Modern Agricultural Entrepreneurship

Carolien Ketelaar-de Lauwere, Ina Enting, Peter Vermeulen, Kees Verhaar

Paper prepared for presentation at the 13th International Farm Management Congress, Wageningen, The Netherlands, July 7-12, 2002

MODERN AGRICULTURAL ENTREPRENEURSHIP[1]

Carolien Ketelaar-de Lauwere[a], Ina Enting[b], Peter Vermeulen[c] , Kees Verhaar[d]

[a]Institute for Agricultural and Environmental Engineering (IMAG), P.O. Box 43, NL-6700 AA Wageningen, The Netherlands, [b]Applied Plant Research, P.O. box 2176, NL-8203 AD Lelystad, The Netherlands, [c] Applied Plant Research, P.O. Box 8, NL-2670 AA Naaldwijk, The Netherlands, [d] Stoas Research, P.O. Box 78, NL-6700 AB Wageningen, The Netherlands

ABSTRACT

Drastic changes in Dutch agriculture have made agricultural entrepreneurship increasingly complex. But are farmers dealing with this complexity, and if so, how? This study, entitled 'the mystery of entrepreneurship', attempts to answer these questions. The aim of the research is to provide insight into the actual state of the art of Dutch agricultural entrepreneurship. This will clarify for policy makers how, and if, agricultural entrepreneurs are dealing with the radical changes in agriculture that are facing them. Answers to these questions will indicate how agricultural entrepreneurship can be stimulated. The final stage of the research will consider how to translate the results into agricultural education. The research will be focussed on the personal characteristics of entrepreneurs, on the different strategies they use to deal with the radical changes in agriculture, on their use of the knowledge infrastructure and, consequently, their use of social networks and on innovativeness. In addition, managerial tasks of entrepreneurs will be studied as well as the extent to which different farmers are oriented towards products, processes, system, chain and society, because this gives an impression of the stage of development of the farms. A survey of 1500 agricultural entrepreneurs, supplemented by more detailed qualitative information gathered from 45 farms by means of structural interviewing, comprise the material for answering our questions about entrepreneurship. Some preliminary results are presented here to illustrate how a farm feature, such as a way of farming, an

[1] The research is officially called 'The mystery of entrepreneurship' and is a collaboration of the Institute of Agricultural and Environmental Engineering (IMAG), Stoas Research, Research Institute for Animal Husbandry (PV) and Applied Plant Research.

environmental factor such as region and a personal feature such as age, can affect entrepreneurship.

INTRODUCTION

Public concern about agriculture is increasing in the Netherlands. The population is becoming more aware of the fact that the consumption of animal products is not totally safe, that animals are not always kept in animal-friendly surroundings, that genetic modification is sometimes used to improve vegetable products and that the environment is being seriously threatened (Ketelaar-de Lauwere et al., 2000a). Consumer demands and legislation are therefore becoming stricter and agricultural entrepreneurs are having to commit more and more resources to animal welfare, environmental measures and the maintenance of the landscape. Other problems, or challenges, they have to face are increasing competition due to open trade, the need for integration within the agricultural chain, the failing attractiveness of the sector as an employer and the increasing flexibility in work time and contracts (van der Schilden and Verhaar, 2000). All these developments have made modern agricultural entrepreneurship increasingly complex. It is open to question whether and how farmers[2] are able to deal with such complexity. Research will therefore be done to define modern agricultural entrepreneurship. Hopefully, this research will enable policy makers to gain more understanding of how farmers may react to radical changes in agriculture, how they will deal with, and be affected by, those changes and how they organise support in dealing with such changes. This will indicate whether modern agro-entrepreneurship needs to be stimulated and if so, how.

