



reports

TOWARDS A CONCEPT OF SUSTAINABLE ANIMAL DIETS

Report based on the collated results of a
survey of stakeholder views

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Report based on the collated results of a
survey of stakeholder views

Harinder P.S. Makkar and Philippe Ankers

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Foreword

Current livestock production systems demand high energy, land, chemicals and water – all of which are increasingly becoming scarce. Thus change and innovation is required in many livestock production systems if they are to meet present and future demand for animal products in a sustainable manner. During the last three decades, inexpensive grain, energy and protein enabled the economic development of intensive meat and milk production systems based on feeding grains and other ingredients sourced from far-off places. Also the poultry and pig intensive production systems became highly capital and input (feed) intensive and they have resulted in many environmental challenges.

It is unlikely that the growth rates of the past could be sustained in the future due to increasing costs of energy, grains and other inputs. They may even decline if the price of grain rises above a critical level, and might even become economically and environmentally unviable. Furthermore, these issues may become magnified due to increasing competition for arable land for food, feed and bio-fuel production. So far, in many situations, feeds have been produced and feeding has been designed to achieve maximum yield, giving high economic benefits; however, this approach in many circumstances have to contribute to ecosystem degradation (deforestation, chemical contamination, decreased biodiversity, water shortage, and water and air pollution) and global warming through the emission of methane and nitrous oxide. Moreover, the current systems of livestock production result in high energy consumption at every step, and even more so in the intensive systems. These situations demand attention to examine the excessive use of resources and to consider ways of adopting more efficient processes and systems.

Animal feed and feeding is the foundation of livestock systems. It directly or indirectly affects the entire livestock sector, associated services, public goods and services, including animal productivity, health and welfare, product quality and safety, land use and land-use change, and greenhouse gas emission. The sustainability of animal diets is crucial in the development of livestock production across production systems. The sustainable increase in livestock productivity, which is key to meeting the large, current and future, demand for livestock products, cannot be achieved without the use of Sustainable Animal Diets.

The concept of Sustainable Animal Diets was proposed earlier¹. It integrates the importance of efficient use of natural resources, protection of the environment, socio-cultural benefits, ethical integrity and sensitivity, in addition to currently recognized nutrition-based criteria for delivering economically viable, yet safe, animal products by producing safe feed. A stakeholder survey was conducted with the aim of prioritizing the main constituent elements and components of the concept, and to assess opinion on how to implement the concept. This document presents results of that survey.

¹ FAO. 2013. Optimization of feed use efficiency in ruminant production systems. Available at: <http://www.fao.org/docrep/018/i3331e/i3331e.pdf>

Sustainable Animal Diets are expected to be beneficial for the animal, the environment and society, and are likely to generate socio-economic benefits, furthering poverty alleviation and food security efforts. This requires active participation of researchers, extension workers, science managers, policy-makers, industry and farmers.

Abbreviations used in the text

The Regional designations used throughout this report are East and Southeast Asia (E&SEA); Europe; Latin America/Caribbean (LAC); Near East and North Africa (NENA); North America; Oceania; South Asia; and Sub-Saharan Africa (SSA).

NGO Non-Governmental Organization
StAnD Sustainable Animal Diets

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Executive summary

Animal feed and feeding is pivotal to livestock production. Feed forms up to 70% of the cost of animal production and hence is financially the single most important element in animal husbandry. Animal productivity, health and welfare, product quality and safety, producers' income, household security, but also land use and land use change, water pollution and greenhouse gas emission, are affected to a great extent by diet selection and how a diet is fed to livestock. Furthermore, animal feed and feeding directly or indirectly affects the entire livestock sector and associated services.

Through various consultative processes a concept has been developed of *Sustainable Animal Diets* (StAnD), integrating the importance of protecting the environment, efficient use of natural resources, socio-cultural benefits, and ethical integrity and sensitivity, in addition to currently recognized nutrition-based criteria in producing safe and economically viable feed. The concept is based on the *Three-P* dimensions of sustainability (*Planet, People and Profit*), complemented by a further vital aspect of animal nutrition, namely the ethics of using a particular feed. The *Three-P* concept has, *inter alia*, been used as a handy descriptor implying economic growth, social equity and ecological soundness (IUCN, 2005). Using the *Three-P* definition of sustainability, an approach or a technology is considered to be sustainable if it is profitable; socio-culturally acceptable and beneficial to people; and protects the environment and natural resource base (i.e. the planet).

In order to further refine the StAnD concept, a survey of stakeholders was conducted. Through a questionnaire, help was sought from stakeholders, both to prioritize the main constituent elements and components of the concept, and to establish opinion on how to implement the concept. The analysis reported here derives from 1195 respondents worldwide. The opinions reflected were from both developing and developed countries (respondents: developing countries 59%; developed ones 41%). Respondents ranged across Academia, Industry, Farmers' associations, government organizations, Non-Governmental Organizations (NGOs) and Intergovernmental organizations. They included science managers, policy-makers, consultants, farmers and extension workers. The largest contribution was from Academia (67%) and the smallest was from International organizations (2%). A good number of respondents were from NGOs (9%) and livestock-sector industries (15%). Consultants formed 7%. Given the unbalanced sample population, a segregated analysis was also conducted in addition to the global analysis. Consumers are also important stakeholders, but due to resource limitations this survey does not present their views.

Respondents were asked to rank the importance of elements of each sustainability dimension, based on a five-level rating scale (5 = most important; 4 = important; 3 = useful; 2 = partly useful; 1 = marginally useful), and ranking was done relative to the weighted average score in the global analysis. For segregated analyses, high or low importance given to an element by a group of respondents was based on weighted average for that element relative to the overall average of all the groups (i.e. global weighted average) being evaluated for that element. The analysis in this report has been reported as global, and segregated by region, sector and field of expertise.

In the global average, for each dimension of the StAnD concept, the elements that emerged as important for production and use of StAnD are, in order of importance:

- (a) *Planet dimension*: Should minimize water pollution; Not lead to deforestation or land degradation; Minimize air pollution; and Preferably use locally available feed resources.
- (b) *People dimension*: Animal products should be affordable to consumers; Promote and preserve local knowledge; Should not compete with human food; and Avoid exacerbation of unfavourable legal processes (e.g. land grab).
- (c) *Profit dimension*: There is a need to internalize socio-environmental costs to the true cost of production i.e. to ensure that environmental costs are fully reflected in the cost of production; Enhance benefit:cost ratio for all stakeholders from the livestock sector; and Not enhance volatility in price of feed ingredients.

Under the miscellaneous category (cutting across more than one dimension of sustainability), the important elements identified are: StAnD Should re-use food waste; Incentives should be given to promote production and use of StAnD; and Should not use food grains in ruminant diets (aim to decrease grain use). A strong agreement emerged for integrating the ethical dimension into the StAnD concept.

In order to re-structure feed productions system to meet StAnD requirements, the stakeholders were of the opinion that the initiative should first be taken by Farmers and farmers' associations, and then by Academia, Regulatory bodies and Industry. The participation of policy makers and private industries is important. For implementing the StAnD concept, the modalities proposed by respondents are to make consumers aware of its benefits, develop guidelines and practices, achieve broad stakeholder engagement, and make civil society aware of the benefits of StAnD.

The segregated analysis by region showed that the sensitivities of respondents from two regions (Sub-Saharan Africa (SSA) and Latin America and the Caribbean (LAC)) to the environmental issues are higher than the global average, while those of North America and Oceania are lower. In the people dimension, overall, higher importance was given to socio-cultural elements by respondents in SSA, LAC and South Asia, with those from developing countries showing higher sensitivity than from developed countries. Stakeholders in SSA, South Asia, LAC, and Near East and North Africa (NENA) gave higher importance to the need to increase benefit:cost ratio than the global average. Respondents from LAC, SSA, South Asia, and Europe (in that order) gave higher importance to the need to take into account environmental and social costs of negative externalities in the production and feeding of diets, while those from Oceania and North America were least sensitive towards it. On miscellaneous elements, stakeholders in SSA, NENA, South Asia, and LAC gave high score to the production of StAnD without enhancing volatility in price of feed ingredients, while those in North America gave it lowest importance. Latin American and European stakeholders appear to be less inclined to including grains in animal diets. The degree of acceptability to grains in monogastric diets is higher than in ruminant diets, suggesting the need to decrease grain use in diets of animals but more so in ruminant diets. Respondents in Oceania and North America gave higher score to the use of genetically modified organisms (GMOs) than the global average. The use of GMO crops and feed ingredients produced through high-input systems was given lower importance by respondents in LAC. Respondents from

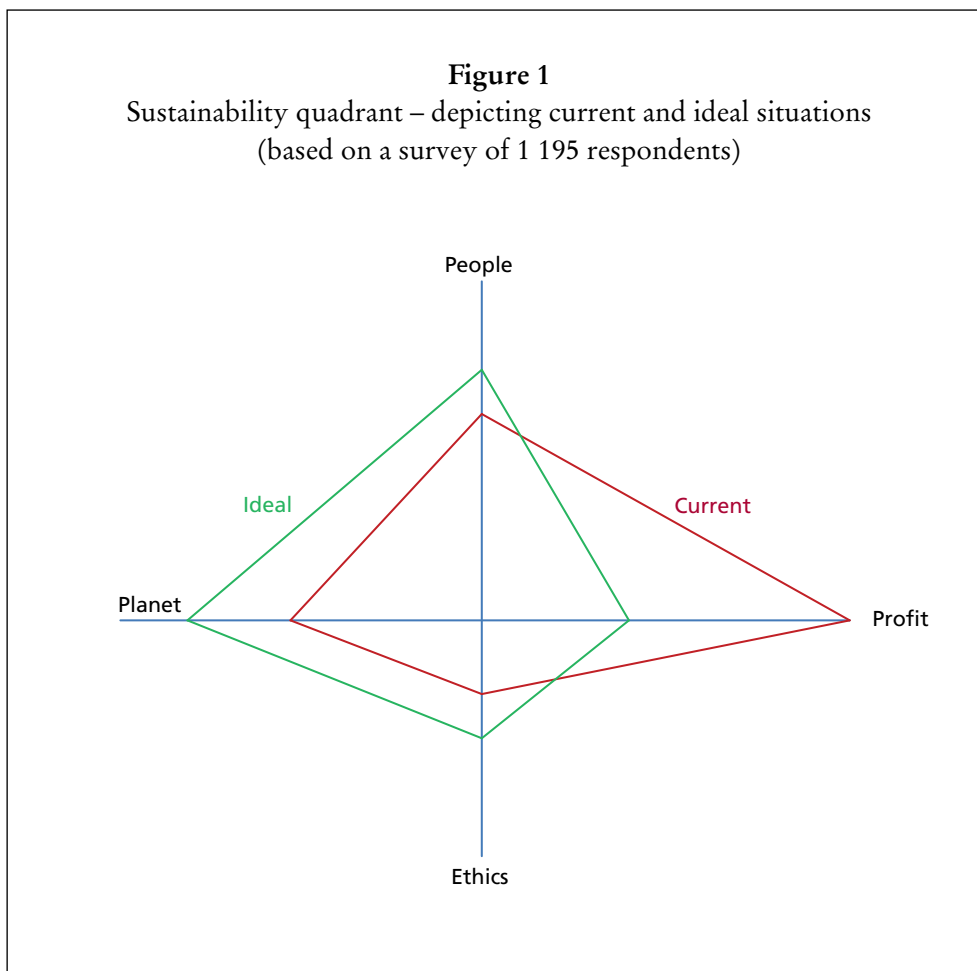
Developing countries gave higher importance to the use of incentives in production and use of StAnD than those in developed countries. Stakeholders in almost all regions highlighted a strong need to integrate ethical dimensions into StAnD. In developed countries, Farmers and farmers' associations were identified as the organizations that should take a lead in implementing the StAnD concept, while in developing countries the responsibility fell on Academia. In addition, the roles of Regulatory bodies and of livestock-related Industry were also considered important. For all regions, the mechanisms identified to translate the StAnD concept into practice were similar to those observed in the global analysis.

The segregated analysis by sector showed that respondents from International organizations, NGOs and Academia gave high importance to the elements of the Planet dimension, while those from Industry gave least importance. Overall, higher importance was given to socio-cultural elements by respondents from NGOs, International organizations and Academia, while those from Industry was less sensitive towards these elements. Respondents from all sectors were in strong agreement that the production and use of StAnD should increase benefit:cost ratio. Also, respondents from all sectors gave high importance to taking into account environmental and social costs of negative externalities in production and feeding of StAnD, while those from Industry gave it least score. The element, Production of StAnD should not enhance volatility in price of feed ingredients, received a high score from respondents from International organizations and Academia, and lowest from those from Industry. NGOs, Academia and Industry respondents gave high importance to the re-use of food waste as feed. Compared with the other sectors, respondents from Industry gave higher score to the use of food grains and of GMO feeds in the diets of monogastrics and ruminants. Use of incentives in production and use of StAnD was favoured more by respondents from Academia than those from the other sectors.

Respondents from almost all sectors except Industry gave a high score to the integration of ethical dimension into StAnD. Academia, and Farmers and farmers' associations were identified as the bodies that should take the initiative to re-structure the feed production system for meeting StAnD criteria. Other bodies that could play an important role in meeting this requirements are Industry and Regulatory bodies (include Policy makers).

Through a segregated analysis by area of expertise, it was shown that animal health specialists consistently gave higher importance to the elements that aim to better the health of the environment. Animal welfare experts also gave higher importance to these elements. For the elements of the *People* dimension, no general pattern emerged. Respondents from all fields except farm management and animal nutrition gave higher score to the need to take environmental and social costs of negative externalities in total costs. Animal nutrition, extension and technology transfer, and animal health specialists gave higher importance than the global average to increasing benefit:cost ratio. Animal health and animal nutrition experts gave higher score to the production of StAnD without enhancing volatility in price of feed ingredients.

Animal welfare experts appear to be less inclined to including grains, GMOs and feed ingredients produced through high-input agriculture in animal diets. Re-use of food waste as animal feed received high scores from experts of all areas. The overall



tolerance to grain use in the diets of ruminants was lower. Experts from almost all areas were in strong agreement to the integration of ethical dimensions into StAnD. Animal welfare experts gave highest importance to this element.

This survey has identified directions for positive change. There has been a strong agreement among all stakeholders, irrespective of region, sector or field of specialization, regarding the direction of positive change that should be followed in the production and feeding of StAnD. That positive change is dictated by higher importance assigned to the *Planet*, *People* and *Ethics* dimensions of StAnD, and lower to the *Profit* dimension (Figure 1). An important message from the survey was that making a profit is important since it is the main driver of the production system, but making a profit at the cost of the environment, socio-economic benefits to people and animal welfare and other ethical aspects of raising livestock may not be appropriate.

The survey has also prioritized various elements of the sustainability dimensions of StAnD, and identified sectors that should take the initiative, and has also presented modalities for incorporating the StAnD concept into practice. These could be the focus in follow-up studies and actions.

Introduction and background

Change and innovation is required in many livestock production systems if they are to meet in a sustainable manner present and future demand for animal products, because livestock production systems demand high energy inputs, land, chemicals and water — all of which are becoming increasingly scarce. Through various consultative processes we have developed and are refining a concept of Sustainable Animal Diets (StAnD), which integrates the importance of efficient use of natural resources, protection of the environment, socio-cultural benefits and ethical integrity and sensitivity, in addition to currently recognized nutrition-based criteria for delivering economically viable and safe animal products by producing safe feed. The concept is based on the *Three-P* dimensions of sustainability (*Planet, People and Profit*), complemented by a further vital aspect of animal nutrition, namely the ethics of using a particular feed, particularly where there are associated animal welfare issues. Furthermore, at a time when 850 million people are hungry and suitable land for growing crops is becoming increasingly scarce, the use of food-grade grains in the diets of ruminants is certain to face increased questioning on both resource-use efficiency and ethical grounds. The rumen is not physiologically designed to cope with high-grain rations. It would therefore appear questionable whether feeding a diet containing large levels of grain to ruminants can be considered ethical, either from a (scarce) resource use perspective or from an animal welfare perspective. Such a diet may result in acidosis, lameness and other associated welfare problems (FAO, 2013a). Feeding grains to animals competes with grain use in human food and nutrition, while improved use of grasslands is more efficient in converting energy into food. A sustainable diet should not only meet the core traits of a feed listed in the definition of proper nutrition and the *Three-P* criteria, but also the relevant ethical dimensions (Figure 2). The details of the concept are explained in Makkar (2013).

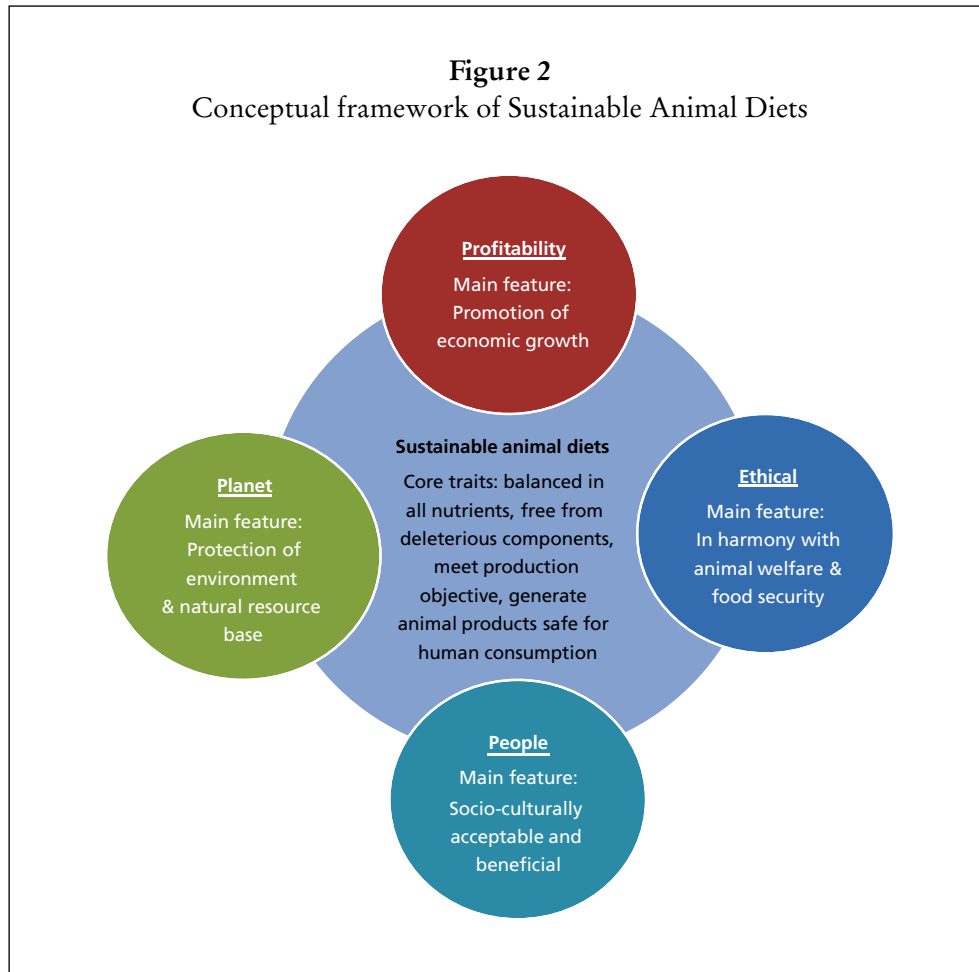
WHY FOCUS ON SUSTAINABILITY OF ANIMAL DIETS (StAnD)?

Animal feed and feeding is the foundation of livestock systems. It has impacts on animal productivity, health and welfare, product quality and safety, producer incomes, household security, land use and land use change, water pollution and greenhouse gas emission. Also it directly or indirectly affects the entire livestock sector and associated services. Furthermore, feed is financially the single most important element of animal husbandry, irrespective of species and production system, forming up to 70% of the cost of production. The sustainability of animal diets is crucial in the development of sustainable livestock production across production systems.

WHAT IS NEW IN THE StAnD CONCEPT AND WHAT DIFFERENCE CAN ITS IMPLEMENTATION MAKE?

It has:

- (a) a thematic focus of meeting the production objectives by improving feed (nutrient) use efficiency while conserving the environment, biodiversity and natural resources;



- (b) multi-dimensional scope, embracing socio-cultural, ethical and environmental dimensions in addition to the economic one;
- (c) an action-oriented holistic approach, targeting change in practices; and
- (d) multi-stakeholder participation, harnessing synergies and complementarities.

In advanced stages of the implementation of the StAnD concept, it is possible that a model could be developed to compare diets against the indicators of Sustainable Animal Diets. A decision tool based on this concept could also be integrated into other models, thus enabling comparison of animal products from different animal species and production systems, and assisting consumers to select one animal product over another. The concept and its likely outcomes also hold potential for integration into other sustainability mechanisms, such as the ‘Global Agenda for Sustainable Livestock’ (FAO, 2013b). Also the concept could pave the way for a new system of feed evaluation, based on the sustainability dimensions.

THE OBJECTIVE OF THIS STUDY

Through a survey, to prioritize the main constituent elements and components of the StAnD concept, and also to obtain opinions on how to translate this concept into action by integrating its elements and components into sound management practices.

Methodology and respondents

To implement the survey, a questionnaire was developed (see Annex 1). The elements for each pillar of StAnD (the *Three-Ps* and the ethical dimension) were selected using literature information and experts' inputs. In addition, a set of miscellaneous questions were included to address more than one dimension of sustainability. Opinion was also sought on which sectors should take a particular initiative, and the modalities of putting the concept into practice.

The survey was conducted during July and August 2013. The questionnaire was sent to approximately 5 000 stakeholders worldwide, in Academia, Industry, science management, and policy-making, together with consultants, Farmers and farmers' associations, extension workers and non-government organizations (NGOs) and intergovernmental organizations. A total of 1 195 (*ca* 24% response rate) completed questionnaires were received. The opinions reflected were those of both developing and developed countries (respondents: developing countries 59%; developed ones 41%). The largest contribution was from Academia (67%) and the least from International organizations (2%). A good number of respondents were from NGOs (9%) and livestock-sector industries (15%). Consultants formed 7%. Among different areas of expertise, the largest number of the respondents (44%) were from animal nutrition. Because of the unbalanced sample, a segregated analysis was also conducted in addition to the global analysis. However, it is important to note that for all the parameters studied, the weighted averages of results from Academia were very close to the global weighted averages, and similarly for the animal nutrition group.

