of piglets and older pigs, have been enhanced through meeting needs more effectively, including earlier diagnosis and remedying of problems. However, it is important to establish whether or not higher overall productivity in terms of enhanced reproductive performance, survival and growth can be equated with enhancement of animal welfare.

Enhanced animal productivity and animal welfare

The concept of 'biological fitness' which can be defined as the basic ability to survive, grow and reproduce has been discussed by Fraser and Broom (1990), Broom and Johnson (1993) and Hemsworth *et al.* (1996) as being potentially a useful index of welfare. The concept is based on the premise that if the animal is suffering from acute or chronic stress there can be undesirable behavioural responses in terms of fear and the development of vices, as well as physiological responses associated with prolonged activation of the hypothalamus-pituitary-adrenal axis. This in turn can lead to suppression of the immune system leading to increased disease susceptibility and higher mortality, as well as depressions in growth, reproduction and milk production. Such stress induced depressions in growth and reproductive performance stem from the disruption of protein metabolism and key reproductive endocrine events (Klasing 1985; Moberg, 1985; Clarke *et al.*, 1992).

Thus, there are strong arguments for using overall animal performance in terms of reproduction, lactation, survival and growth as a useful index of welfare (Beilharz and Zeeb, 1981; Beilharz, 1982). However, Broom and Johnston (1993) have urged rightful caution regarding generalizing about the closeness of this association, indicating that a high level of animal performance might be achieved with the support of procedures and products which are not consistent with welfare enhancement. Such examples include the force feeding of geese to enhance growth and liver weight, the use of bovine and porcine somatotropin to enhance milk yield in dairy cows and growth in pigs respectively and the use of in-food antibiotics to suppress endemic disease conditions induced by faulty husbandry and facilities.

However, in the case of animal performance increases (reproduction, survival and growth) in the current study which result from the application of the educational, training and motivational initiatives,

these are likely to reflect improvements in both overall welfare within the system and that of the individuals which were most disadvantaged before the initiatives were implemented.

The basis of the educational and training initiatives is in enhancing awareness of the basic needs of the livestock, on how best to provide for these needs, on behavioural indices of well being, on the ability to detect problems earlier and rectify them more promptly and effectively, and the importance of stockperson-animal relationships to the animal, its well being and performance. The further emphasis is on enhancing motivation and job satisfaction and the stimulation to improve animal care through better understanding, attention to detail and good husbandry in general.

Thus the improvements in animal performance achieved in the livestock enterprises participating in the study very largely stem from these enhanced husbandry influences and not from artificial agents such as in-food antibiotics and exogenous hormones which are likely to compromise animal welfare.

Projected development of the initiatives

The projected further development of the educational/training/motivational initiatives being evaluated in the present study is summarized in Figure 1.

Part of the future strategy will be the training of trainers so that each farm will eventually have the opportunity to be responsible for its own regular and progressive training. Thus the owner, managers and senior stockpeople can gradually contribute increasing proportions of the training provision. It is

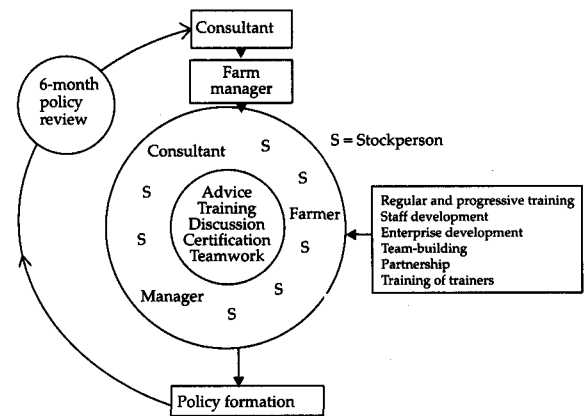


Figure 1 Projected development: a model for regular and progressive training, staff development, team building and enterprise development.

desirable that the main farm consultants (e.g. the veterinarian, nutritional consultant, the husbandry or business adviser) also become more involved in training. Up to the present, it is likely that these consultants communicate almost exclusively with management. This communication at management level should continue but should also be extended to include the stockpeople during the regular and progressive training which is envisaged. With all personnel involved in training, trouble shooting, and problem solving together, the talents and ideas of the stockpeople can contribute to the policy making of the management team. Thus, progressively, the stockpeople themselves have the opportunity to contribute to policy making. This is effective team working as well as training and the stockpeople feel an increasing sense of partnership in the business. Conferring such increased problem solving and policy making responsibility has been found to contribute substantially to employee motivation and enhanced job satisfaction (Herzberg *et al.*, 1959; Bowen, 1992; Grusenmeyer, 1992; Umphrey, 1992). These workers found that farm policies which had the 'handprint' of the entire management-stockpeople team on them were much more likely to succeed. Grusenmeyer (1992) established on the basis of experience in large dairy herds in the USA that good stockpeople need leadership and not management, and further asserted that such good employees should not be over managed and under lead.

Conclusions

Thus, while the on-farm educational, training and motivational approaches deployed in this study have been successful to date in a small number of farms in enhancing livestock performance, the initiatives are still in their early developmental stages. However, the interim results are promising and making the most of human resources on farms, both individually and collectively, in effective teams of animal carers, trouble shooters, problem solvers and policy makers, is likely to be the most cost-effective way in the future to ensure high standards of animal welfare, livestock performance and business efficiency in livestock enterprises.