THEORETICAL BACKGROUND

What is entrepreneurship? A precise definition is difficult. Entrepreneurship can be approached from several viewpoints. Various studies have shown that the entrepreneur's *personal characteristics* are an important element (Verhaar and Hoeve, 1999; Nandram and Samson, 2000; de Buck, et al, 2000; Schrapnel and Davie, 2001). Elfring (2000) describes that the drive to achieve, the need to control, the nerve to take

[2] 'farm' or 'farmer' are defined respectively as all agricultural enterprises or agricultural entrepreneurs working in animal husbandry, arable farming or horticulture

risks and the ability to deal with uncertainty are the most frequently mentioned and important personal characteristics of entrepreneurs. Brockhaus and Horwitz (1986) also included 'achievement orientation' and 'internal locus of control'. These authors also stated that the *environmental perspective* is an important element of entrepreneurship. They wrote: "..if the work environment provided more freedom and opportunity for creative expression, most entrepreneurs would probably never open their own businesses". Elfring (2000) also mentions the environment as an important element of entrepreneurship but he emphasises the stimulating effect that the environment may have on the development of entrepreneurship and on the importance of *social networks*. This is supported by the research of Bosma et al. (2000), who found that s*ocial capital* is an important determinant of entrepreneurship. Having contact with other entrepreneurs in networks is one of the elements of this social capital, but other elements such as having other entrepreneurs in the family and getting emotional support from one's spouse are also mentioned. Other determinants of entrepreneurship according to Bosma et al. (2000) are *human capital* (age, education, experience in the branch, etc.), *financial capital* (eg. own capital, amount of income from sources other than the enterprise) and *strategies for keeping up with business demands*. The latter determinant is related to the entrepreneur's focus on commercial relations, the branch and direct business relations (customers and suppliers) and on informal contacts with fellow-entrepreneurs. These contacts are important "…..in retrieving relevant information that will help to keep up with business demands" (Bosma et al., 2000). This brings us to another important element of entrepreneurship: proper *use of the knowledge infrastructure* to help the entrepreneur to react effectively to any new developments (Van der Schilden and Verhaar, 2000). The last important element of entrepreneurship we wish to mention (without claiming that these are all the factors) is *innovativeness*. Elfring (2000) defines innovative entrepreneurship as the will and the ability of individuals to do things differently and to aspire to chances without too much concern for the resources available at that moment. Innovativeness is believed to be a key-factor for successful entrepreneurship.

All the above-mentioned elements of entrepreneurship will be studied in our research, but the focus will be on the personal characteristics of entrepreneurs, on their different strategies for dealing with the radical changes in Dutch agriculture, on their use of the knowledge infrastructure and, consequently, on their use of social networks and on

innovativeness. In addition, managerial tasks of entrepreneurs will be studied, as well as the extent to which different farmers are oriented towards the products, processes, system, chain and society. Studying managerial tasks will provide insight into the way different entrepreneurs divide their management into strategic, tactical and operational planning. In this context, 'strategic' refers to long-term decision making with regard to the future of the farm, 'tactical' refers to short-term decision making with regard to the progress of production processes and 'operational' refers to the performing of tasks (such as milking or weeding). Studying the orientation of farmers towards the products, processes, system, chain and society according to 'Total Quality Management' (TQM) methodology provides insight into the stage of development of the farm concerned (INK, 2000). Both information about managerial tasks, and farmers' and growers' orientations tell us something about the 'quality' of the entrepreneurship of individuals, and thus about the way we can help them to 'improve' their entrepreneurship.
Our aim is to provide insight into the actual state of the art of Dutch agricultural entrepreneurship. This will indicate to the policy makers how, and if, agricultural entrepreneurs are dealing with the radical changes in agriculture facing them. The answers to these questions will help to clarify how agricultural entrepreneurship can be stimulated. The final stage of the research will be to translate the results into agricultural education, as entrepreneurship is not only dependent on the personal effort of the farmer but also on the supporting infrastructure.