Respondents were asked to rank the importance of elements of each sustainability dimension, based on a five-level rating scale (5 = most important; 4 = important; 3 = useful; 2 = partly useful; and 1 = marginally useful) and ranking was done on the basis of weighted average score in the global analysis. The higher the score, the higher is the ranking. For segregated analyses, high or low importance given to an element by a group of respondents was based on weighted average for that element being higher or lower than the overall average of all the groups (i.e. relative to the global weighted average) for that element. The analysis in this report has been reported both as global, and segregated by region, sector and field of expertise. Consumers are of course an important stakeholder group, and the ones who ultimately drive the expansion of the livestock sector due to their growing consumption of animal protein. At this initial stage, with the concept still evolving, it was not considered pertinent to involve customers. However, a consumer survey to appreciate if and how the concept of StAnD could be implemented in practice, generating a close linkage between animal diets, animal production and consumer choice, is planned for the next phase.

Survey analysis and discussion

GLOBAL VIEW

Distribution of respondents

The highest number of respondents were from Europe, followed by SSA and then LAC. These three regions together contributed more than 60% of the replies (Table 1).

Importance of the StAnD elements that aim to protect environment and natural resource base

These are the elements for the ‘Planet dimension’ of sustainability and are listed in Figure 3. The most important four elements of StAnD that emerged through the survey were: Minimize water pollution; Not lead to deforestation and land degradation; Minimize air pollution; and Preferably use locally available feed resources. In contrast, Reduction in water footprint and Reduction in carbon footprint were not considered as important, although Reduction in carbon footprint was considered the more important of the two (Figure 3). This preference for reduction in carbon footprint could be a reflection of greater interest of donor agencies, International organizations, researchers and politicians alike, due to ongoing global warming and the importance it is being given by all stakeholders, as well as the media. However, in the context of StAnD, reduction in water footprint is also of great importance, since water use for feed production is highest among other water-dependent activities in the livestock sector. Preferable use of locally available feed resources is also likely to reduce the carbon footprint of StAnD (Alqaisi *et al.*, 2014). Reduction in water pollution will also decrease the water footprint of preparing and feeding StAnD. Higher importance was given to reduction in water pollution rather than reduction of air pollution, and this might be driven by the possible greater adverse impact of water pollution on human and animal health.

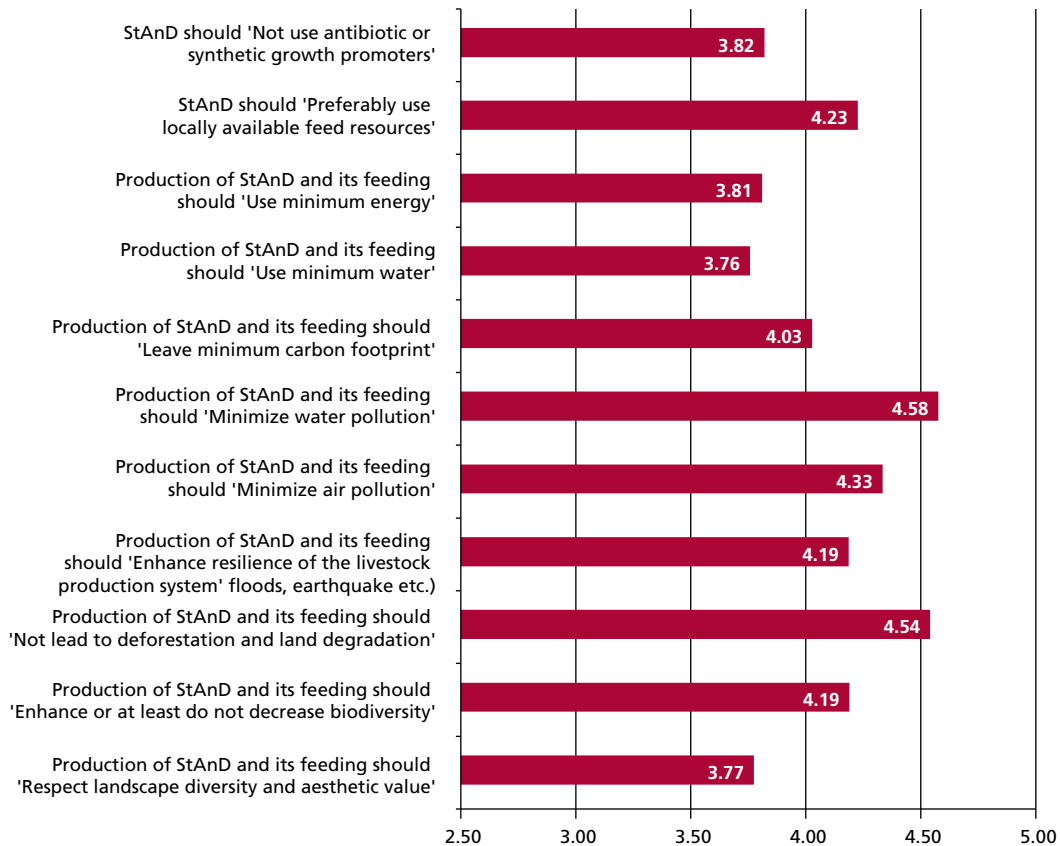
Table 1. Number of respondents by region

Region	Number of respondents	Percent distribution
E&SEA	114	9.5
Europe	338	28.3
LAC	184	15.4
NENA	63	5.3
North America	91	7.6
Oceania	59	4.9
South Asia	126	10.5
SSA	220	18.4
Total	1195	-

Figure 3

Importance of the elements of Sustainable Animal Diets (StAnD) that aim to protect environment and natural resource base (*Planet* dimension of sustainability)

Key: 1 = Not important; 2 = Somewhat Important; 3 = Reasonably important; 4 = Important; 5 = Extremely Important.



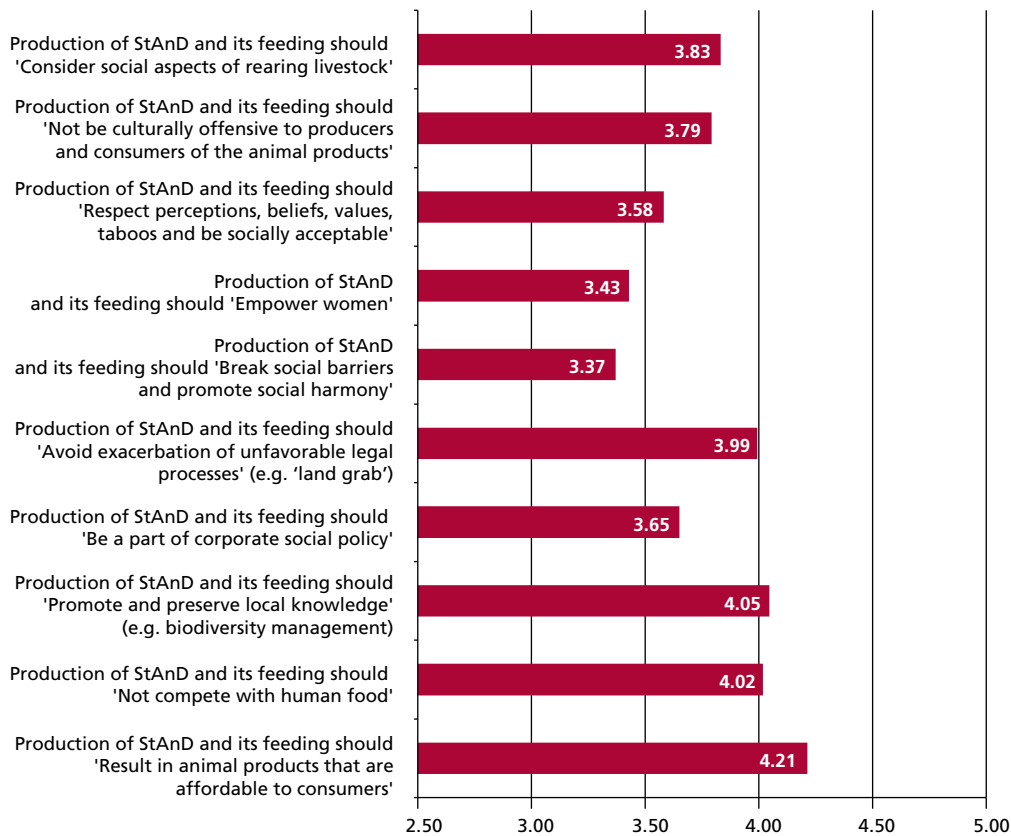
Importance of the socio-cultural elements of StAnD that provide benefits for people

The elements in this category on which ranking was sought from the respondents are presented in Figure 4. The four most important elements were in the order: Animal products should be affordable to consumers > Promote and preserve local knowledge > Do not compete with human food > Avoid exacerbation of unfavourable legal processes. Respondents gave less importance to elements such as Empower women and Break social barriers and promote social harmony (Figure 4). From the respondents' perspective, the production of StAnD should not make animal products so expensive that consumers cannot afford them. Production of animal products with ingredients that do not compete with human food was considered important, which could possibly be attributed to the increasing world food insecurity. Thus the direct use of grains for feeding humans would be considered as more acceptable than producing animal products by feeding those grains.

Figure 4

Importance of the socio-cultural elements of Sustainable Animal Diets (StAnD) that provide benefits for people (*People* dimension of sustainability)

Key: 1 = Not important; 2 = Somewhat Important; 3 = Reasonably important; 4 = Important; 5 = Extremely Important.

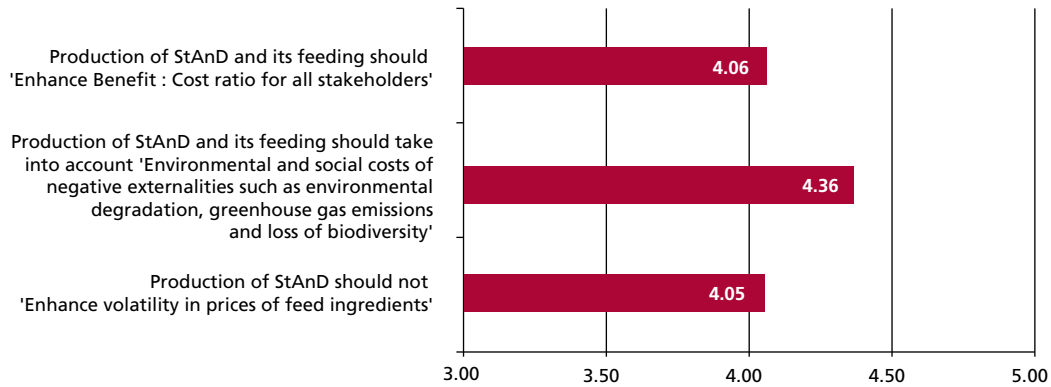


Importance of the economic elements of StAnD

For the *Profit* dimension, the highest importance was given to the Need to internalize socio-environmental costs to the true cost of production, which was followed by Enhancing benefit:cost ratio for all stakeholders from the livestock sector, and Not enhancing volatility in price of feed ingredients (Figure 5). It would be a challenge to reconcile two opposing forces: consideration of the costs of including the socio-environmental damage into the total cost of production (which is likely to enhance cost of production) and increase in benefit:cost ratio. An attractive option would be decoupling of fossil fuel use from feed production and feed use, and this possibly could be done through the use of solar or wind energy, possibly through simultaneous production of feeds and energy. New ways of production and use of animal diets need to be considered. Increase in feed use efficiency to reduce the cost

Figure 5
 Importance of the economic elements of Sustainable Animal Diets (StAnD)
 (*Profit* dimension of sustainability)

Key: 1 = Not important; 2 = Somewhat Important; 3 = Reasonably important;
 4 = Important; 5 = Extremely Important.



of production would be an attractive option. To increase feed use efficiency it will be pivotal to consider a holistic approach embracing not only biological means but also structural and institutional approaches, including reduction in the loss of feed resources in the food and agriculture supply chain. Another option would be to use agro-industrial by-products and alternative resources as feed including realisation of full potential of grasslands, which is likely to reduce cost as well as water and possibly carbon footprints. Overall, the focus needs to shift from yield maximization towards feed and other inputs optimization. However, there is no one-size-fits-all solution, and innovative practices tailored towards the needs of production systems should be considered.

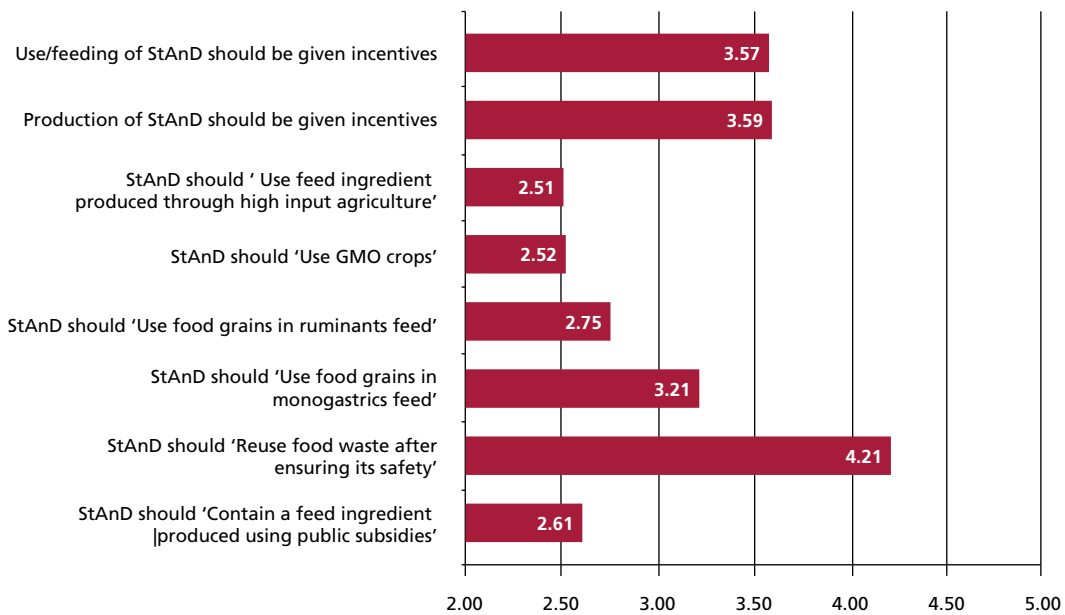
Importance of the miscellaneous elements of StAnD

The miscellaneous elements are those that could not be categorized under the *Three-P* pillars of StAnD. Re-use of food waste after ensuring its safety in animal diets was given the top priority, which was followed by Giving incentives to promote production and use of StAnD. The elements Use of feed ingredients produced through high-input agriculture, and GMO crops and food grains in ruminant feed, did not receive high prominence, suggesting their avoidance in the production and use of StAnD (Figure 6). Approximately one-third of food produced is wasted (FAO, 2011), and to increase the overall resource use efficiency to decrease water and carbon footprints, it is imperative that waste should be decreased, and its use as animal feed is one of the attractive options. For countries in the tropics, microbial contamination, and especially infestation with mycotoxin-producing fungi,

Figure 6

Importance of other elements of Sustainable Animal Diets (StAnD)

Key: 1 = Not important; 2 = Somewhat Important; 3 = Reasonably important; 4 = Important; 5 = Extremely Important.



would be an important aspect to consider. Very high ranking (importance) given to this parameter of using food waste in animal diets must inspire researchers and policy-makers to give serious thought to this option and to transforming food waste into a feed resource.

Extent of agreement of stakeholders on integration of the ethical dimension into StAnD

Almost 85% of the respondents acknowledged that the Ethical dimension should be integrated into the concept. Some were of the opinion that it should be a part of the *People* dimensions of StAnD, and animal welfare must be included in StAnD (Figure 7). Generally, sustainability in the conventional sense takes into consideration the *Three-P* dimensions. A strong opinion given by respondents to integrate ethics into the sustainability of the animal diets illustrates that the ethical dimension must be integrated into the sustainability considerations.

Who should take the initiative to re-structure feed production system for meeting StAnD requirements? According to respondents the initiative should first be taken by Farmers and farmers' associations, followed by scientists, Regulatory bodies, and Industry (in that order) (Figure 8). These observations suggest that role of policy makers and private industry partners is equally important. There are

Figure 7
Extent of agreement of stakeholders on integration of the ethical dimensions into Sustainable Animal Diets

Key: 1 = Strongly Disagree; 2 = Disagree; 3 = Neither Agree nor Disagree; 4 = Agree; 5 = Strongly Agree

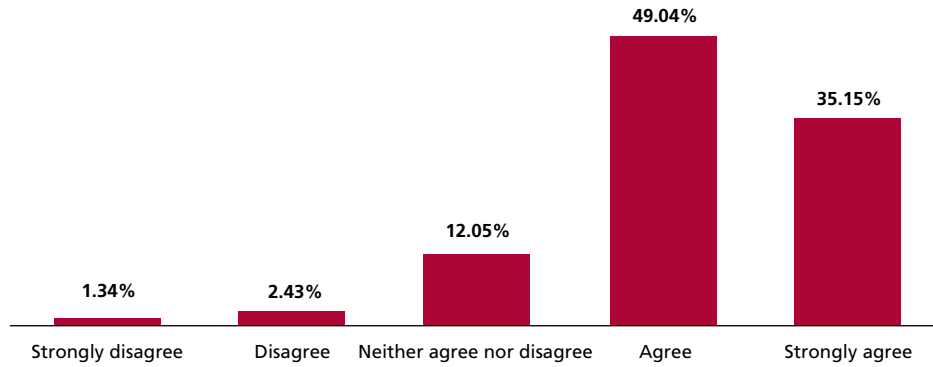
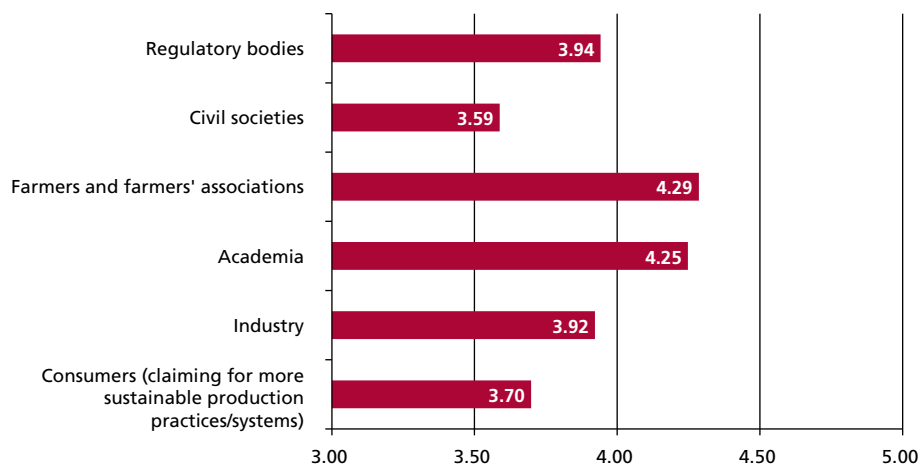
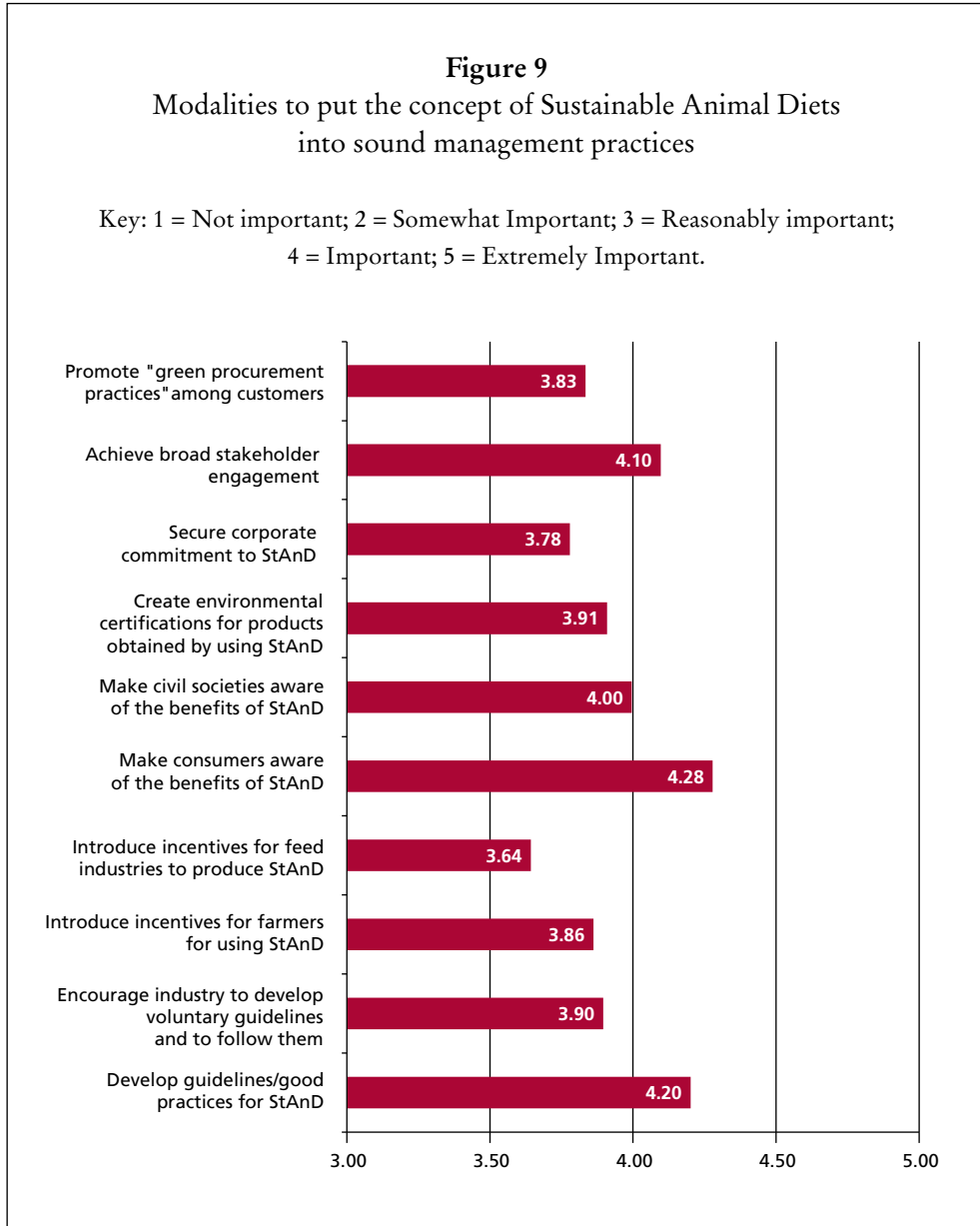


Figure 8
Bodies or organizations that should take initiative first to re-structure the feed production system for meeting the requirements of Sustainable Animal Diets

Key: 1 = Not important; 2 = Somewhat Important; 3 = Reasonably important; 4 = Important; 5 = Extremely Important.