Acknowledgements

We are grateful to the European Union for the award of a grant for this work under the Leonardo da Vinci programme.

References

Beilharz, R. G. 1982. Genetic adaptation in relation to animal welfare. *International Journal of the Study of Animal Problems* 3: 117-124.

Beilharz, R. G. and Zeeb, K. 1981. Applied ethology and animal welfare. *Applied Animal Ethology* 7: 3-10.

Bennett, R. 1989. *Managing people*. Richard Clay, Great Britain.

Bowen, M. K. 1992. The role of the dairy manager in human resource management. In *Large dairy herd management* (ed. H. H. van Horn, and C. J. Wilcox), pp. 757-763. American Dairy Science Association.

Broom, D. M. and Johnson, K. G. 1993. *Stress and animal welfare*. Chapman and Hall, London.

Clarke, I. J., Hemsworth, P. H., Barnett, J. L. and Tilbrook, A. J. 1992. Stress and reproduction in farm animals. In *Stress and reproduction* (ed. K. E. Sheppard, J. H. Boublik and J. W. Funder), pp. 239-251. Sero Symposium Publications, vol. 86. Raven Press, New York.

English, P. R. 1996. Stockmanship: improving this valuable resource. *Proceedings of the Saskatchewan Park Industry Symposium, Saskatoon, November 1996*, pp. 111-125.

English, P. R., Burgess, G., Segundo, R. and Dunne, J. H. 1992. *Stockmanship: improving the care of the pig and other livestock*. Farming Press, Ipswich, Suffolk, England.

English, P. R., McPherson, O., Deligeorgis, S. G., Vidal, J. M., Tarocco, C., Bertaccini, F. and Sterten, H. 1999. Evaluation of training, certification and career development strategies for livestock industry workers in Scotland, Greece, Spain, Italy and Norway. In *Farm animal welfare. Who writes the rules?* (ed. A. J. F. Russel, C. A. Morgan, C. J. Savory, M. C. Appleby, and T. L. J. Lawrence), pp. 144-149. British Society of Animal Science, occasional publication no. 23.

Fraser, A. F. and Broom, D. M. 1990. *Farm animal behaviour and welfare*. CAB International, Wallingford, UK.

Grusenmeyer, D. 1992. Maximising human resource output. In *Large dairy herd management* (ed. H. H. Van Horn and C. J. Wilcox), pp. 764-771. American Dairy Science Association.

Hemsworth, P. H., Barnett, J. L. and Campbell, R. G. 1996. A study of the relative aversiveness of a new daily injection procedure for pigs. *Applied Animal Behaviour Science* 49: 389-401.

Hemsworth, P. H., Barnett, J. L. and Hansen, C. 1981. The influence of handling by humans on the behaviour, growth and corticosteroids in the juvenile female pig. *Hormones and Behaviour* 15: 396-403.

Hemsworth, P. H. and Coleman, G. J. 1998. *Human-livestock interactions: the stockperson and the productivity and welfare of intensively farmed animals*. CAB International, Wallingford.

Hemsworth, P. H., Coleman, G. J., and Barnett, J. L. 1994. Improving the attitude and behaviour of stockpeople towards pigs and the consequences on the behavioural and reproductive performance of commercial pigs. *Applied Animal Behaviour Science* 39: 349-362.

Herzberg, F., Mausner, B. and Snyderman, B. 1959. *The motivation to work*. J. Wiley, London.

Klasing, K. C. 1985. Influence of stress on protein metabolism. In *Animal stress* (ed. G. P. Moberg), pp. 268-280. American Physiological Society, Baltimore, USA.

Lloyd, D. H. 1975. Effective staff management. In *Economic factors affecting egg production*. (ed. B. M. Freeman and K. N. Boorman), pp. 221-251. British Poultry Science, Edinburgh.

- Meat and Livestock Commission.** 1998. *Meat and Livestock Commission pig year book*. MLC, PO Box 44, Milton Keynes.
- Milkminster Axiem: Genus.** 1998. *Axiem Milkminster annual report 1997-98*. Genus PLC, Westmere Drive, Crewe.
- Moberg, G. P.** 1985. Influence of stress on reproduction: measure of wellbeing. In *Animal stress* (ed. G. P. Moberg), pp. 245-267. American Physiological Society, Bethesda, Maryland.
- Muirhead, M.** 1983. The veterinary surgeon's role as an advisor in pig production. *International Swine Update. SQUIBB. March 1983*.
- Ravel, A., D'Allaire, S. and Bigras-Poulin, M.** 1996. Survey of management and housing in farrowing quarters among independent and integrated swine farms in Quebec. *Canadian Journal of Veterinary Research* **60**: 21-28.
- Seabrook, M.** 1974. A study of some elements of the cowman's skills as influencing the milk yield of dairy cows. *Ph.D. thesis, University of Reading*.
- Segundo, R. C.** 1989. A study of stockpeople and managers in the pig industry with special emphasis on the factors affecting their job satisfaction. *M.Sc. thesis, University of Aberdeen*.
- Umpfrey, J. E.** 1992. Understanding employee motivation. In *Large dairy herd management* (ed. H. H. Van Horn and C. J. Wilcox), pp. 786-792. American Dairy Science Association.
- Vroom, V. H.** 1964. *Work and motivation*. J. Wiley, London.