METHODOLOGY

Qualitative interviewing

The research is divided into two main parts.
In one part of the research several elements of entrepreneurship are studied in detail on approximately 45 farms by means of structural interviewing; approximately 15 dairy farms, 15 pig farms and 15 horticultural farms will be involved. These interviews will be used pre-eminently to gain insight into the managerial tasks of the farmers and their orientation towards the product, process, system, chain and society, according to TQM methodology. In addition, of course, some common questions are raised about the entrepreneur's age and education and size of the farm. In a second interview with the same farmers, questions will be asked about the entrepreneur's personal characteristics, about his use of the knowledge infrastructure, use of social networks and

innovativeness. The farmers selected for these interviews were not chosen at random. An estimate of the orientation of the farmer was made beforehand on the basis of acquaintance with the farmer and his enterprise. In this way, we hoped to have an equal distribution of orientations of the farmers interviewed, because we expected to find differences in managerial tasks, personal characteristics and use of the knowledge infrastructure according to the different orientation of the individuals. More details about this part of the research will be given in separate poster sessions at this congress.

Telephone survey

Another part of the research consists of a telephone survey (questionnaire) of approximately 1500 farmers to document the actual situation of agricultural entrepreneurship in the Netherlands. Several factors believed to affect entrepreneurship are studied (see below). These factors are related to the elements of entrepreneurship mentioned in the section on Theoretical Background. The information obtained in the 45 qualitative interviews mentioned above will be used to supplement and validate the results of the survey.

The 1500 addresses for the telephone survey are the results of contact with 6000 farmers and growers chosen at random from the six sectors, (1) dairy husbandry, (2) husbandry of pigs, poultry and veal, (3) arable farming, (4) vegetables in the open, fruit farming and tree cultivation, (5) vegetables under glass, and (6) flowers under glass. Per sector, 1000 addresses were chosen. From the enterprises with vegetables or flowers under glass, only non-organic growers could be selected for the survey. From the other sectors 50 organic farmers or growers were selected and 950 non-organic farmers or growers. The 6000 addresses were chosen at random from the address file for the year 2000, used for the annual agricultural inventories of the Agricultural-Economics Institute. Lower limits were defined for the size of farms in the different sectors. It was agreed beforehand that the response would have to be approximately 1500 and be divided evenly over the six sectors. A letter signed by the chairman of the Dutch agricultural and horticultural organisation was sent to all 6000 farmers and growers selected in an attempt to lower the non-response rate. The questions asked dealt with:

1. strategy on how to keep up with business demands (growth orientation or social orientation);
2. attitude to government interference (autonomy);
3. extent to which the farmer is pro-active;

4. financial security;
5. personal characteristics;
6. use of the knowledge infrastructure;
7. use of social networks;
8. innovativeness;
9. mental health;
10. view of the future (optimistic or not);
11. personal features such as age and education;
12. farm features such as size and sector;
13. income and the ratio of farm income to other income.

We considered that the survey contained too many questions for one individual. It was therefore divided into two questionnaires. 750 farmers were asked to answer one questionnaire and 750 the other. Questions 1 to 4 and 10 to 13 were common to both questionnaires. Questions 5 and 9 were added to one questionnaire and questions 6 to 8 to the other. Most questions could be answered by allocating a score between –4 (totally disagree) and +4 (totally agree).

Data analysis

Frequency tables for all separate items, and Pearson's correlation coefficients for items assumed to be related, were calculated. Several scales were composed out of probably related items on the basis of the calculated correlation coefficients, common sense and the literature. Cronbach's alphas were calculated to check the reliability of the scales. It should be mentioned, however, that more advanced statistical methods will be used at a later stage of data analysis to validate the scales. The scales described in this paper should therefore be interpreted as preliminary.

A univariate analysis of variance was used to estimate the effects of way of farming, region and age, on the farmers'strategies in a general linear model. The SPSS statistical package was used for the analyses (SPSS V10.0, 1999).

PRELIMINARY RESULTS

At the time of writing, the data from the survey had only just become available. It is impossible therefore to give a complete overview of the results at present. The preliminary results presented are thus only an illustration, and focus on differing

strategies of farmers to keep up with business demands, and their manner of answering questions related to these subjects. It will also be shown how farmers' strategies are affected by the farm feature sector, by the environmental feature region and by the personal feature age. Some more detailed information will be given in the poster presentations at the congress.