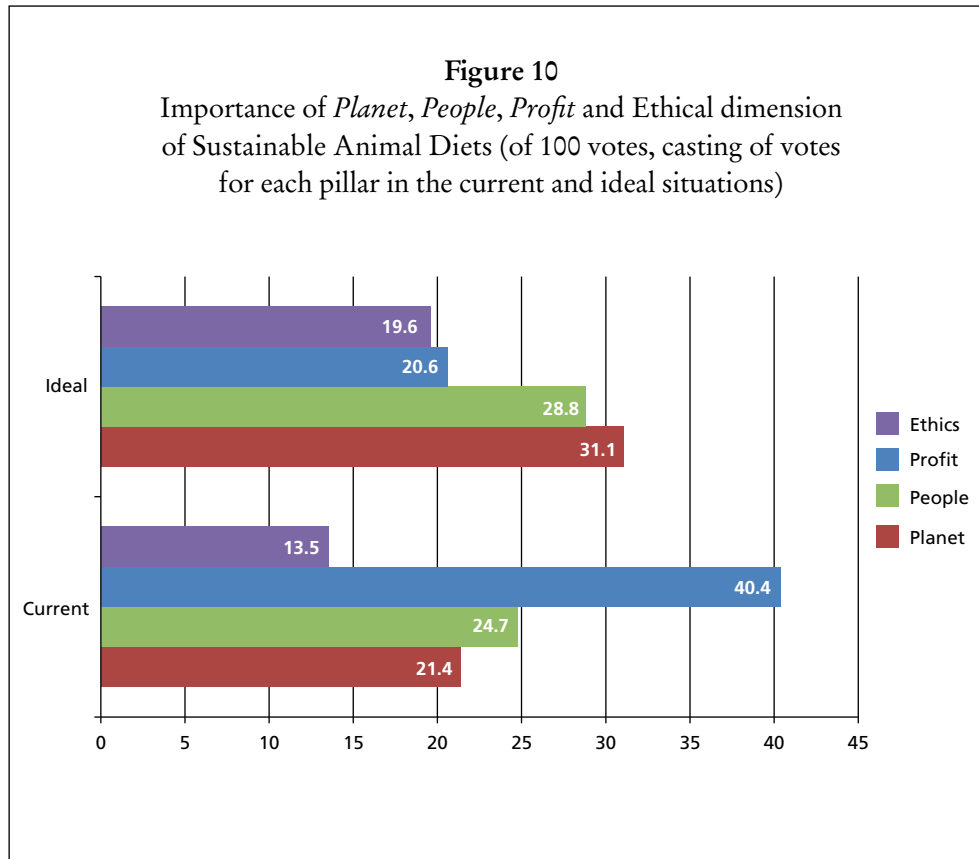




different ways in which these bodies can play their part, and some of the options have been identified through this survey (see next section).

Modalities through which the StAnD concept can be put into sound management practices

For putting the StAnD concept into practice, the Need for making consumers aware of its benefit was given the first ranking, followed by Development of guidelines and practices, Achievement of broad stakeholder engagement, and Making civil society aware of the benefits of StAnD (Figure 9). Good and transparent communication between all stakeholders is vital for the successful implementation of StAnD. There would be a strong need to inform all stakeholders of the benefits of StAnD to achieve their broad engagement. This will also enable the bodies identified in the previous section to take initiative to implement the StAnD concept.



All stakeholders should also join forces in developing guidelines and practices for putting the StAnD concept into practice.

Importance of Planet, People, Profit and Ethical dimension of StAnD

The respondents were asked to cast a vote (out of 100) to each of these four pillars in the current situation and in a desired ideal situation. The respondents were of the opinion that at present there is much emphasis on generating profit, while the other three dimensions of sustainability—*Planet*, *People* and *Ethics*—are being neglected, and under ideal conditions the weight given to the *Profit* dimension should be halved from 40 units to almost 20 units and importance to *Planet*, *Ethics* and *People* dimensions should be enhanced (importance in the order mentioned) (Figure 10). This does not mean that livestock farming will be less profitable but the profitability could be achieved by taking better consideration of other dimensions of the StAnD concept.

In summary, the respondents were from all the continents. The opinions reflected are from both developing and developed countries. The important elements (in the order mentioned) for each pillar of the StAnD concept are listed below, and these could provide a focus in future follow-up studies and action.

Planet dimension

- Minimize water pollution
- Not lead to deforestation and land degradation
- Minimize air pollution
- Preferably use locally available feed resources.

People dimension

- Animal products should be affordable to consumers
- Promote and preserve local knowledge
- No competition with human food
- Avoid exacerbation of unfavourable legal processes (e.g. land grab)

Profit dimension

- Need to internalize socio-environmental costs to the true cost of production
- Enhance benefit:cost ratio for all stakeholders from the livestock sector
- Not enhance volatility in price of feed ingredients

Other elements

- Re-use food waste in animal diets
- Give incentives to promote production and use of StAnD
- Not use food grains in monogastric diets Not use food grains in ruminant diets
(*Note: the change proposed is towards decreasing grains in animal diets, more so in ruminant diets*).

There was a strong agreement on integration of the ethical dimension into the StAnD concept. In order to re-structure feed productions system for meeting StAnD requirements, the initiative should first be taken by Farmers and farmers' associations, followed by Academia, Regulatory bodies (include Policy makers) and Industry. For implementing the StAnD concept there is a need for making consumers aware of its benefits. Other modalities suggested were: Develop guidelines and practices, Achieve broad stakeholder engagement, and Make civil society aware of the benefits of StAnD, as well as of the unsustainability of current systems in the face of climate change impact on future crop yields (and prices).

As a general agreement, it appeared that currently high emphasis is given to generating profit, while the other three dimensions of sustainability—*Planet*, *People* and *Ethics*—are being neglected, and that under ideal conditions the importance given to the *Profit* element should be lowered and that to the *Planet*, *Ethics* and *People* dimensions should be enhanced.

REGIONAL VIEWS

The Regional distribution of respondents is given in Figure 11. There was a good distribution of respondents across all regions. From all regions, most respondents were from the field of animal nutrition. Most animal health experts that contributed to the study were from SSA, followed by LAC, while animal welfare experts were most from Europe (16.0%) and then from North America (14.3%), and fewest (0.9%) from E&SEA. Farm management and technology transfer experts were also in considerable numbers (5.3 to 16.9%) in all regions except for Oceania (Table 2).

Figure 11
Regional distribution of the respondents

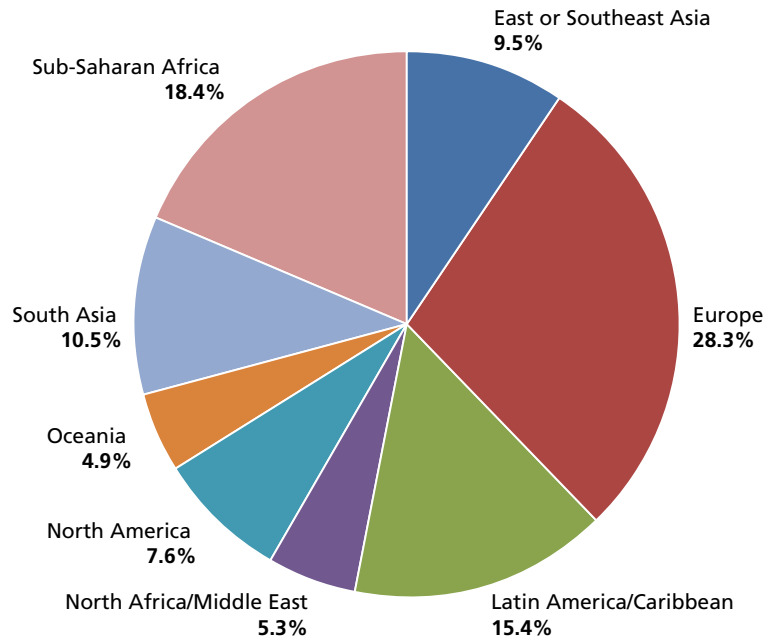


Table 2. Field of expertise of respondents in different regions

	E&SEA	Europe	LAC	NENA	North America	Oceania	South Asia	SSA
Animal nutrition	63.2%	32.2%	48.4%	58.7%	41.8%	44.1%	54.8%	41.4%
Animal health	8.8%	7.1%	12.5%	9.5%	6.6%	1.7%	7.1%	15.9%
Animal welfare	0.9%	16.0%	10.9%	1.6%	14.3%	8.5%	4.8%	2.7%
Animal genetics	7.0%	1.2%	3.3%	7.9%	3.3%	3.4%	4.8%	7.7%
Farm management	5.3%	9.5%	7.1%	11.1%	6.6%	16.9%	5.6%	5.0%
Extension & technology transfer	9.6%	7.4%	8.7%	4.8%	6.6%	0.0%	11.9%	10.9%
Social science	0.0%	5.9%	1.6%	1.6%	5.5%	0.0%	2.4%	2.7%
Economics	0.9%	3.3%	1.1%	0.0%	2.2%	0.0%	0.8%	2.3%
Science management	0.9%	4.1%	3.8%	1.6%	2.2%	8.5%	0.8%	5.5%
Policy	1.8%	10.4%	2.2%	1.6%	7.7%	8.5%	5.6%	5.9%
Not working	1.8%	3.0%	0.5%	1.6%	3.3%	8.5%	1.6%	0.0%

Table 3. Importance of the elements of the *Planet* dimension in different regions

Elements	Regions that gave higher importance than the average	Region that gave lowest importance
Not use antibiotics and synthetic growth promoters	NENA, Europe, LAC, SSA	North America < Oceania
Preferably use locally available feed resources	SSA, South Asia, E&SEA, LACs	North America < Oceania
Use minimum energy	LACs, South Asia=Europe, SSA	North America < Oceania
Use minimum water	LACs, Europe, South Asia, SSA	Oceania < North America
Minimum C-footprint	South Asia, LAC, SSA, E&SEA, Europe	Oceania < NENA
Minimize water pollution	LACs, SSA, NENA	Oceania < North America
Minimize air pollution	SSA, LAC, NENA, E&SEA, South Asia	Oceania < North America
Enhance resilience of livestock production system	SSA, LAC, NENA	North America
Not lead to deforestation and land degradation	SSA, LAC, NENA, Europe	Oceania < North America
Enhance or at least do not decrease biodiversity	SSA, LAC, NENA, South Asia	Oceania < North America
Respect landscape diversity and aesthetic value	LAC, SSA, South Asia, E&SEA	Oceania < North America

Importance of the StAnD elements that aim to protect environment and natural resource base

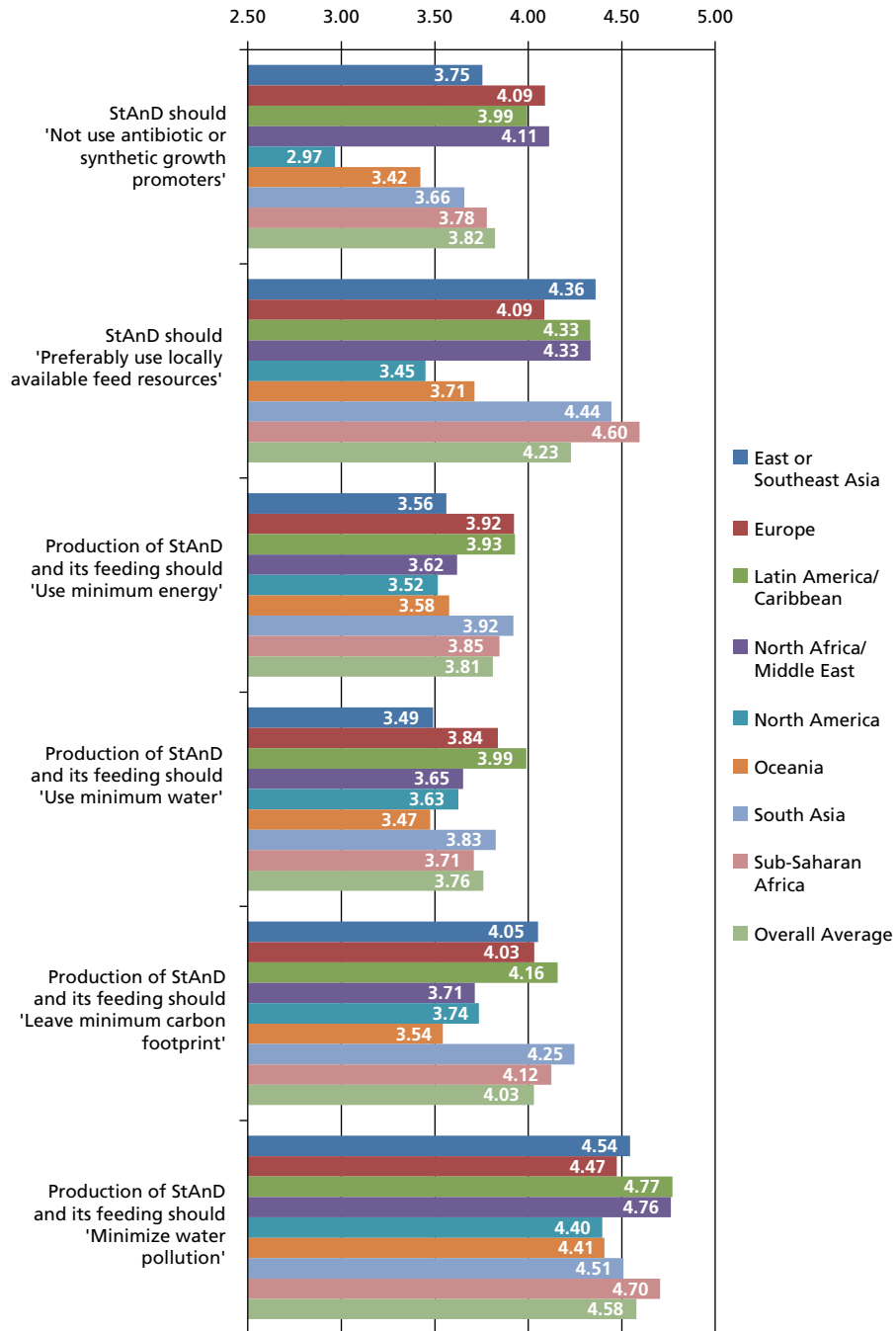
The regional scores, which are reflection of the ranking of different elements of StAnD, are given in Figure 12. In the *Planet* dimension of sustainability, regions responded in different manners. Salient findings from this figure are presented in Table 3. Out of 11 elements, SSA was either at number one or two for eight elements and LAC for nine elements, suggesting that these two regions are highly sensitive to the environmental issues related to StAnD. The regions that gave low importance to the environmental issues were North America and Oceania. A number of analyses state that higher negative impact is expected to be elicited by the environmental problems, including global warming in SSA and other parts of the developing world, and this could be the reason for these regions being more sensitive to the elements that aim to protect the environment.

Importance of the socio-cultural elements of StAnD that provide benefits for people

Regional ranking of different elements are given in Figure 13. In the *People* dimension of sustainability, regions responded in different manners. Important findings from this figure are presented in Table 4. Overall, higher importance was given to socio-cultural elements by SSA, LAC and South Asia. Developing countries appear to be more sensitive to socio-cultural issues than developed countries. This could be a reflection of many socio-cultural reasons for which the farmers keep livestock in developing countries, while in developed countries livestock are kept mainly for producing animal products for sale.

Figure 12
 Importance of the elements of Sustainable Animal Diets (StAnD)
 that aim to protect environment and natural resource base
 (*Planet* dimension of sustainability)

Key: 1 = Not important; 2 = Somewhat Important; 3 = Reasonably important;
 4 = Important; 5 = Extremely Important.



(cont.)

Figure 12 (cont.)

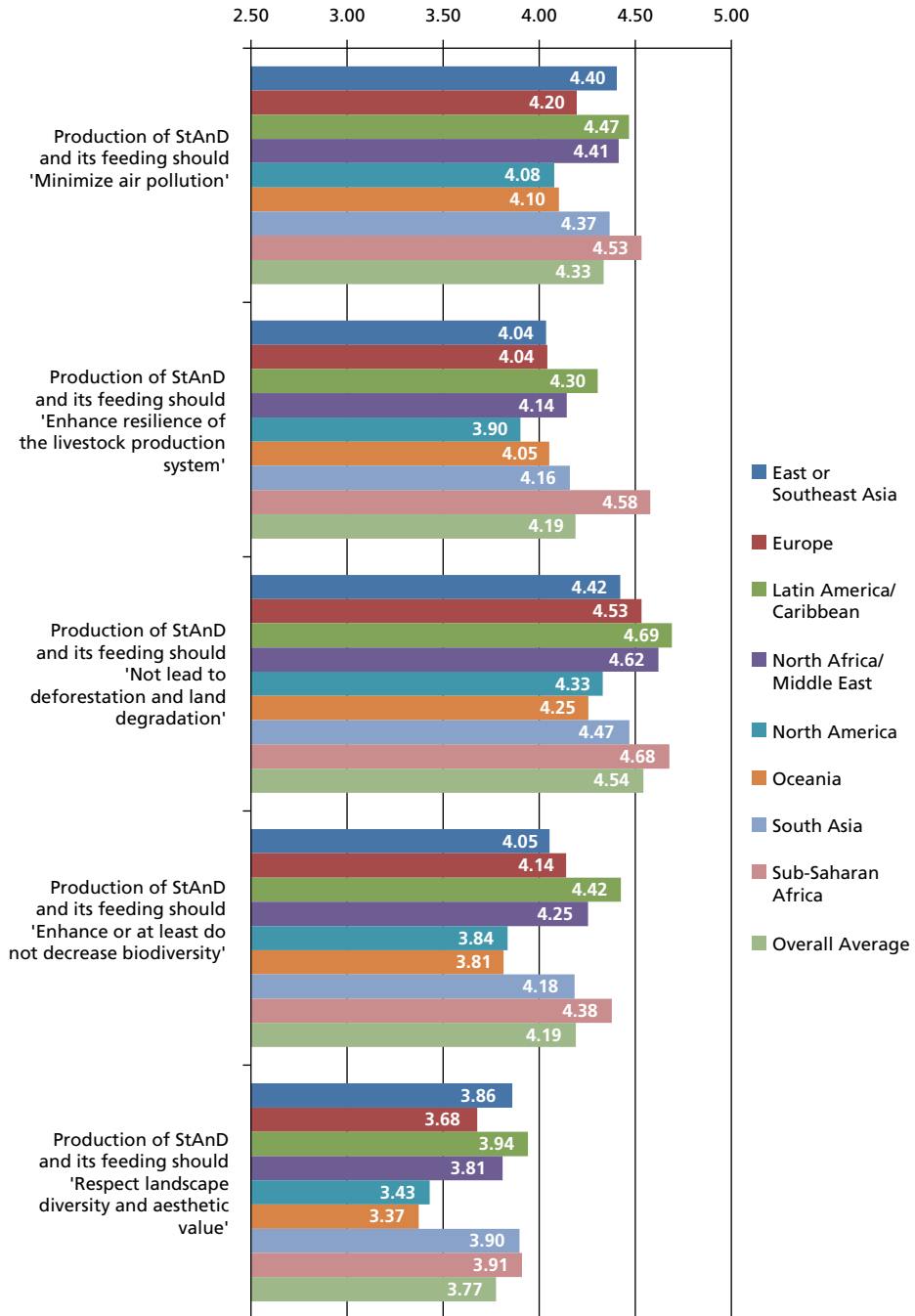
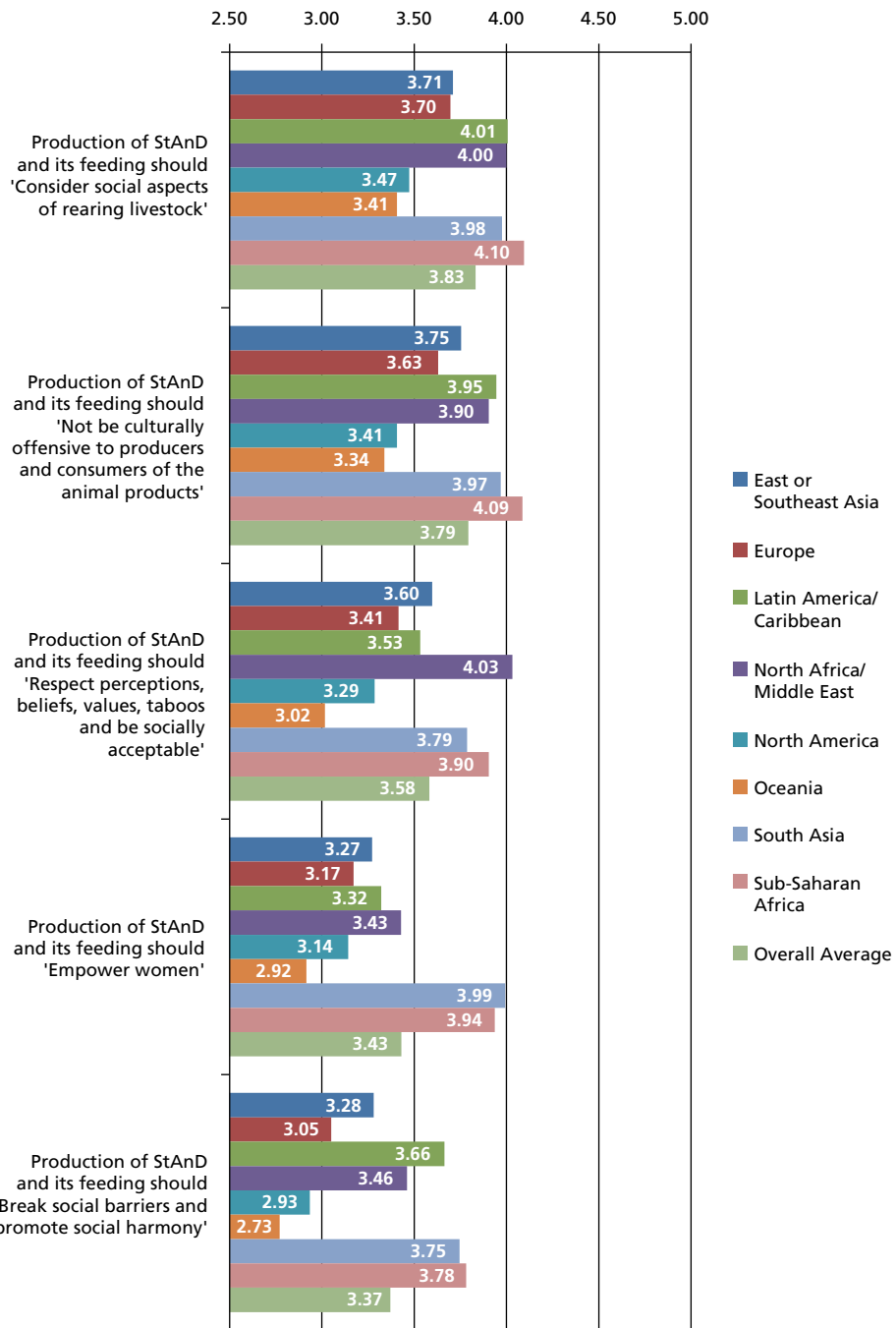


Figure 13

Importance of the socio-cultural elements of Sustainable Animal Diets (StAnD) that provide benefits for people (*People* dimension of sustainability)

Key: 1 = Not important; 2 = Somewhat Important; 3 = Reasonably important; 4 = Important; 5 = Extremely Important.