Complete information about the interviews is unavailable at present. The only 'result' we want to mention of the qualitative interviews which have been taken so far is that it appears to be quite difficult to find farmers who could be defined as chain oriented or socially oriented according to the TQM methodology. None of the 16 horticultural farmers interviewed could be defined as chain or socially oriented, in spite of the fact that some of them had been expected to be so inclined beforehand. The same trend was seen for the six dairy farmers and five pig farmers interviewed so far.

Response to the survey

In total, 4687 phone calls had to be made in order to obtain a final response of 1504. The real non-response was 39.8 %. The unreal non-response (not at home, voice mail, etc.) was 28.1%.

The most important reasons for non-response were 'refuses to cooperate' (36.1%), 'survey has no use' (14.5%), 'already too many surveys' (13.6%), 'not possible to cooperate within research period' (8.7%) and 'survey takes too much time' (8.5%).

The response per sector was 262 dairy farmers (27 organic and 235 non-organic), 262 pig, poultry and veal farmers (27 organic and 235 non-organic), 255 arable farmers (21 organic and 234 non-organic), 254 growers with vegetables in the open, fruit or trees (23 organic and 231 non-organic), 235 growers of vegetables under glass (all non-organic) and 236 growers of flowers under glass (all non-organic).

Strategies to keep up with business demands

In the questionnaire, thirty general questions were compressed to five scales about growth and social orientation, autonomy, pro-activity and financial security. These scales can be interpreted as a kind of strategy. Table 1 gives an overview of the five scales and the items concerned. Cronbach's Alpha is also given for each scale as well as farmers' answers per item. Figure 1 shows how average scores of farmers are distributed over the measuring scale. It is obvious that farmers tended to score more positives than negatives for all scales (i.e. more 'agree' than 'disagree').

Table 1a. Overview of the items[1] which comprise the preliminary scales growth orientation, social orientation and autonomy; answers possible from –4 (totally disagree) to +4 (totally agree). The distribution of the farmers' answers to separate items is given in percentages.

answering possibilities	-4	-3	-2	-1	0	1	2	3	4
growth orientation (7 items;Alpha=0.62)	**0.2**	**0.3**	**1.5**	**4.8**	**14.1**	**26.3**	**32.0**	**17.9**	**3.0**
farm produces as much as possible with costs as low as possible	5.6	2.0	4.7	3.0	4.9	7.9	20.1	21.1	30.8
high production is a good strategy to keep up with business demands	4.0	3.5	6.8	5.7	4.2	10.9	18.2	18.6	28.0
lowering production costs is good strategy…..*	2.1	1.5	3.5	3.2	2.3	9.1	15.4	22.8	40.3
growing into a large specialised farm is good strategy…..	10.4	6.4	10.0	9.6	5.9	12.7	15.2	13.2	16.6
continuity of the farm is the only thing that matters; no matter how	5.8	3.1	9.7	8.4	5.9	12.2	21.1	16.1	17.8
the bigger and more modern the farm is than other farms; the more it succeeds	5.3	5.9	10.8	9.4	8.3	20.7	19.6	12.7	7.4
ensuring that technical results are as high as possible	0.9	2.2	4.7	5.7	3.1	13.8	26.7	26.0	16.8
social orientation (8 items; Alpha=0.60)	**0**	**0.3**	**2.2**	**9.7**	**20.9**	**31.5**	**23.1**	**10.6**	**1.7**
taking consumer demands into account p	1.0	0.5	1.3	1.2	2.2	8.7	24.1	28.3	32.7
progress due to environmentally and animal friendly management is good strategy	1.1	1.8	4.3	7.5	8.0	17.5	24.1	18.1	17.7
integration within the agricultural chain is a good strategy to keep up with business demands *	2.6	2.3	5.4	5.1	5.4	12.7	27.2	19.5	19.8
diversification is good strategy….	21.4	8.1	14.6	7.7	4.7	12.8	12.4	7.2	11.2
always looking for products with a high added value is good strategy *	3.1	2.1	6.0	6.2	6.0	16.4	23.9	16.5	19.7
organic agriculture or horticulture is good strategy*	36.9	11.4	11.9	7.4	4.7	9.0	6.6	3.7	8.3
investing in the environment or animal welfare will increase one's competitive position	3.4	2.3	5.5	4.6	4.4	14.1	24.4	20.4	20.9
important that products are marketed in a socially justified way p	1.4	0	0.9	1.1	2.3	7.2	21.6	29.0	36.6
autonomy (2 items; Alpha=0.38)	**0.5**	**0.5**	**1.9**	**4.5**	**9.3**	**16.2**	**19.5**	**24.3**	**23.3**
farmers should be given more flexibility to achieve government goals in their own way	0.6	0.5	1.3	1.9	2.3	6.3	18.5	24.5	44.1
farmers should not have to be bothered with demands concerning nature and landscape	4.3	4.3	11.8	10.4	6.3	14.8	15.8	10.7	21.7

[1]items are largely based on three existing questionnaires from Wageningen Agricultural University (van der Ploeg et al., 1994; Ettema et al., 1994; Ettema et al., 1995). Items marked with p are based on personal communication with van Broekhuizen from Wageningen Agricultural University; items marked with * are new.

Table 1b. Overview of the items[1] which comprise the preliminary scales pro-activity and financial security; answers possible from –4 (totally disagree) to +4 (totally agree). The distribution of the farmers' answers to separate items is given in percentages.

answering possibilities	-4	-3	-2	-1	0	1	2	3	4
pro-activity (6 items; Alpha=0.52)	**0.1**	**0.3**	**1.3**	**5.2**	**11.2**	**28.4**	**32.2**	**18.5**	**20.9**
social developments and changing legislation are more challenging than threatening *	12.6	5.1	10.8	9.5	9.7	15.7	18.8	10.7	6.9
cooperation with colleagues is a good strategy to keep up with business demands	6.5	3.9	6.2	4.9	4.9	12.5	19.2	17.2	24.7
anticipating developments in the market is good strategy…..	2.2	1.4	3.3	3.6	4.6	14.8	24.7	23.6	22.0
anticipating developments in policy is good strategy…..	2.4	1.9	5.9	5.3	5.1	17.5	29.0	19.0	13.8
Dutch agriculture should accept the challenge of open trade	9.3	4.6	8.9	5.1	4.0	11.6	17.5	15.9	23.1
farmers should take more initiatives themselves and strive for quality production and own marketing	1.3	1.1	3.5	2.1	2.5	9.8	27.0	25.3	27.5
financial security (7 items; Alpha=0.56)	**0.3**	**0.5**	**5.9**	**14.9**	**25.4**	**27.7**	**18.2**	**6.6**	**0.6**
with the future in mind, I will not make large investments at the moment	19.2	10.1	13.7	4.7	5.6	10.4	11.9	8.7	15.5
the farm should be free from loan capital	14.0	12.9	18.7	6.5	3.9	9.9	13.2	8.7	12.1
working pressure at the farm is not too great	3.3	4.1	7.1	5.3	2.7	9.3	21.1	22.4	24.7
there is not too much pressure on the family	6.8	6.3	12.6	8.6	4.1	11.2	18.7	17.6	14.2
ambitious investment has taken place (recode)	3.3	4.2	6.7	6.3	4.8	15.0	21.8	20.9	17.0
the farmer keeps costs as low as possible	2.4	3.7	7.5	6.7	2.6	13.6	22.8	20.8	20.0
the farmer uses own labour as much as possible	5.3	5.1	9.3	3.9	2.3	6.5	13.5	18.3	35.8

[1]items are largely based on three existing questionnaires from Wageningen Agricultural University (van der Ploeg et al., 1994; Ettema et al., 1994; Ettema et al., 1995). Items marked with * are new.