(cont.)

Figure 13 (cont.)

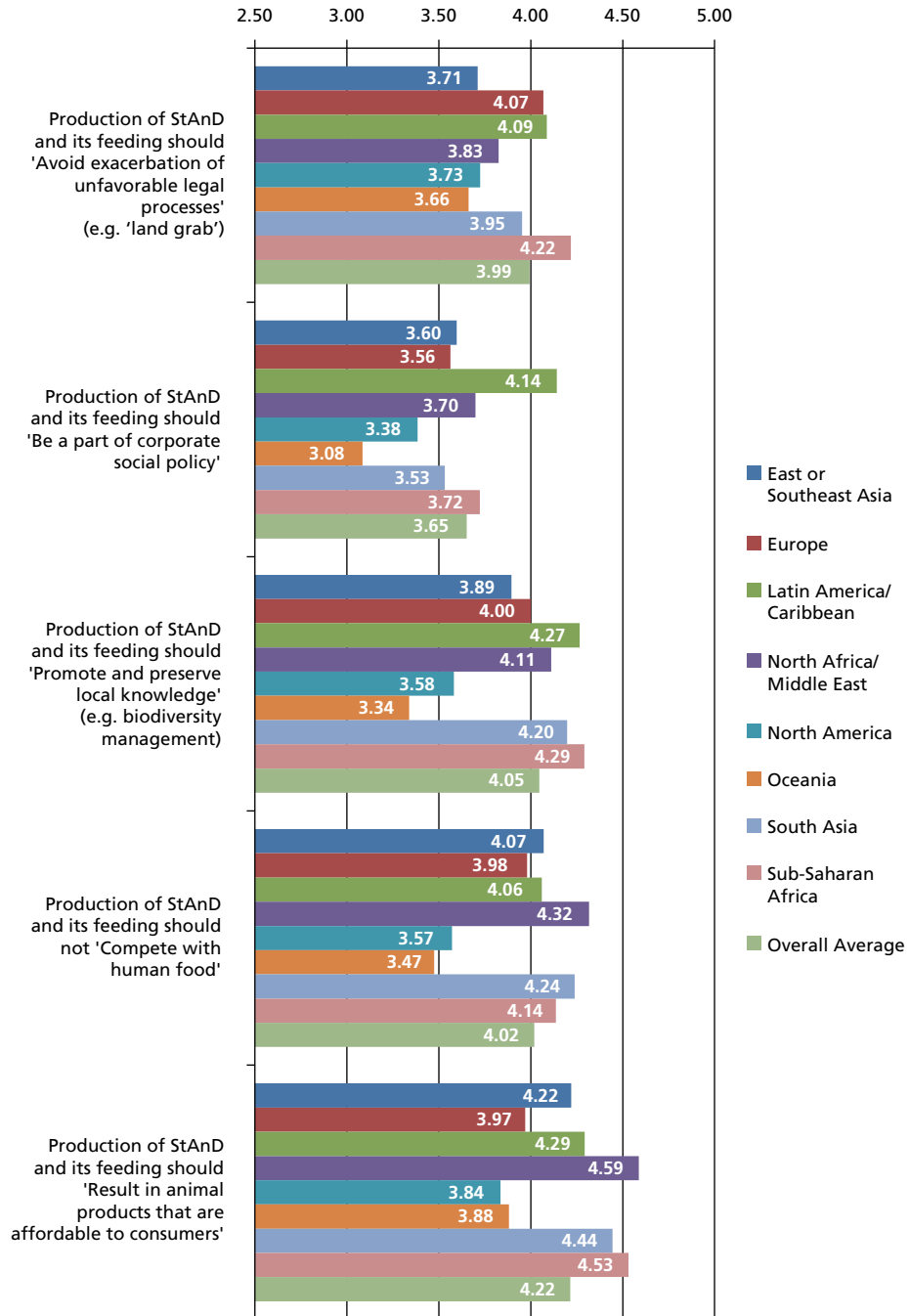


Table 4. Importance of the elements of the *People* dimension in different regions

Element	Regions that gave higher importance than the average	Region that gave lowest importance
Consider social aspects of rearing livestock	SSA, LAC, South Asia	Oceania < North America
Not be culturally offensive to producers and consumers	SSA, South Asia, LAC, NENA	Oceania < North America
Respect perceptions, beliefs, values, taboos and be socially acceptable	NENA, SSA, South Asia	Oceania < North America
Empower women	South Asia, SSA, NENA	Oceania < North America
Break social barriers and promote social harmony	SSA, South Asia, LAC, NENA	Oceania < North America
Be a part of corporate social policy	LAC, SSA, South Asia, NENA	Oceania < North America
Promote and preserve local knowledge	SSA, LAC, South Asia, NENA, Europe	Oceania < North America
Not compete with human food	NENA, South Asia, SSA, E&SEA, LAC	Oceania < North America
Animal products affordable to consumers	NENA, SSA, South Asia, LAC,	North America < Oceania

Importance of the economic elements of StAnD

The scores given by respondents from different regions are given in Figure 14. SSA, South Asia, LAC and NENA gave higher importance to increasing benefit:cost ratio than the global average. To the issue that the production and feeding of the diets should take into account Environmental and social costs of negative externalities, LAC, SSA, South Asia and Europe (in that order) gave higher importance than the global average, while Oceania and North America gave the lowest score. Amongst the developed parts of the world, Europe appears to be in higher favour of taking into account the environmental and social costs of negative externalities than do North America and Oceania. Higher sensitivities of developing countries than developed countries for these elements has been evident from the results presented in Part 1 of Section 3 of this document ('Global view'). The results there have helped to rank different regions for their sensitivities towards these elements. That Production of StAnD should not enhance volatility in price of feed ingredients received a higher score (higher importance) from SSA, NENA, South Asia and LAC. Least importance was given to this element by North America. Constraints such as poor infrastructure, climatic vagaries, low access to resources and technologies, and low human skills, amongst others, make developing countries more vulnerable to volatility in prices.

Importance of miscellaneous elements of StAnD

The scores given by respondents from different regions are presented in Figure 15. A synthesis of the results is given in Table 5. The degree of acceptability for use of grains in monogastric diets was higher than in ruminant diets, suggesting the need to decrease grain use in diets of animals, but more so in ruminant diets. Respondents from Oceania and North America gave higher score to the use of GMO than the global average. Use of GMO crops and Feed ingredients produced through

Figure 14
 Importance of the economic elements of Sustainable Animal Diets (StAnD)
 (*Profit* dimension of sustainability)

Key: 1 = Not important; 2 = Somewhat Important; 3 = Reasonably important;
 4 = Important; 5 = Extremely Important.

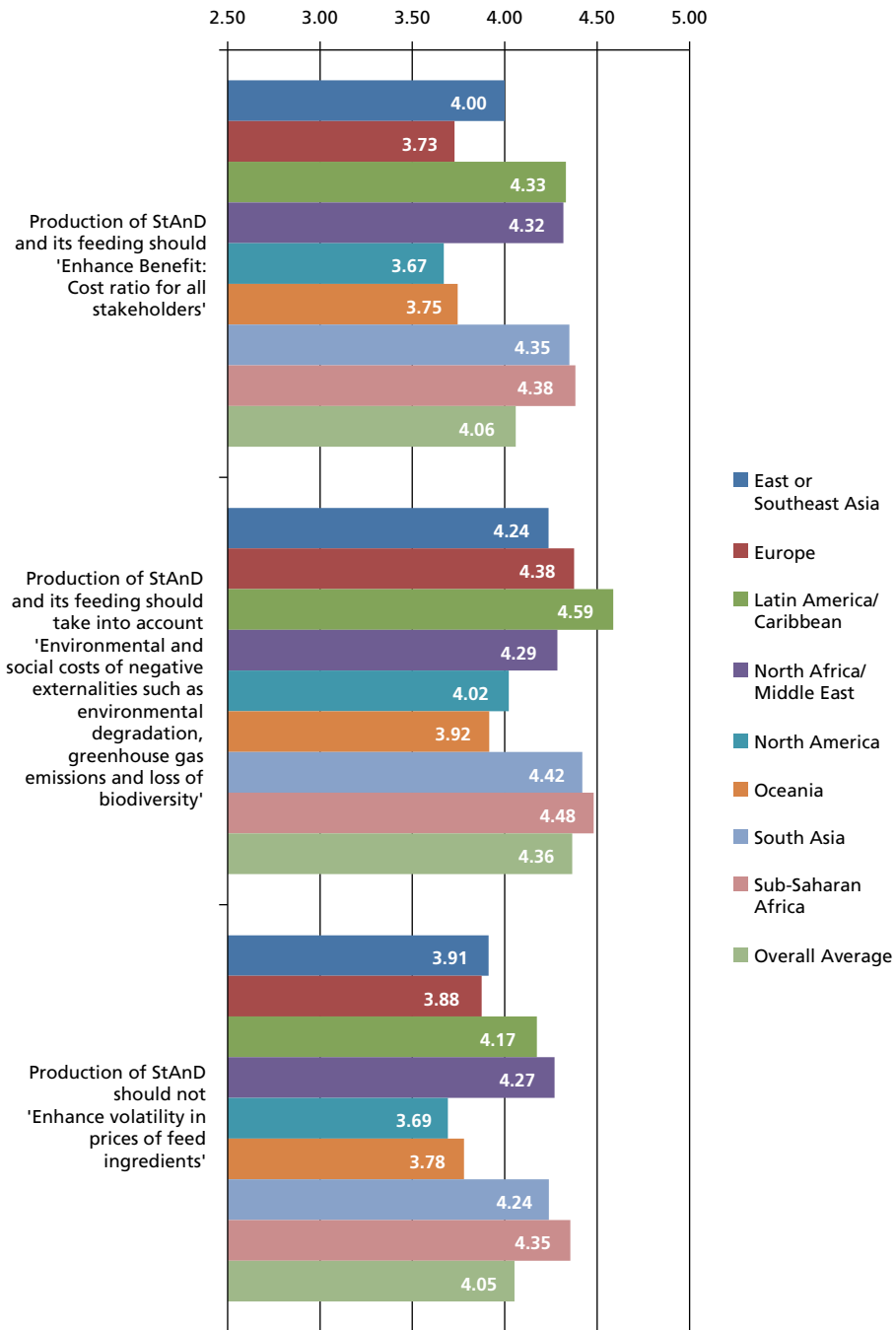
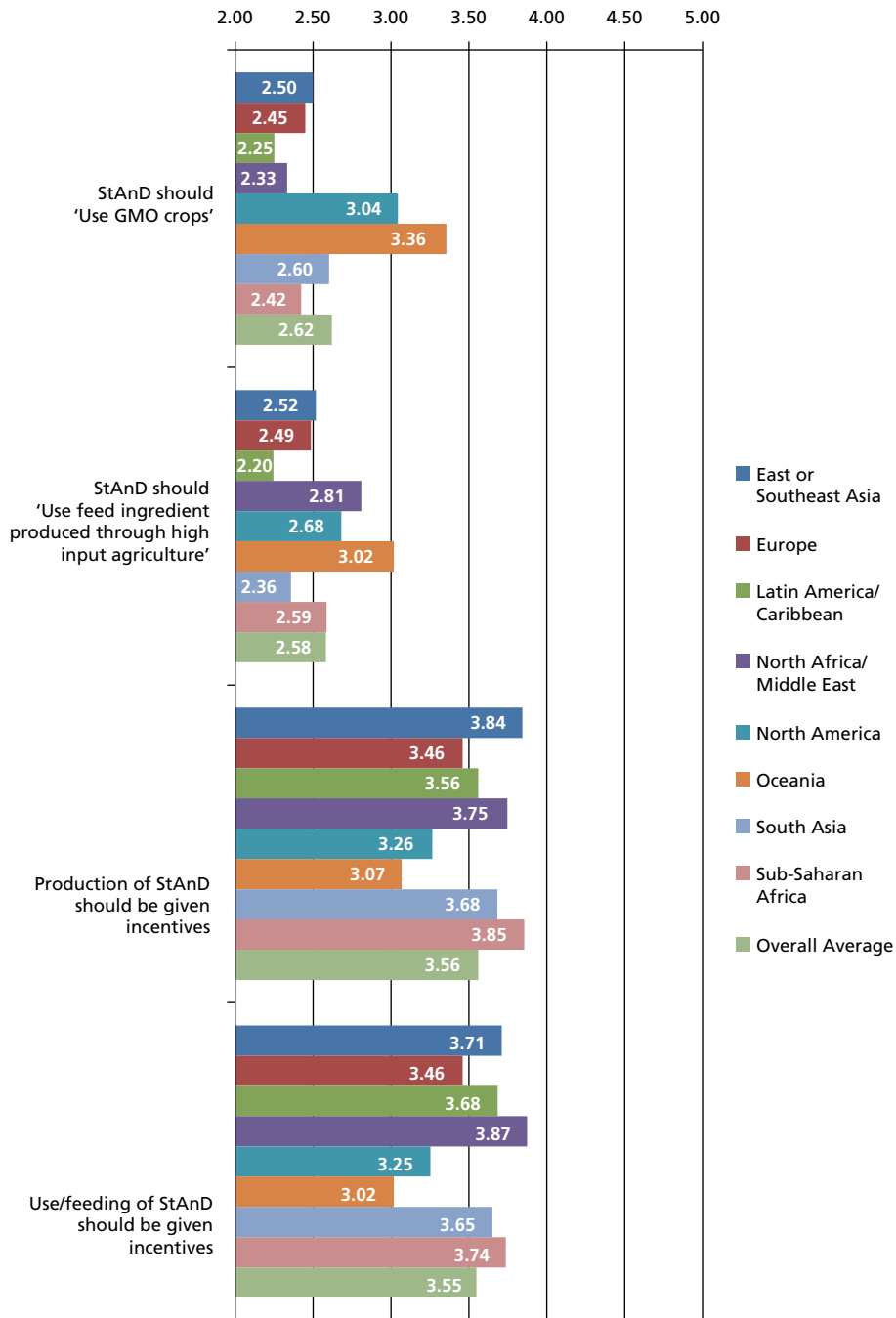


Figure 15
Importance of the elements of Sustainable Animal Diets (StAnD)

Key: 1 = Not important; 2 = Somewhat Important; 3 = Reasonably important; 4 = Important; 5 = Extremely Important.



(cont.)

Figure 15 (cont.)

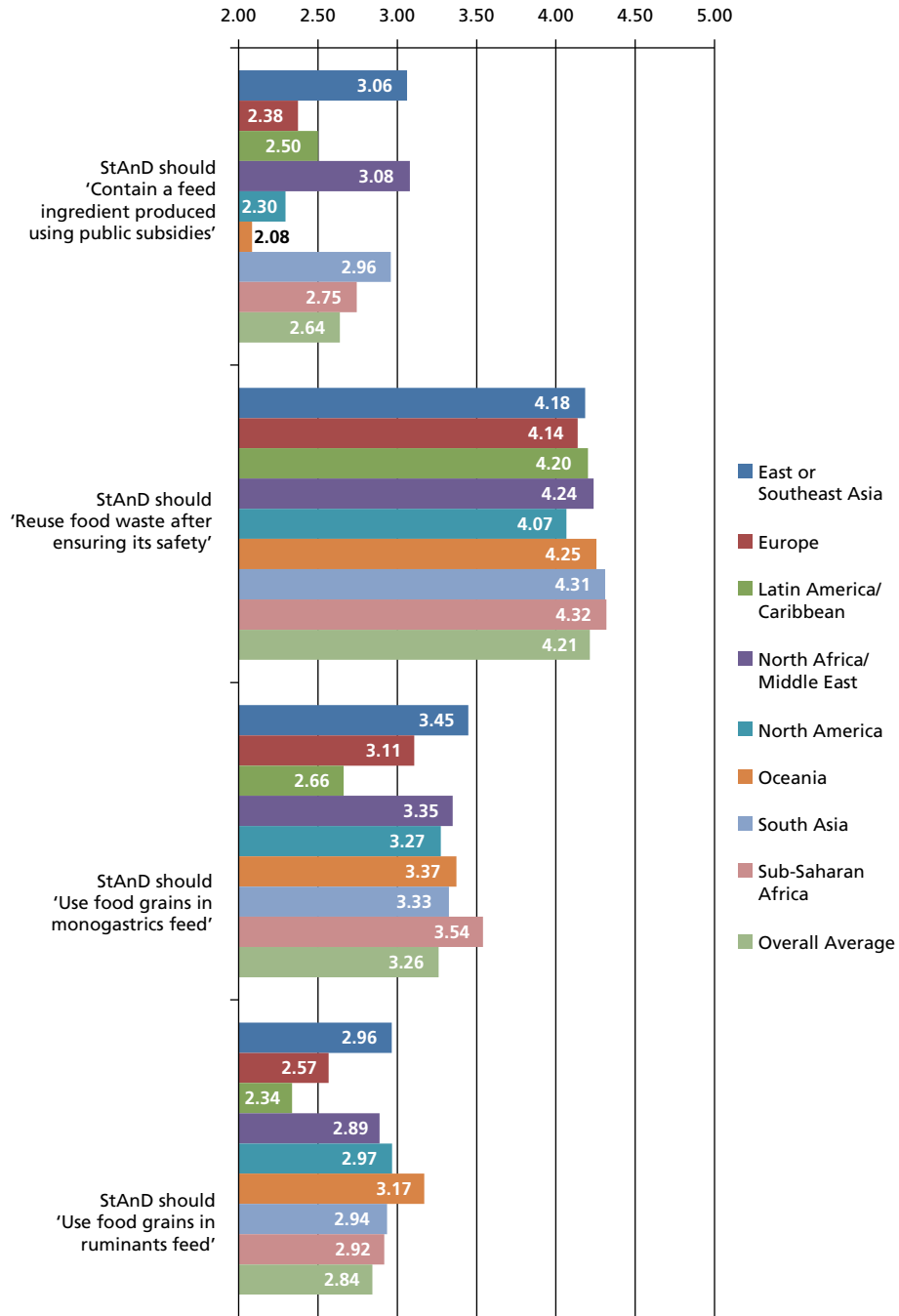


Table 5. Importance given to other elements of Sustainable Animal Diets (StAnD) by different regions

Elements	Regions that gave higher importance than the average	Regions giving lowest importance
Contain a feed ingredient produced using public subsidies	NENA, E&SEA, South Asia, SSA	Oceania < North America
Re-use food waste after ensuring its safety	High importance given by all regions. SSA, South Asia, NENA	North America
Use food grains in monogastric feed	All regions except LAC, and Europe	LAC < Europe
Use food grains in ruminant feed	All regions except LAC and Europe	LAC < Europe
Should use GMO	Oceania, North America	LAC < NENA
Should use feed ingredients produced through high-input agriculture	Oceania, NENA	LAC < South Asia
Production of StAnD be given incentives	SSA, E&SEA, NENA, South Asia	Oceania < North America
Use of StAnD be given incentives	NENA, SSA, E&SEA, LAC, South Asia	Oceania < North America

high-input systems was given low importance by respondents from LAC, despite that this region produces substantial amounts of GMO crops. Developing countries gave higher importance to the Use of incentives in production and use of StAnD than developed countries.

Extent of agreement of stakeholders on integration of the ethical dimension into StAnD

Respondents from almost all regions except Oceania gave a high score, close to the global average, to the integration of ethical dimensions into StAnD (Figure 16a). A small number of respondents in each of the regions, varying from 2.4% to 10.2%, did not agree to the integration of the ethical dimension. The number was 6.6% in Oceania and 10.2% in North America (Figure 16b), suggesting lower sensitivity of these regions towards ethical issues of StAnD.

Who should take initiative first to re-structure the feed production system for meeting the StAnD requirements?

The details of the ranking are given in Figure 17. For each region, three bodies or organizations that should take the initiative to re-structure the feed production system for meeting the requirements of Sustainable Animal Diets are given in Table 6. The analysis show that in developed countries, Farmers and farmers' associations should take the lead in putting into practice the concept of StAnD, while in developing countries the responsibility fell on Academia. In addition, the roles of Regulatory bodies and of Industry were also considered important.

Figure 16a

Extent of agreement on integration of the ethical dimensions into Sustainable Animal Diets. Relative agreement in different regions

Key: 1 = Strongly Disagree; 2 = Disagree; 3 = Neither Agree nor Disagree; 4 = Agree; 5 = Strongly Agree.

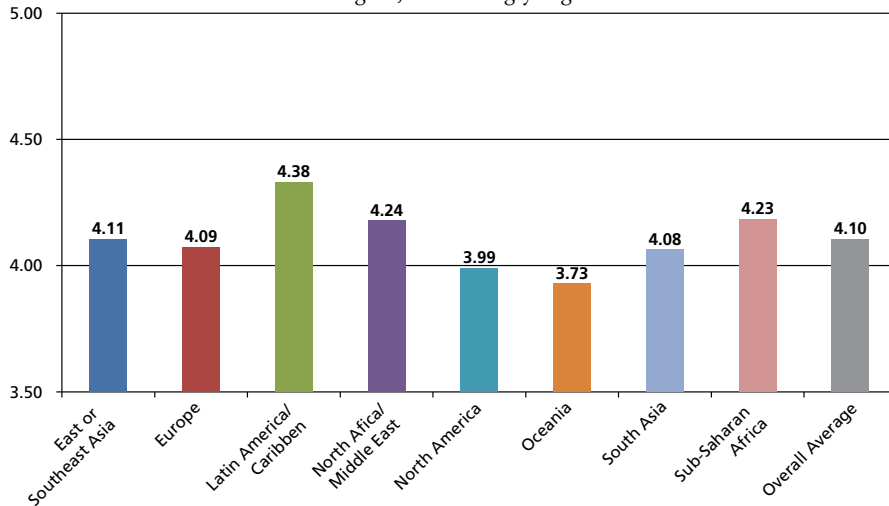


Figure 16b

Extent of agreement on integration of the ethical dimensions into Sustainable Animal Diets? Percentage respondents in different regions on the extent of agreement

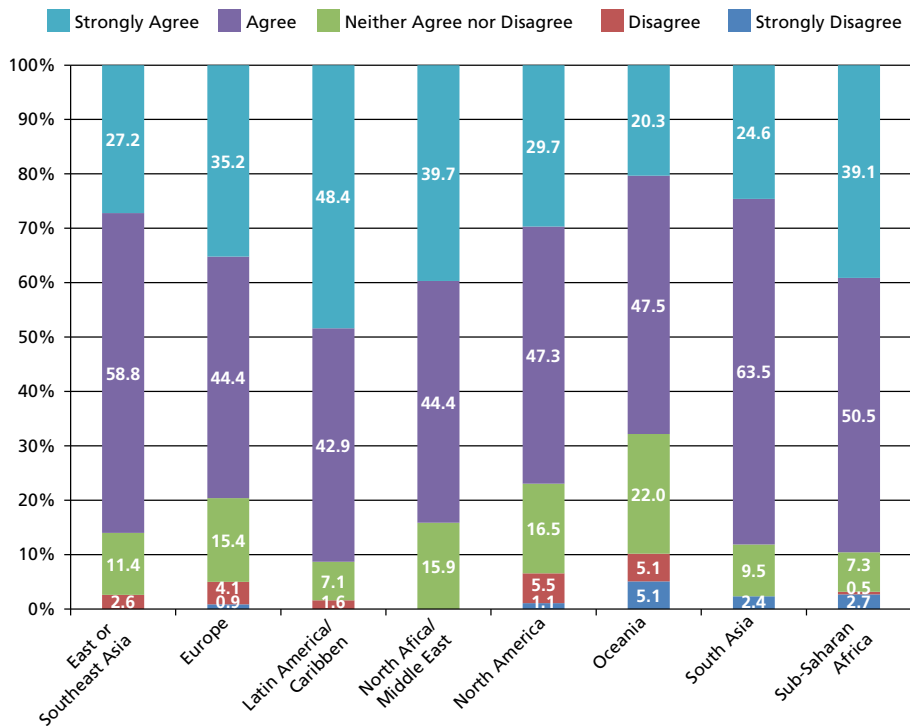


Figure 17
 Bodies and organizations that should take the initiative
 to re-structure the feed production system for meeting the requirements
 of Sustainable Animal Diets

Key: 1 = Not important; 2 = Somewhat Important; 3 = Reasonably important;
 4 = Important; 5 = Extremely Important.

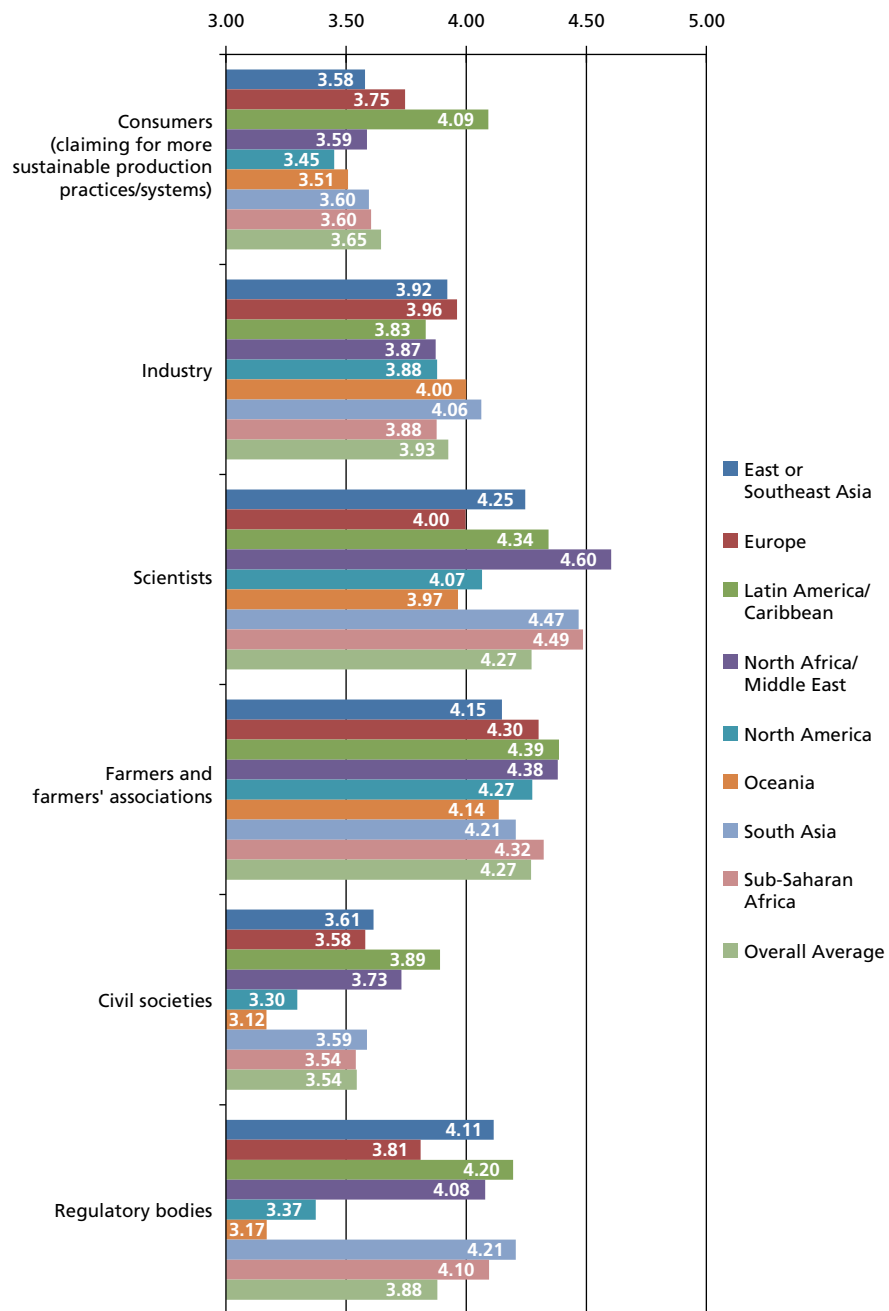


Table 6. Regional presentation of three bodies that should take first initiative to re-structure production system to meet the requirements of Sustainable Animal Diets

Region	Body 1	Body 2	Body 3
E&SEA	Scientists	Farmers and farmers' associations	Regulatory bodies
Europe	Farmers and farmers' associations	Scientists	Industry
LAC	Farmers and farmers' associations	Scientists	Regulatory bodies
NENA	Scientists	Farmers and farmers' associations	Regulatory bodies
North America	Farmers and farmers' associations	Scientists	Industry
Oceania	Farmers and farmers' associations	Industry	Scientists
South Asia	Scientists	Regulatory bodies	Farmers and farmers' associations
SSA	Scientists	Farmers and farmers' associations	Regulatory bodies

Table 7. Regional presentation of three top modalities for putting the Sustainable Animal Diet (StAnD) concept into practice

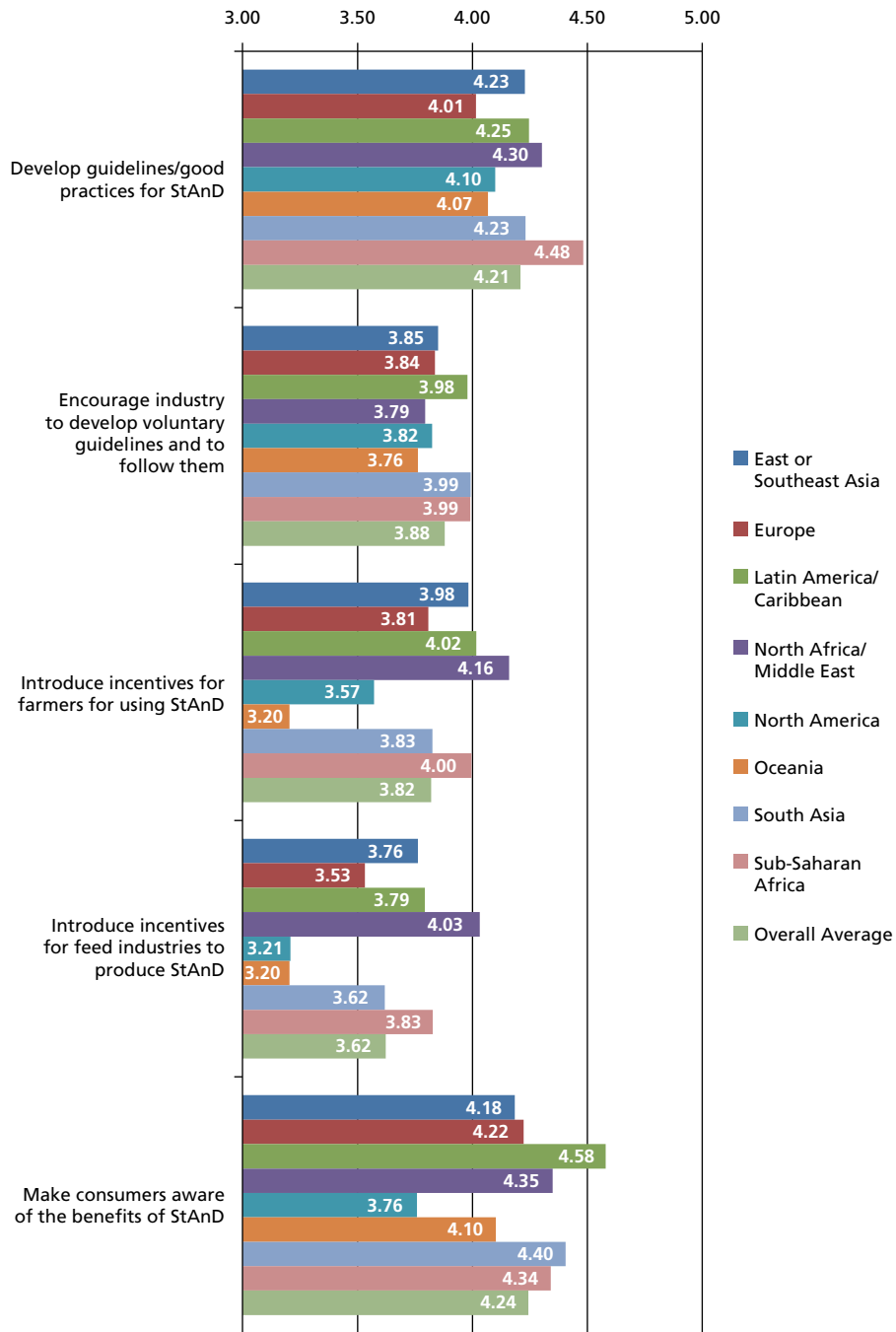
Region	Mode 1	Mode 2	Mode 3
E&SEA	Develop guidelines and good practices	Make consumers aware of the benefits of StAnD	Create environmental certification for products obtained by using StAnD
Europe	Make consumers aware of the benefits of StAnD	Develop guidelines and good practices	Achieve broad stakeholder engagement
LAC	Make consumers aware of the benefits of StAnD	Make civil society aware of the benefits of StAnD	Achieve broad stakeholder engagement
NENA	Make consumers aware of the benefits of StAnD	Develop guidelines and good practices	Create environmental certification for products obtained by using StAnD
North America	Develop guidelines and good practices	Achieve broad stakeholder engagement	Encourage Industry to develop voluntary guidelines and to follow them
Oceania	Make consumers aware of the benefits of StAnD	Achieve broad stakeholder engagement	Develop guidelines and good practices
South Asia	Make consumers aware of the benefits of StAnD	Develop guidelines and good practices	Make civil society aware of the benefits of StAnD
SSA	Develop guidelines / good practices	Make consumers aware of the benefits of StAnD	Achieve broad stakeholder engagement

Modalities through which the StAnD concept can be put into sound management practices

The details on the scores received from respondents are given in Figure 18; and for each region, top three modalities of putting the concept into practices are presented in Table 7. The suggested options that could be applied to all regions are: Develop guideline and good practices, Make consumers and civil society aware of the benefits of StAnD, and Achieve broad stakeholder engagement.

Figure 18
 Modalities for putting the concept of Sustainable Animal Diets (StAnD)
 into sound management practices

Key: 1 = Not important; 2 = Somewhat Important; 3 = Reasonably important;
 4 = Important; 5 = Extremely Important.



(cont.)

Figure 18 (cont.)

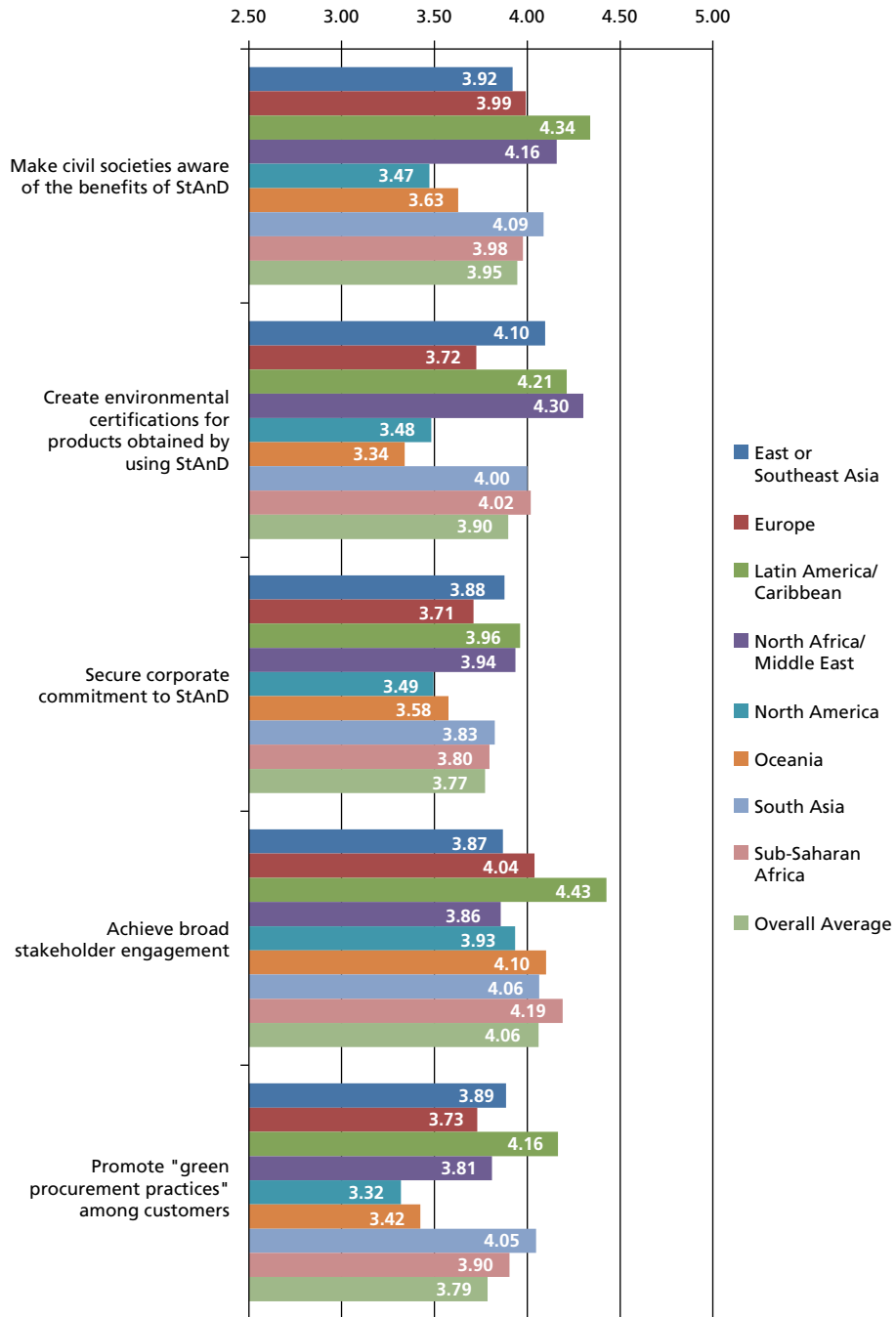


Table 8. Regional percentage unit shift from current to an ideal situation

Region	Planet		People		Profit		Ethics	
	Current	Ideal	Current	Ideal	Current	Ideal	Current	Ideal
E&SEA	20.5	29.2	27.5	30.2	39.0	23.9	13.0	16.7
	+ 8.7		+ 2.7		- 15.1		+ 3.7	
Europe	21.5	33.4	21.9	28.0	43.1	18.3	13.5	20.3
	+ 11.9		+ 6.1		- 24.8		+ 6.8	
LAC	20.7	30.4	21.9	27.7	44.7	19.8	12.8	22.1
	+ 9.7		+ 5.8		- 24.9		+ 9.3	
NENA	20.5	29.5	24.8	29.1	41.6	22.7	13.1	18.7
	+ 9.0		+ 4.3		- 18.9		+ 5.6	
North America	18.3	31.3	22.8	25.5	45.1	20.9	13.8	22.2
	+ 13.0		+ 2.7		- 24.2		+ 8.4	
Oceania	22.7	30.4	26.6	27.5	36.2	22.9	14.5	19.2
	+ 7.7		+ 0.9		- 13.3		+ 4.7	
South Asia	23.0	30.0	29.3	31.5	34.5	21.4	13.3	17.1
	+ 7.0		+ 2.2		- 13.1		+ 3.8	
SSA	22.6	30.2	27.6	30.2	35.6	21.2	14.2	18.5
	+ 7.6		+ 2.6		- 14.4		+ 4.3	

For most regions these modalities should be effective. The regional identified modalities are in general agreement with those identified through ‘Global view’ (Part 1 of Section 3).

Shift in the importance of the Planet, People, Profit and Ethical dimensions of StAnD

For each of the four categories of StAnD, regional shifts in emphasis from the current to an ideal situation of sustainability is presented in Table 8. Overall, realization of StAnD demands shifts in all dimensions of sustainability in all regions. The shifts were consistent in all regions, with the magnitude of change did not differ drastically across all the regions. Increase in importance to the issues that affect environment (increase by 7 to 13 percentiles), people (increase by 2.7 to 6.1 percentiles, except in Oceania where the increase desired was only 0.9 percentiles) and ethics (increase by 3.7 to 9.3 percentiles) and lowering of importance assigned to profit generation by 13.1 to 24.9 percentiles in the different regions. While keeping animal products affordable for consumers (respondents had strong opinions concerning this element) and making a profit, the general opinion appears to be that the production and use of StAnD should give more importance to the *Planet* and *People* dimensions, and less to the *Profit*. The derive to generate profit should not lead to degradation of environment and negligence of socio-cultural aspects. The reduction in the relative relevance of the *Profit* with respect to the *Planet* and *People* dimensions is acceptable to the people as long as gains are made towards enriching the *Planet* and *People* dimensions. It also does not mean making livestock farming less profitable. The profitability can be maintained or enhanced by taking better care of other dimension of the StAnD concept.