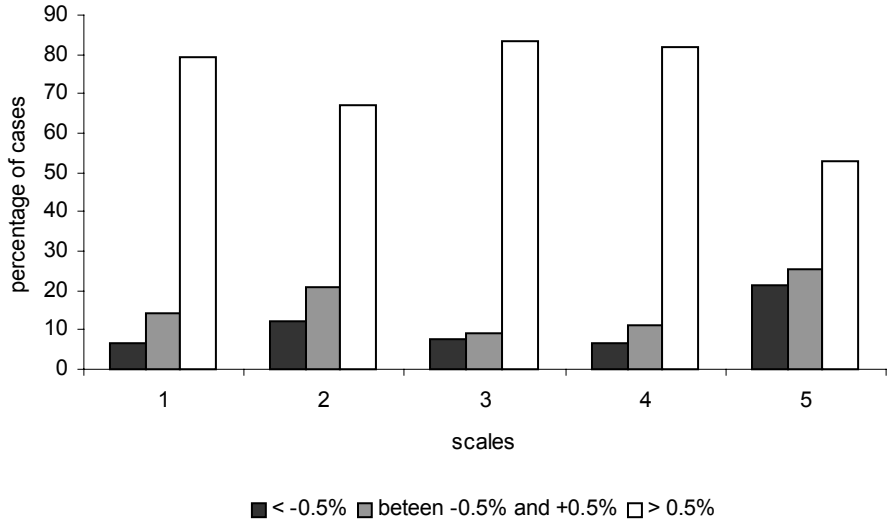

Figure 1. Distribution of average score of farmers for growth orientation (1), social orientation (2), autonomy (3), pro-activity (4) and financial security (5)

Table 2 shows how farmers' strategies are affected by their way of farming (organic vs. non-organic). In comparison with organic farmers, non-organic farmers are more growth oriented, less socially oriented, more keen on autonomy and have better financial security.

Table 2. The effects (parameter estimates) of organic or non-organic farming on farmers' strategies.

	organic farming	non-organic farming
growth orientation	0.23[a]	1.55[b]
social orientation	2.20[b]	0.87[a]
autonomy	0.76[a]	2.02[b]
pro-activity	1.31	1.43
financial security	0.06[a]	0.61[b]

[a,b] different characters indicate a significant difference ($p<0.05$)

Table 3 shows how the region where farmers come from can affect their strategy or attitude. Region is interpreted as an environmental feature. The results show that the northern part of the Netherlands is less socially oriented and pro-active than other regions and the western part of the Netherlands is more socially oriented and pro-active than other regions.

Table 3. The effects (parameter estimates) of region on farmers' strategies

	north	middle	west	south
growth orientation	1.58	1.39	1.42	1.52
social orientation	0.69[a]	0.97[b]	1.14[c]	0.90[b]
autonomy	2.10	1.90	1.95	1.89
pro-activity	0.98[a]	1.46[b]	1.71[c]	1.43[b]
financial security	0.62	0.46	0.57	0.63

[a,b] different characters indicate a significant difference ($p<0.05$)

The effects of age class on the farmers' strategies is given in Table 4. Farmers up to thirty years old are more growth oriented than farmers between thirty-one and fifty, but do not differ significantly from farmers older than fifty. Social orientation of farmers, the extent to which they are keen on autonomy and their financial security seem to increase with age. Farmers up to forty years old are less socially oriented than farmers who are older than fifty, farmers who are older than sixty are more keen on autonomy than younger farmers and the financial security of farmers older than fifty is greater than that of younger farmers.

Table 4. The effects (parameter estimates) of age on farmers' strategies.

	≤ 30 years	31-40 years	41-50 years	51-60 years	> 60 years
growth orientation	1.77[bd]	1.40[ac]	1.36[a]	1.55[cd]	1.89[b]
social orientation	0.74[a]	0.82[a]	0.93[ac]	1.22[b]	1.19[bc]
autonomy	1.89[abc]	1.80[ab]	1.92[bc]	2.07[c]	2.52[d]
pro-activity	1.44	1.43	1.40	1.52	1.38
financial security	0.29[a]	0.35[a]	0.50[a]	0.95[b]	1.29[c]

[a,b] different characters indicate a significant difference ($p<0.05$)

DISCUSSION

We have tried to identify a very small part of the 'mystery of entrepreneurship'. The results show that factors such as the way of farming, region and age can have an effect. One interesting finding was that farmers from the western part of the Netherlands appeared to be more socially oriented and pro-active than the rest of the country, while farmers from the north appeared to be less so than the rest of the country. One explanation could be that farmers in the west live in competition with urbanisation (Duijzer, 1999), while farmers in the north live in a pre-eminently agricultural area. Farmers in the west of the country are therefore probably more or less forced to be socially oriented because it is the only way they can survive.

Another interesting finding was that organic farmers appeared to be more socially oriented and less growth oriented than non-organic farmers. In general, organic farming is interpreted as more progressive than non-organic farming. Does this mean that we should interpret social orientation as being more progressive than growth orientation? This might be the case at a time when consumer concerns are becoming more and more important (Ketelaar-de Lauwere et al., 2000b). In this respect, we might have to worry about the fact that older farmers appeared to be more socially oriented than younger farmers. For it is the young farmers who will shape the future, and the importance of social orientation would perhaps have been more emphasised in their education. This might be a challenge for the agricultural education of young farmers. On the other hand, it might not be so surprising that young farmers are less socially oriented than older farmers. The fact that they have less financial security, as shown in our results, may be an explanation. The financial pressure - especially if the farm has had to be bought – might be so severe that young farmers are simply not able to be socially oriented.
If we assume that social orientation is important for 'good' entrepreneurship, does this necessarily mean that growth orientation is 'bad'? This does not have to be the case. According to Verhaar and Hoeve (1998) entrepreneurs of 'mega-enterprises', who are pre-eminently growth oriented, can be very socially oriented and pro-active as well. Too many large farms, however, can crowd out smaller ones which are more directed towards diversification, and this can be a cause for concern (van der Ploeg, 1999), at least at the macro-social level.

This discussion elucidates that, at the present stage of our research, we have solved only a few tiny pieces of the puzzle known as 'agricultural entrepreneurship'. In the near future, we hope to solve more of the problems based on our study of personal characteristics of agricultural entrepreneurs, their use of the knowledge infrastructure, their way of performing managerial tasks and their orientation towards the products, processes, systems, chain and – last but not least- society.

REFERENCES

Bosma, N., M. van Praag and G. de Wit, 2000. Determinants of successful entrepreneurship. Research report 0002/E. EIM, Zoetermeer, 35 pp.

Brockhaus, R.H. and P.S. Horwitz, 1986. The psychology of the entrepreneur. In: D.L. Sexton and R.W. Smilor (eds.), The art and science of entrepreneurship. Ballinger publishing company, Cambridge, pp. 25-48.

Buck, A.J. de, I. van Rijn, N.G. Röling, and G.A.A. Wossink, 2000. Farmers' reasons for changing or not changing to more sustainable practices: an exploratory study of arable farming in the Netherlands. In: A. de Buck, The role of production risks in the conversion to more sustainable arable farming (thesis), Wageningen University, Wageningen.

Duijzer, D., 1999. The country side of The Hague (in Dutch), LTO-Nederland, Den Haag.

Elfring, T., 2000. Innovative entrepreneurship – Management briefing - (in Dutch). Academic Services, Schoonhoven, 64 pp.

Ettema, M., A. Nooij, J.D. van der Ploeg and R. van Broekhuizen, 1994. The renovation – national agricultural debate - (in Dutch). Misset, Doetichem, 51 pp.

Ettema, M., A. Nooij, G. van Dijk, J.D. van der Ploeg and R van Broekhuizen, 1995. The future – national agricultural debate – (in Dutch). Misset, Doetichem, 48 pp.

INK, 1998. Manual for position-finding and improvement of enterprises (in Dutch). Triam Kennismanagement, bureau voor advies, ontwerp en productie, Papendrecht.