Summation of the Regional view

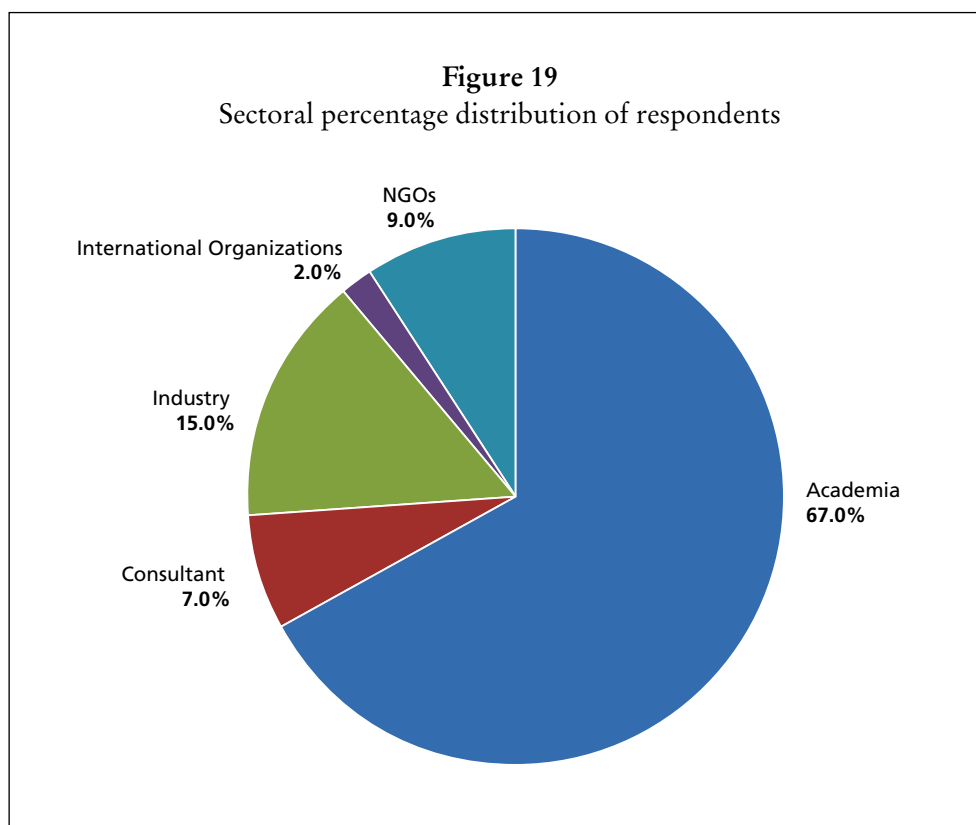
In summary, there was a good distribution of respondents across all regions. Respondents from Two regions, SSA and LAC, were highly sensitive to the environmental issues, while those from North America and Oceania gave low importance to these issues. In the *People* dimension of StAnD, overall, higher importance was given to socio-cultural elements by respondents from SSA, LAC and South Asia. Those from Developing countries were more sensitive to socio-cultural issues than respondents from developed ones. Stakeholders in SSA, South Asia, LAC and NENA gave higher importance to increase in benefit:cost ratio than the global average. Those in LAC, SSA, South Asia and Europe (in that order) gave higher importance to the need to take into account environmental and social costs of negative externalities in the production and feeding of diets, while respondents in Oceania and North America were least sensitive towards this criterion. Stakeholders in SSA, NENA, South Asia and LAC gave a high score to the production of StAnD without enhancing volatility in price of feed ingredients, while those North America gave lowest importance to this criterion.

On other miscellaneous elements, stakeholders in LAC and Europe appear to be less inclined to include grains in animal diets. The degree of acceptability to grains in monogastric diets was higher than in ruminant diets, suggesting the need to decrease grain use in diets of animals, but more so for ruminants. Respondents in Oceania and North America gave higher scores to the use of GMO than the global average. Use of GMO crops and feed ingredients produced through high-input systems was given low importance by respondents in LAC, despite this region producing substantial amounts of GMO crops. Stakeholders in Developing countries gave higher importance to the Use of incentives in production and use of StAnD than did those in developed countries. Respondents from almost all regions highlighted the need to integrate ethical dimensions into StAnD.

In developed countries, Farmers and farmers' associations should take the lead in introducing the StAnD concept in practice, while in developing countries the responsibility fell on Academia. In addition, the roles of Regulatory bodies and of Industry were also considered important. Modalities that could be applied in all regions to translate the StAnD concept into practice were: Develop guideline and good practices; Make consumers and civil society aware of the benefits of StAnD; and Achieve broad stakeholder engagement. The realization of StAnD demands shift in all dimensions of sustainability in all regions, with the shift being of almost the same magnitude in all regions. For keeping animal products affordable for consumers (respondents stressed this element) and making a profit, the general opinion was that production and use of StAnD should give higher importance to the *Planet* and *People* dimensions, and lower to the *Profit* dimension.

SECTORAL VIEWS

Of the 1 195 respondents, 931 provided information on their sector. The largest contribution was from the Academia and least from International organizations. A good number of respondents were from NGOs and livestock-sector industries (Figure 19; Table 9).



Importance of the StAnD elements that aim to protect the environment and the natural resource base

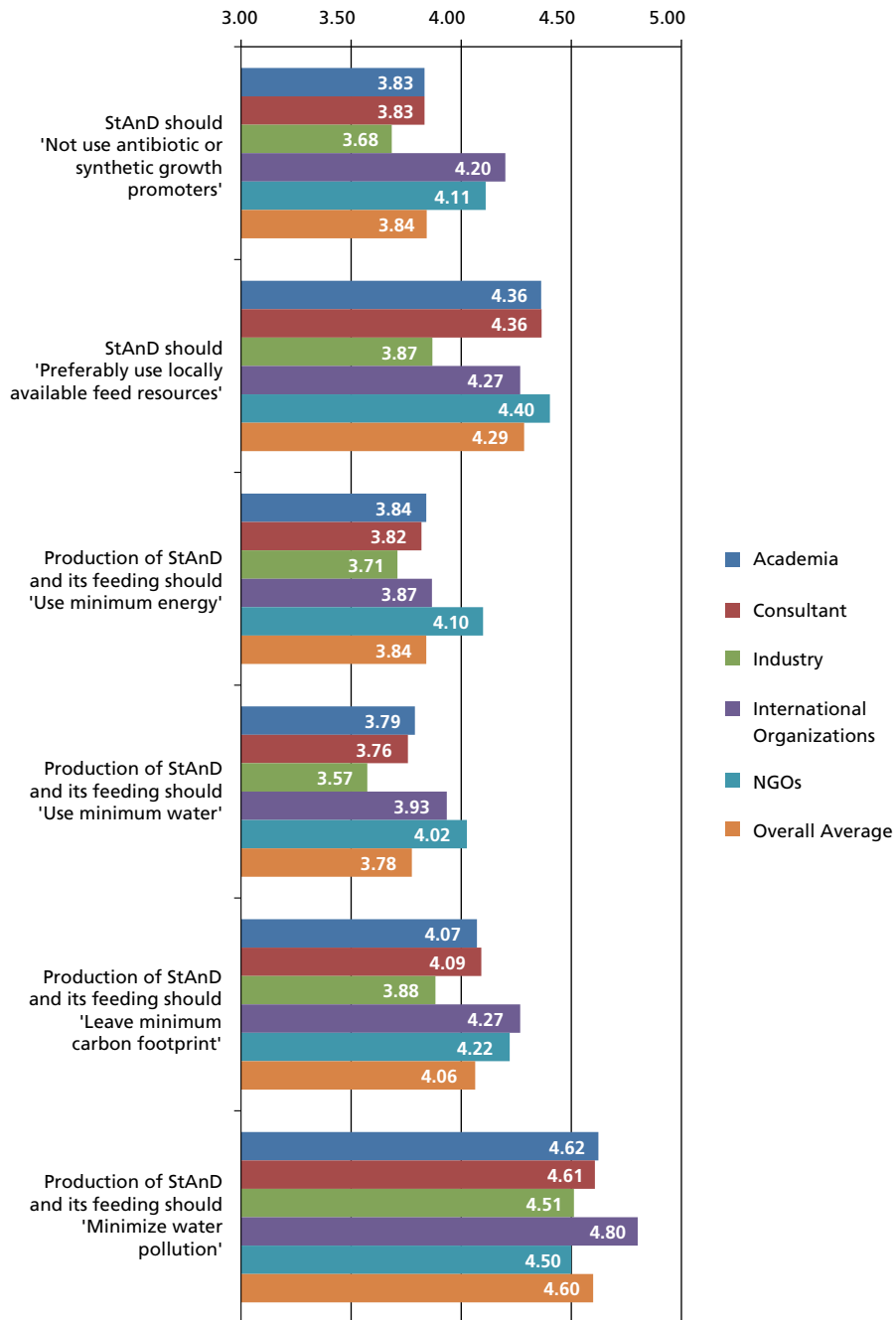
In the *Planet* dimension of sustainability, different sectors responded differently (Figure 20). Important findings from this figure are presented in Table 10. For most of the elements related to environmental health, International organizations, NGOs and Academia gave high importance, while overall least importance was given by livestock-sector industries; however, other sectors appears to be more sensitive towards the elements that aim to protect the environment and natural resource base. Recently, using a life cycle analysis approach, some activities (LEAP, 2013-2014) have been initiated by the livestock industry for estimating the environmental impact of their activities.

Table 9. Number of respondents from different sectors

Sector	No. of respondents
Academia	623
Consultant	66
Livestock-sector Industry	145
International organization	15
NGOs	82
Total	931

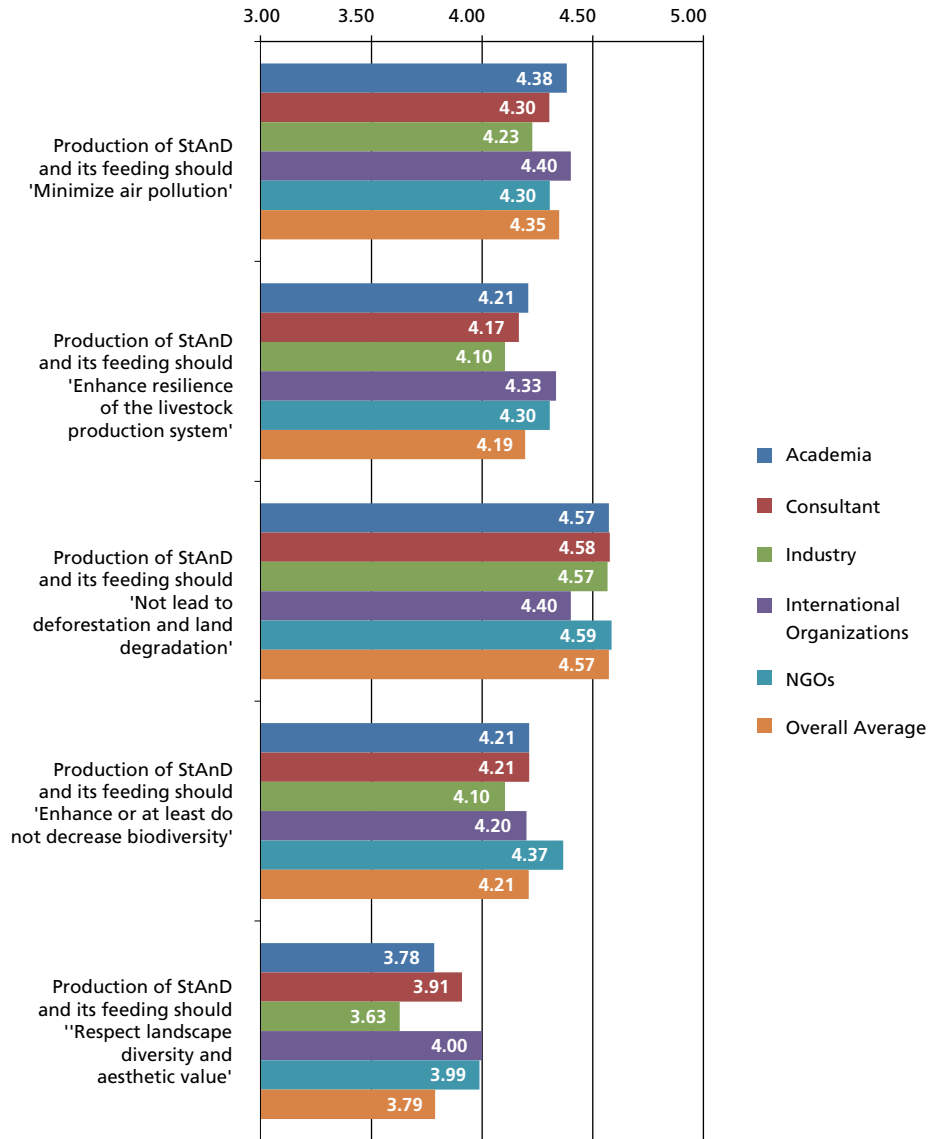
Figure 20
 Importance of the elements of Sustainable Animal Diets (StAnD)
 that aim to protect the environment and natural resource base
 (*Planet* dimension of sustainability)

Key: 1 = Not important; 2 = Somewhat Important; 3 = Reasonably important;
 4 = Important; 5 = Extremely Important.



(cont.)

Figure 20 (cont.)



Importance of the socio-cultural elements of StAnD that provide benefits for people

Different sectors gave varied levels of importance to the socio-cultural elements (Figure 21; Table 11). Overall, higher importance was given to socio-cultural elements by NGOs, International organizations and Academia, while Industry was least sensitive towards these elements, which is to some extent understandable (Table 11).

Table 10. Importance of the elements of the *Planet* dimension of Sustainable Animal Diets by different sectors

Elements	Sectors that gave higher importance than the average	Sector that gave lowest importance
Not use antibiotics and synthetic growth promoters	International organizations, NGOs	Industry
Preferably use locally available feed resources	NGOs, Academia, Consultants	Industry
Use minimum energy	NGOs, International organizations	Industry
Use minimum water	NGOs, International organizations	Industry
Minimum C-footprint	International organizations, NGOs, Academia, Consultants	Industry
Minimize water pollution	International organizations, Academia	Industry
Minimize air pollution	International organizations, Academia	Industry
Enhance resilience of livestock production system	All sectors except Industry	Industry
Not lead to deforestation and land degradation	All sectors equal to global average except International organizations	International organizations
Enhance or at least do not decrease biodiversity	NGOs, other sectors equal to global average except Industry	Industry
Respect landscape diversity and aesthetic value	International organizations, NGOs, Consultants	Industry

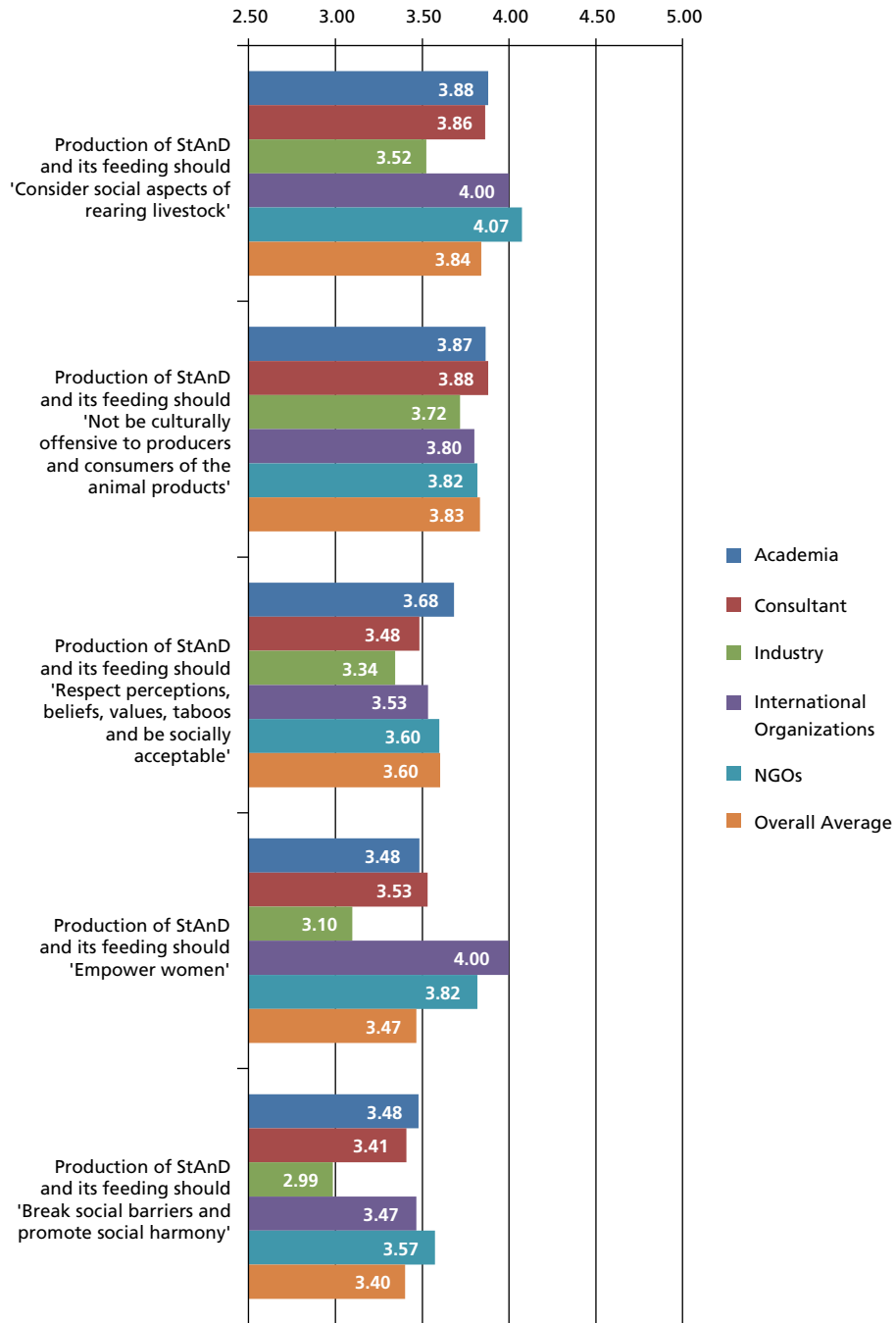
Table 11. Salient findings on the importance of the socio-cultural elements of Sustainable Animal Diets for different sectors

Elements	Sector that gave higher importance than the average	Sector that gave lowest importance
Consider social aspects of rearing livestock	NGOs, International organizations, Academia, Consultants	Industry
Not be culturally offensive to producers and consumers	All sectors except Industry very close to global average	Industry
Respect perceptions, beliefs, values, taboos and be socially acceptable	All sectors except Industry very close to global average	Industry
Empower women	International organizations, NGOs, Consultants, Academia	Industry
Break social barriers and promote social harmony	NGOs, Academia, International organizations	Industry
Avoid exacerbation of unfavorable legal process (e.g. land grab)	NGOs, Consultants	Industry
Be a part of corporate social policy	Academia, other sectors except Industry close to global average	Industry
Promote and preserve local knowledge	NGOs, International organizations, Academia	Industry
Not compete with human food	Academia, NGOs	Industry
Animal products affordable to consumers	Academia, Industry	NGOs

Figure 21

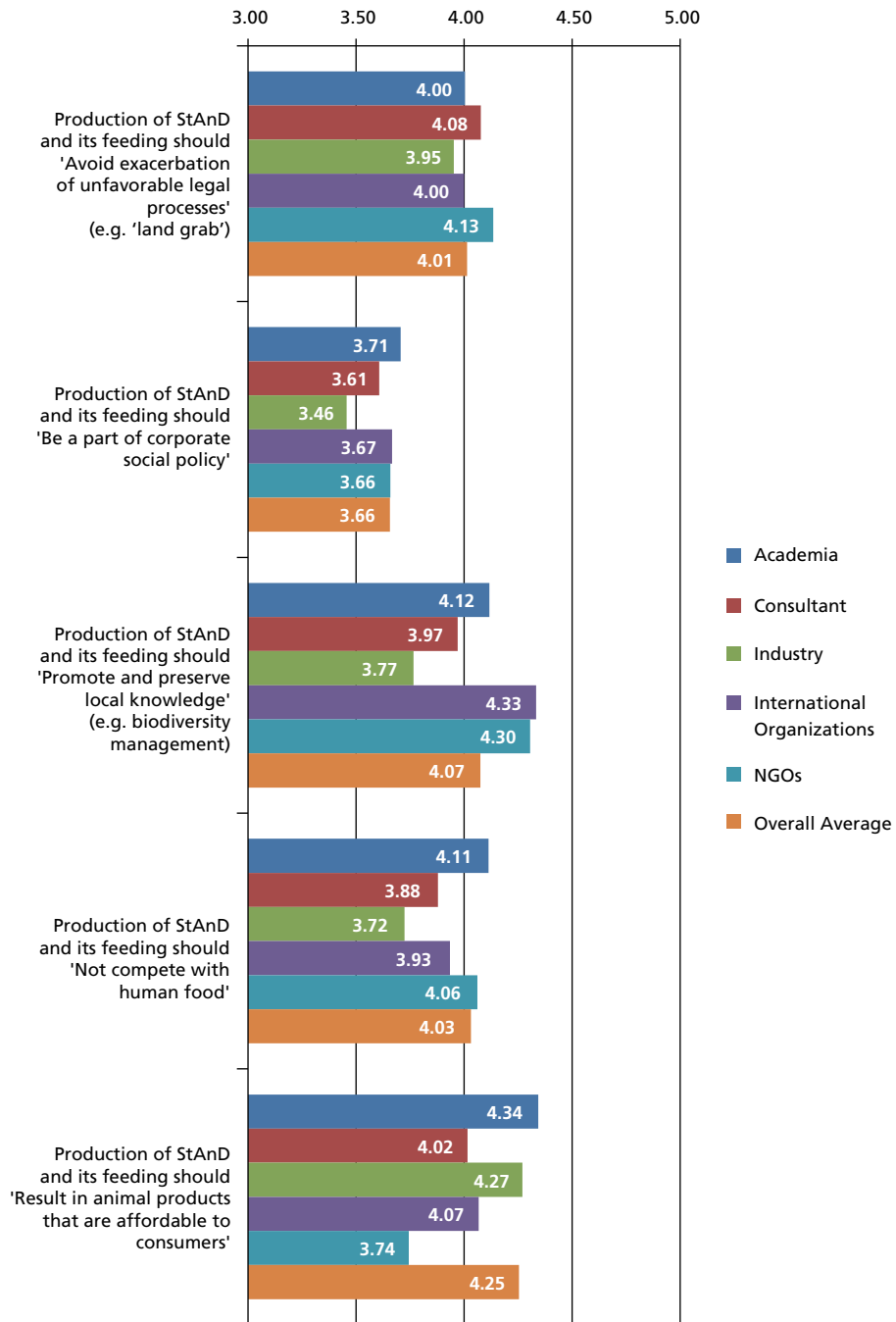
Importance of the socio-cultural elements of Sustainable Animal Diets (StAnD) that provide benefits for people (*People* dimension of sustainability)