Ketelaar-de Lauwere, C.C., J. Luttik, K.H. de Greef, P.W.G. Groot Koerkamp, J.W.A. Langeveld and G.B.C. Backus, 2000a. Turning point and future of the livestock industry (in Dutch; English translation is available or will be soon at website: www.vsys.nl). Wageningen University and Research Centre, Lelystad.

Ketelaar-de Lauwere, C.C., H.J. Blokhuis, J.C. Dagevos, A.H. Ipema and J.A. Stegeman, 2000b. Changing human-animal relationships and their impact on livestock farming in 2040 (in Dutch with English summary). IMAG-report 2000-6, Wageningen, 52 pp.

Nandram, S.S. and K.J. Samson, 2000. Succesful entrepreneurship: more a matter of character than of knowledge (in Dutch with English summary). Nyenrode Center for Entrepreneurship, Breukelen, The Netherlands, 242 pp.

Ploeg, J.D. van der, 1999. The virtual farmer (in Dutch). Van Gorcum, Assen.

Ploeg, J.D. van der, M. Ettema and J. Roex, 1994. The crisis – national agricultural debate – (in Dutch). Misset, Doetichem, 45 pp.

Schilden, M. van der and C.H.A. Verhaar, 2000. A concept of modern entrepreneurship in Dutch horticulture. In: J.P. Ogier (ed.), Proc. of the XIVth. Int. Symp. on horticultural economics. ISHS, Leiden, pp. 439-447.

Schrapnel, Marilyn and Jim Davies, 2001. The influence of personality in determining farmer responsiveness to risk. In: Journal of Agricultural Education and Extension, vol. 7, no. 3, pp. 167 – 178.

SPSS, 1999. SPSS/V10.0 reference manual, SPSS Inc., Chigaco.

Verhaar, C.H.A. and A. Hoeve, 1999. Mega-enterprises in Dutch agriculture (in Dutch). Stoas Research Wageningen, 149 pp.

BIOGRAPHY OF AUTHORS

Dr. Carolien Ketelaar-de Lauwere graduated in Animal Behaviour and Animal Welfare at Wageningen Agricultural University, the Netherlands. She gained a PhD from Wageningen Agricultural University in Cow Behaviour and Managerial Aspects of Fully Automatic Milking in Loose Housing Systems. She then became involved in several projects on Socially Desirable Housing Systems for future livestock farming. Her involvement in the project on agricultural entrepreneurship, where she is co-project leader with Kees Verhaar, is an extension of this. Carolien is currently a researcher for the Labour and Management cluster at the Institute for Agricultural and Environmental Engineering in Wageningen.

Dr. Kees Verhaar studied Business Economics at the Erasmus University of Rotterdam. During the period 1985-1996 he was a researcher at the Fryske Akademy, and since then has been employed by the Stoas Group as a senior research consultant. He gained a PhD on Labour Market Behaviour of Young Unemployed, and has published various articles and volumes on labour market and economic issues, mainly from a multi-disciplinarian perspective. Together with Aimee Hoeve he carried out a study on Megafarming in the Netherlands.

Dr. Ina Enting graduated in Pig Husbandry at Wageningen Agricultural University, the Netherlands. She gained a PhD in Animal Health Management at the Faculty of Veterinary Medicine in Utrecht, the Netherlands. She is currently working at the

Research Institute for Animal Husbandry in Lelystad, where she is manager of the Economics and Management research programme for pigs and poultry.

Peter Vermeulen is a researcher in Economics and Management Support in the Department of Glasshouse Horticulture at Applied Plant Research in Naaldwijk, the Netherlands. His research topics are bench marketing (yield, cost, production, energy and labour), modelling (gas consumption, energy saving, investment selection and labour planning), management support (crop planning, effects on labour of size and shape of glasshouses, energy saving and equipment, labour conditions, labour planning, labour qualifications, management and entrepreneur qualifications) and economics studies (energy saving investments and energy equipment, heat storing and CO_2 supply, plant lighting and firm equipment).