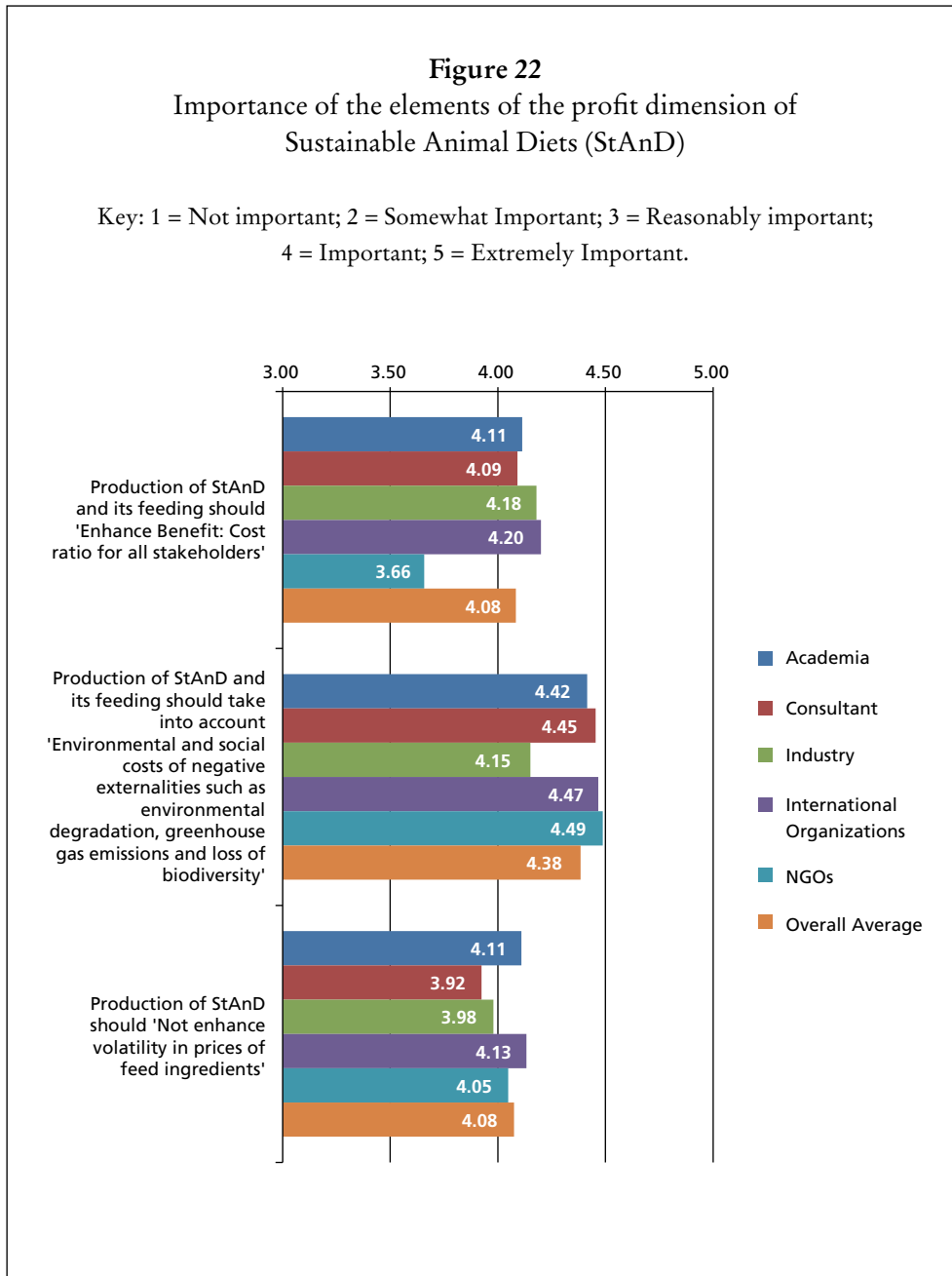
Key: 1 = Not important; 2 = Somewhat Important; 3 = Reasonably important; 4 = Important; 5 = Extremely Important.



(cont.)

Figure 21 (cont.)





Importance of the economic elements of StAnD

All sectors gave high importance to increasing benefit:cost ratio, although NGOs assigned this least importance. To the issue that the Production and feeding of the diets should take into account environmental and social costs of negative externalities, respondents from all sectors except Industry gave higher importance than the global average. That Production of StAnD should not enhance volatility in price of feed ingredients received a high score (higher importance) from respondents from International organizations and Academia, and lowest from those from Industry (Figure 22).

Table 12. Salient findings on the importance of miscellaneous elements given by different sectors

Elements	Sector that gave higher importance than the average	Sector that gave lowest score
Contain a feed ingredient produced using public subsidies	Overall a low score, suggesting that StAnD should not contain a feed produced using public subsidies	Consultants
Re-use food waste after ensuring its safety	NGOs, Academia, Industry	Consultants
Use food grains in monogastric feed	Industry	NGOs
Use food grains in ruminant feed	Industry	NGOs
Should use GMO	Industry	NGOs
Should use feed ingredients produced through high-input agriculture	Industry	NGOs
Production of StAnD be given incentives	Academia	NGOs
Use of StAnD be given incentives	Academia	Consultants

Importance of the miscellaneous elements of StAnD

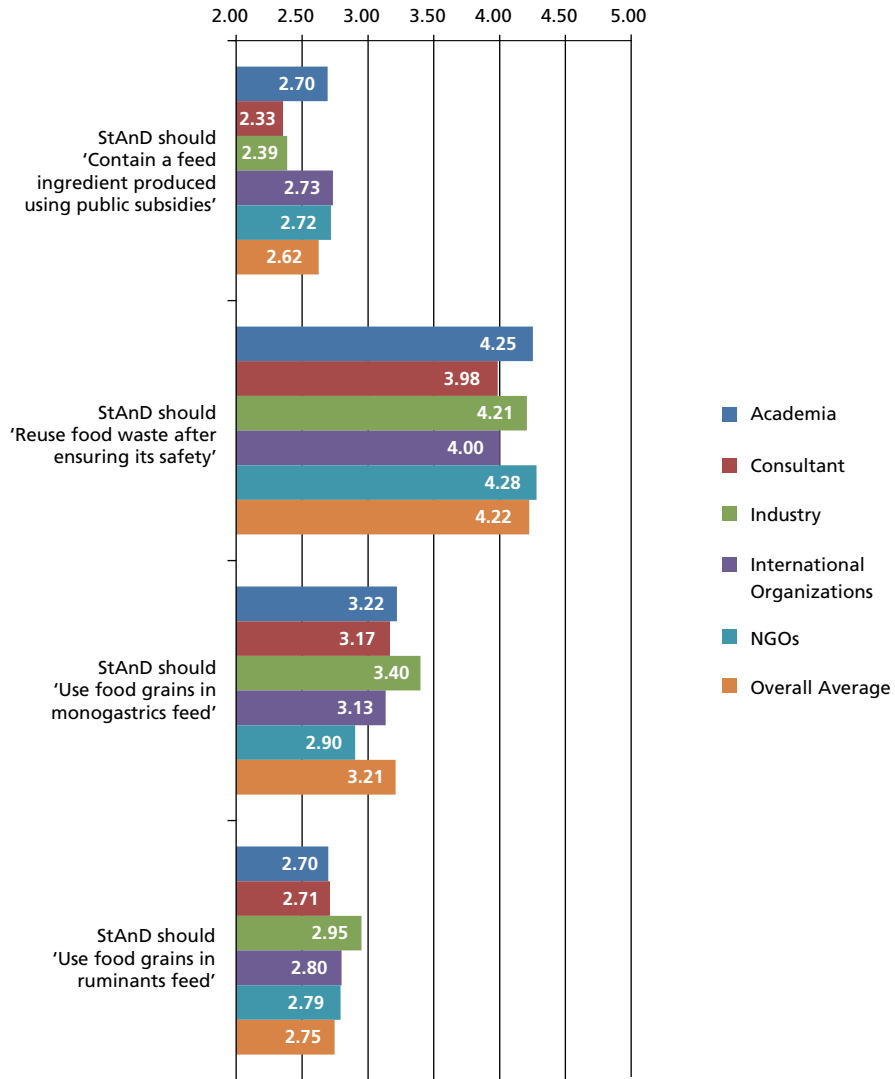
The ranking of the elements by different sectors are presented in Figure 23 and salient findings from this figure in Table 12. Respondents from NGOs, Academia and Industry gave higher importance to the Re-use of food waste as feed. Compared with other sectors, Industry respondents showed a higher degree of acceptance to the Use of food grains in the diets of monogastric and ruminants, and use of GMO feeds. Respondents from NGOs were less inclined to use them. Use of incentives in production and use of StAnD was favoured more by Academia than the other sectors.

Extent of agreement of stakeholders on integration of the ethical dimension into StAnD

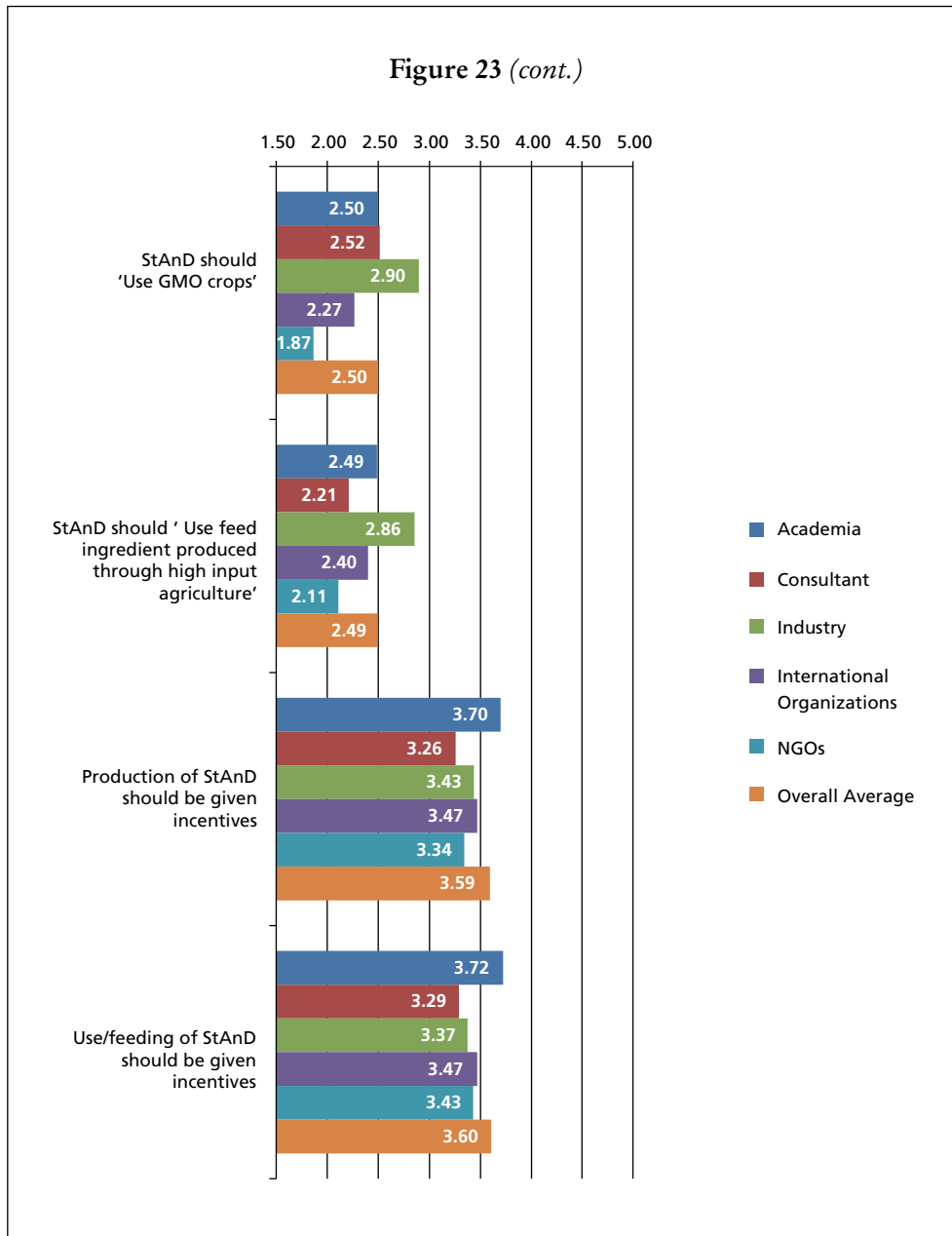
Respondents from almost all sectors except Industry gave a high score, showing higher willingness to integrate ethical dimensions into StAnD by these sectors. From all sectors except Industry, those disagreeing or strongly disagreeing were <5%. From Industry, 7.6% belonged to these two categories combined, and from International organizations none were in these categories. Also, most respondents from Industry were unsure whether ethical dimension should be integrated into StAnD.

Figure 23
 Importance of the other elements of Sustainable Animal Diets
 (StAnD)

Key: 1 = Not important; 2 = Somewhat Important; 3 = Reasonably important;
 4 = Important; 5 = Extremely Important.



(cont.)



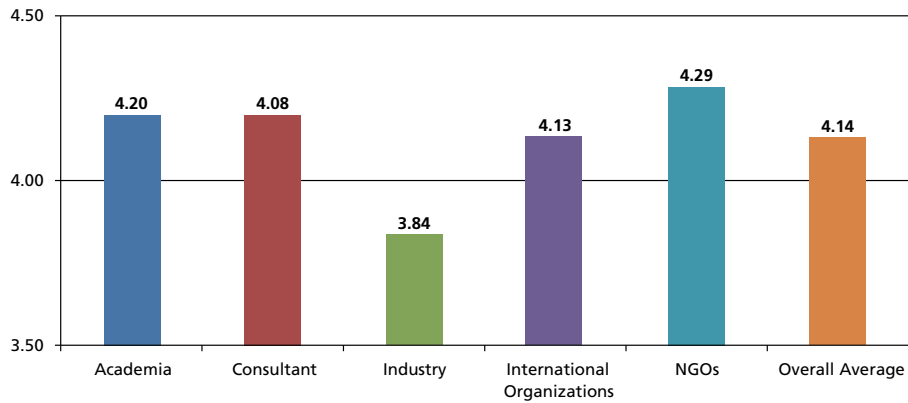
Who should take first initiative to re-structure the feed production system for meeting StAnD requirements?

The scores given by stakeholders from different sectors are given in Figure 25, and from this figure for each region, three bodies or organizations that should take first initiative to re-structure the feed production system for meeting the requirements of Sustainable Animal Diets are presented in Table 13. The analysis shows that the initiative should first be taken by Academia, and then Farmers and farmers’ associations. Other bodies that could play an important role are Industry and Regulatory bodies (these include policy makers). It is interesting to note that Academia identified themselves as the spear head for change. In the opinion of Industry, NGOs and International organizations, the initiative should first be taken by Farmers and farmers’ associations.

Figure 24
Extent of agreement on integration of the ethical dimensions into Sustainable Animal Diets?

Key: 1 = Strongly Disagree; 2 = Disagree; 3 = Neither Agree nor Disagree; 4 = Agree; 5 = Strongly Agree

Relative agreement from different sectors



Percentage of respondents in different sectors on the extent of agreement

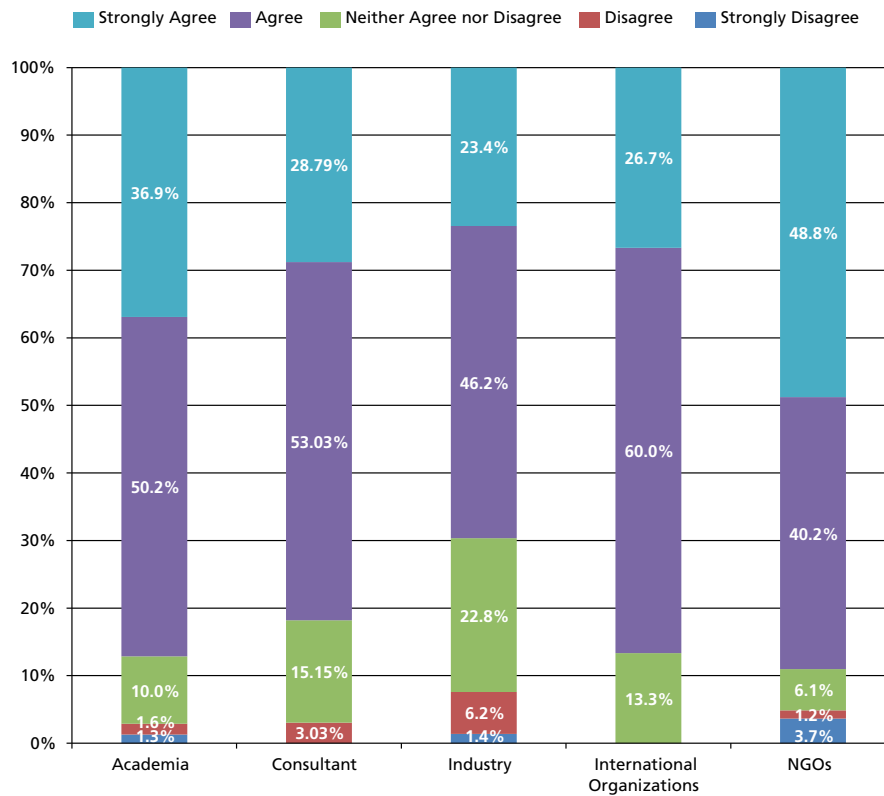


Figure 25
 Bodies or organizations that should take initiative first
 to re-structure the feed production system for meeting the requirements
 of Sustainable Animal Diets

Key: 1 = Not important; 2 = Somewhat Important; 3 = Reasonably important;
 4 = Important; 5 = Extremely Important.

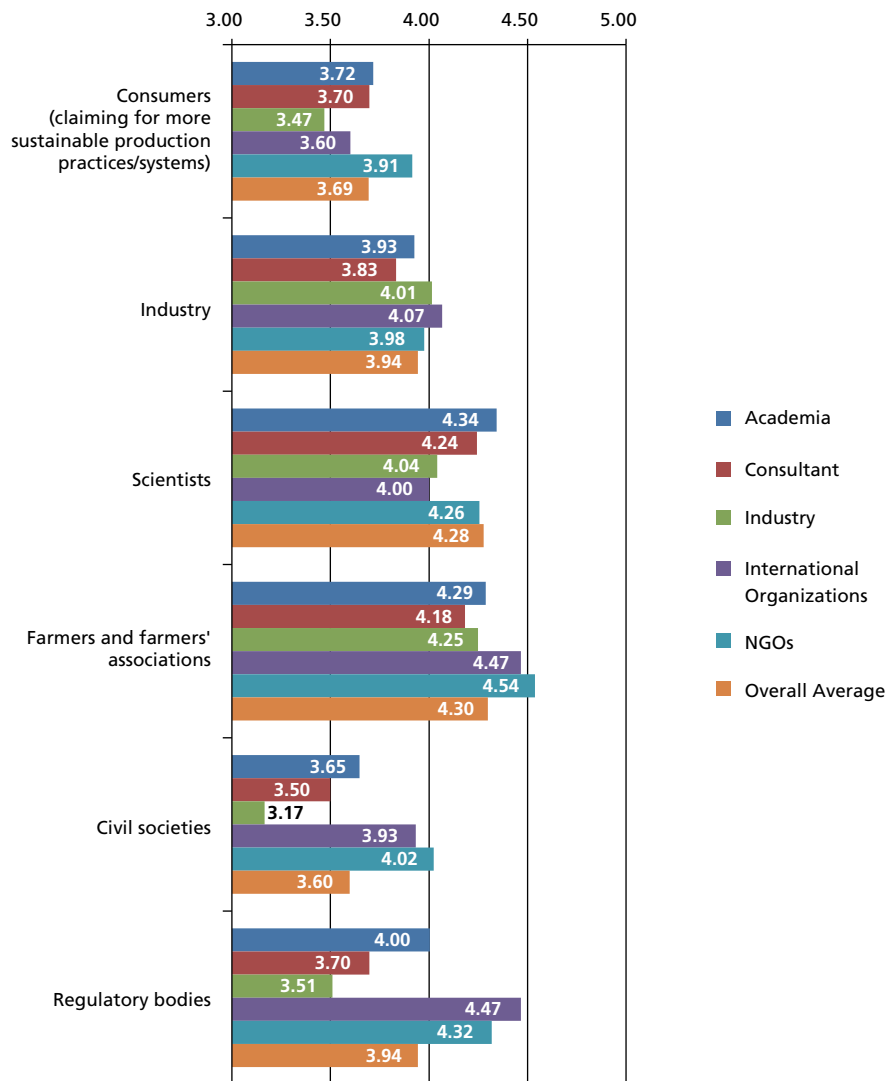


Table 13. Sectoral presentation of three bodies that should take first initiative to re-structure production system to meet the requirements of Sustainable Animal Diets

Sector	Body 1	Body 2	Body 3
Academia	Academia	Farmers and farmers' associations	Regulatory bodies
Consultants	Academia	Farmers and farmers' associations	Industry
Industry	Farmers and farmers' associations	Academia	Industry
NGOs	Farmers and farmers' associations	Regulatory bodies	Academia
International organizations	Farmers and farmers' associations	Regulatory bodies	Industry

Table 14. Sectoral presentation of three top modalities for putting the Sustainable Animal Diet (StAnD) concept into sound management practice

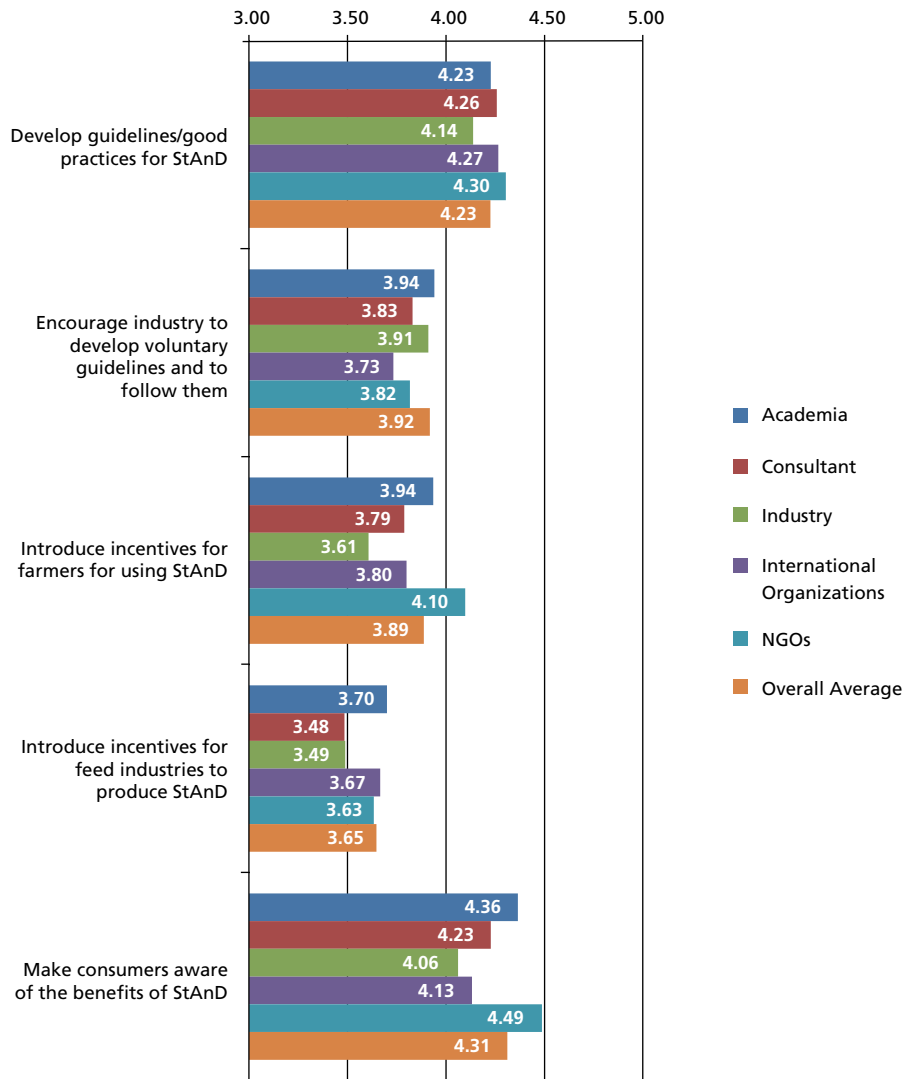
Region	Mode 1	Mode 2	Mode 3
Academia	Make consumers aware of the benefits of StAnD	Develop guidelines / good practices	– Encourage Industry to develop voluntary guidelines and to follow them – Introduce incentives for farmers for using StAnD
Consultants	Develop guidelines and good practices	Make consumers aware of the benefits of StAnD	Encourage Industry to develop voluntary guidelines and to follow them
Industry	Develop guidelines and good practices	Make consumers aware of the benefits of StAnD	Encourage Industry to develop voluntary guidelines and to follow them
International organizations	Develop guidelines and good practices	Make consumers aware of the benefits of StAnD	Introduce incentives for farmers for using StAnD
NGOs	Make consumers aware of the benefits of StAnD	Develop guidelines and good practices	Introduce incentives for farmers for using StAnD

Modalities through which the StAnD concept can be put into sound management practice

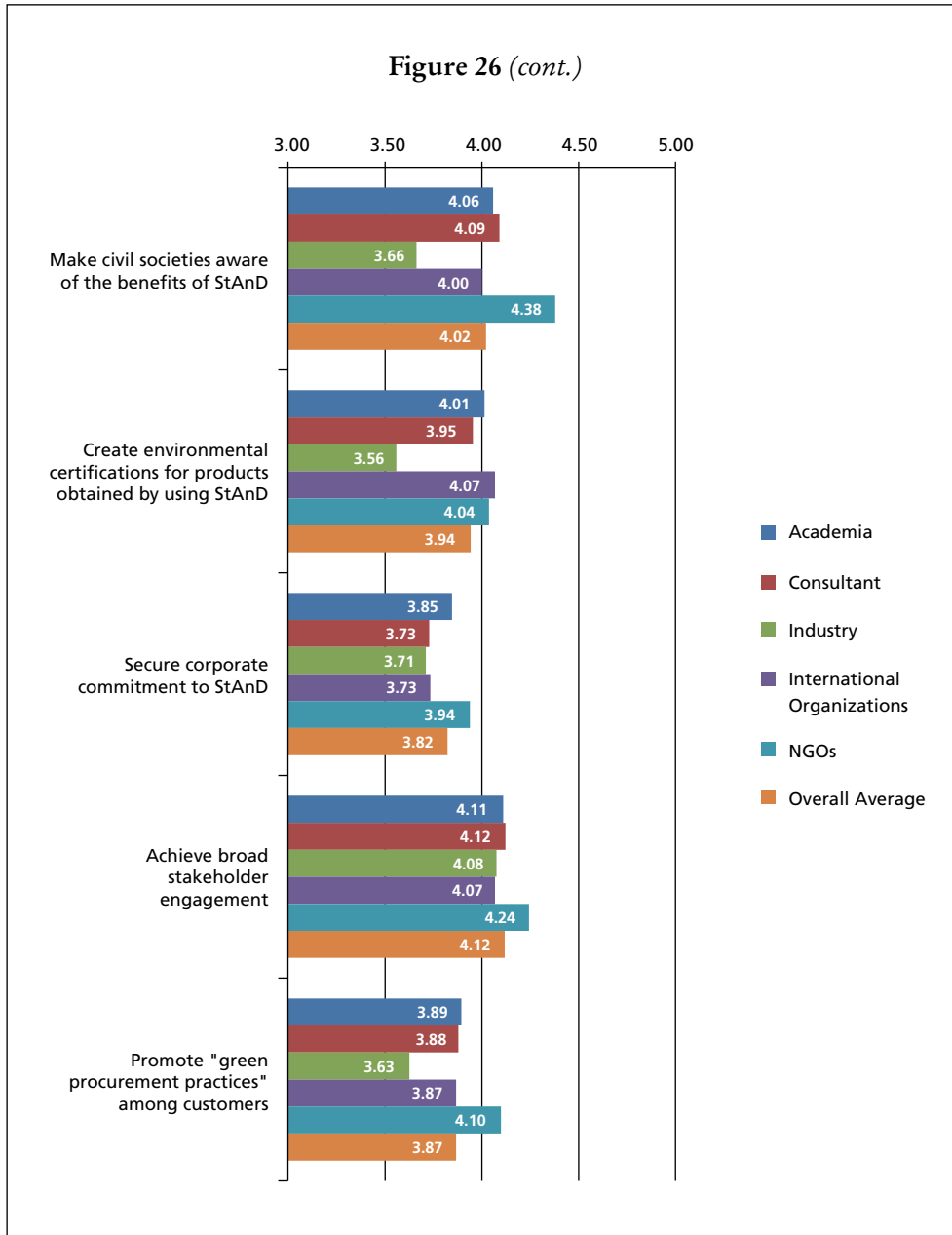
The details of the scores (reflection of ranking or importance) from stakeholders from the different sectors are presented in Figure 26. For each sector, top three modalities of putting the concept into practices are given in Table 14. Make consumers aware of the benefits of StAnD, Develop guidelines and good practices, Encourage Industry to develop voluntary guidelines and to follow them, and Introduce incentives for farmers for using StAnD were the prominent modalities identified for implementing the concept on the ground. There has been good agreement among different groups of stakeholders for the modalities to be used, and broadly these are the same as identified through the Global analysis (Part 1 in Section 3).

Figure 26
 Modalities for putting the concept of Sustainable Animal Diets (StAnD)
 into sound management practices

Key: 1 = Not important; 2 = Somewhat Important; 3 = Reasonably important;
 4 = Important; 5 = Extremely Important.



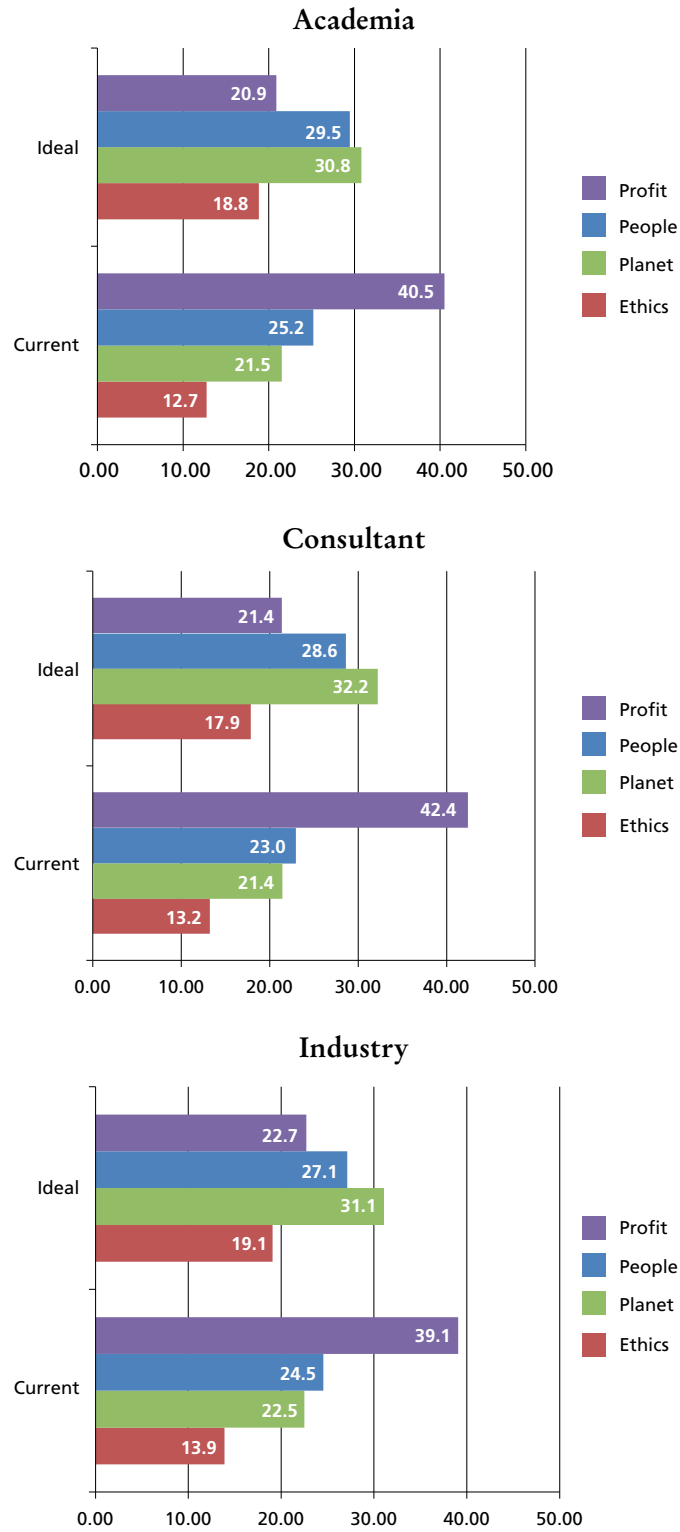
(cont.)



Shift in the importance of the Planet, People, Profit and Ethical dimensions of StAnD

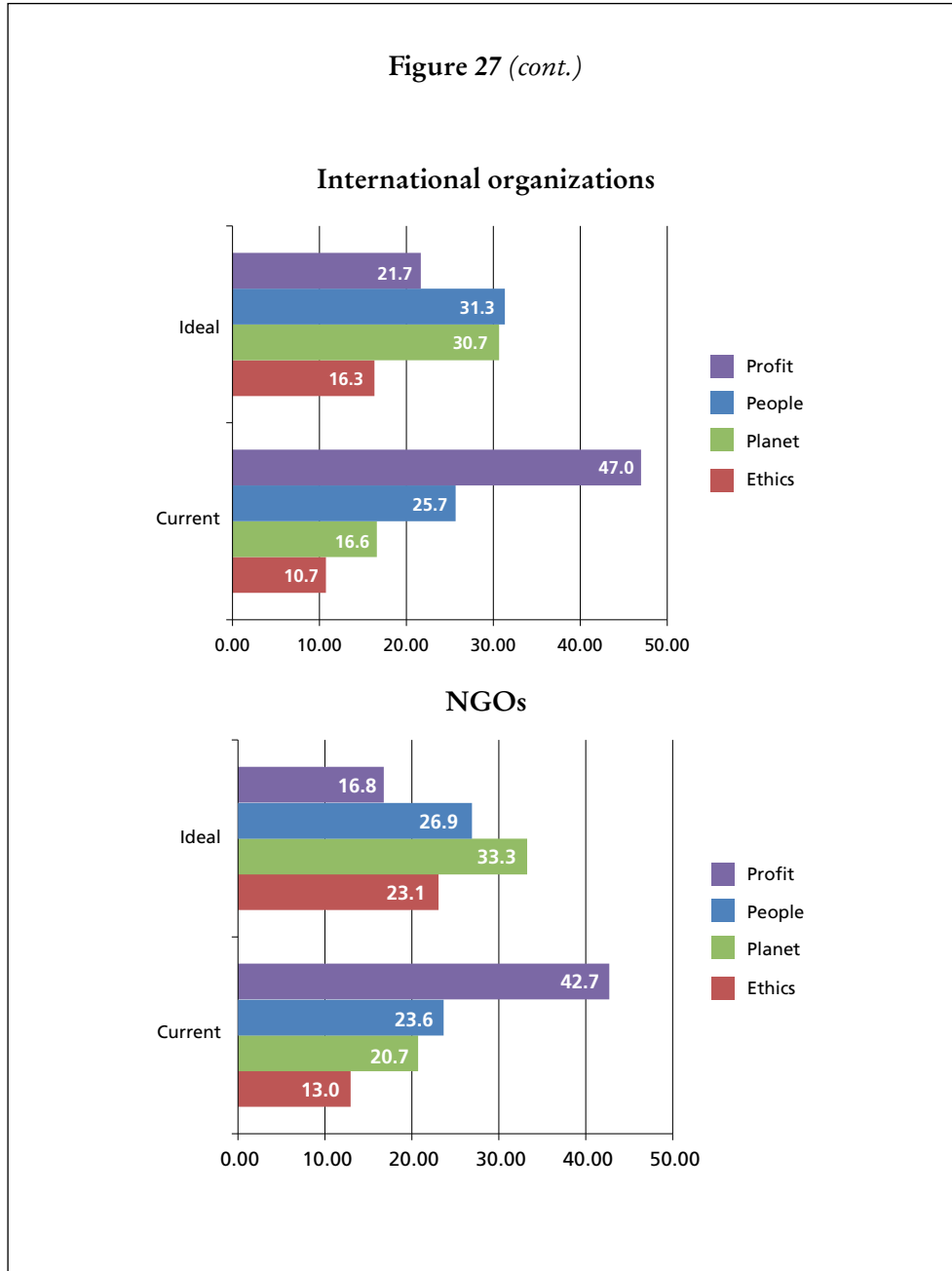
All sectors were of the opinion that the realization of StAnD demands a shift in all dimensions of StAnD. All sectors except International organizations perceive the current situation to be almost the same, although the latter gave higher score to the *Profit* dimension. For this parameter the magnitude of change (decrease) was highest in terms of percentage change to achieve an ideal situation. Higher importance needs to be given to the *Planet*, *People* and *Ethic* dimensions of StAnD in the future (Figure 27). These changes are similar to those observed for different regions (see Part 2 in Section 3 of this study). The Global analysis (Part 1 in Section 3) also showed the need for similar change. All groups of stakeholders in all regions have a similar opinion.

Figure 27
Sectoral percentage unit shift to move from a current to an ideal situation



(cont.)

Figure 27 (cont.)



In summary, respondents were from the five sectors of Academia, Industry, Civil society, Consultants and NGOs. To most of the elements related to the environmental issues of StAnD, respondents from International organizations, NGOs and Academia gave high importance, while those from Industry gave them the least importance. Overall, higher importance was given to socio-cultural elements by NGOs, International organizations and Academia, while Industry was less sensitive towards these elements. Respondents from all sectors gave high agreement to increasing benefit:cost ratio; however, least importance was given to this element by respondents from NGOs. Stakeholders from all sectors gave higher importance to taking into account environmental and social costs of negative externalities in the production and feeding of StAnD, while respondents from Industry gave it lowest

score. The element, Production of StAnD should not enhance volatility in price of feed ingredients, received a higher score from respondents from International organizations and Academia and lowest from Industry. Respondents from NGOs, Academia, and Industry gave higher importance to Re-use of food waste as feed. Compared with the other sectors, respondents from Industry gave higher score to the Use of food grains in the diets of monogastric and ruminants, and use of GMO feeds. Use of incentives in production and use of StAnD was favoured more by Academia than by the other sectors.

Stakeholders from almost all sectors except Industry gave a high score to the integration of the ethical dimension into StAnD, overall showing willingness to integrate ethical dimensions. The analysis showed that the initiative to re-structure the feed production system for meeting StAnD requirements should first be taken by Academia, followed by Farmers and farmers' associations. Other bodies that could play an important role in meeting the requirements are Industry and Regulatory bodies. The modalities through which the StAnD concept can be put into sound management practices, as identified by the sectors, were: Make consumers aware of the benefits of StAnD, Develop guidelines and good practices, Encourage Industry to develop voluntary guidelines and to follow them, and Introduce incentives for farmers to apply StAnD. Respondents from all sectors were of the opinion that the realization of StAnD demands a shift in all the dimensions. In the future, higher importance needs to be given to the *Planet*, *People* and Ethical dimensions of StAnD, so that all of its four dimensions be adequately represented. Respondents from all regions responded in the same manner, suggesting that all stakeholders in all regions have similar opinions.

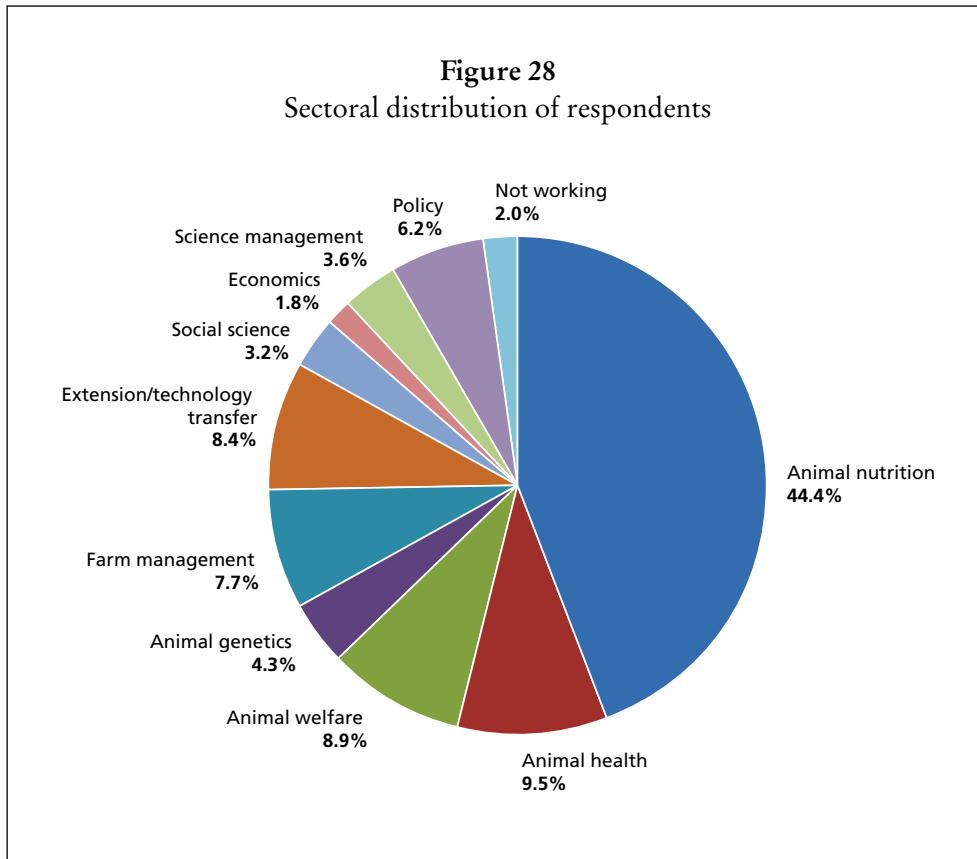
VIEWS SEGREGATED ON THE BASIS OF FIELD OF EXPERTISE

Distribution of respondents based on field of expertise is given in Figure 28. The most respondents (44.4%) were from the field of Animal nutrition, followed by Animal health (9.5%), Animal welfare (8.9%), Extension and technology transfer (8.4%), Farm management (7.7%) and Policy (6.2%), with other areas contributing <4% each. Although the survey touched several dimensions of livestock production systems and most sectors of the livestock value chain, it is understandable that the respondents belonged largely to the animal nutrition sector because the focus was on animal diets.

On a regional basis, the most animal health experts that contributed to the study were from SSA, followed by LAC, while Animal welfare experts were most from Europe (16.0%) and then from North America (14.3%), and least (0.9%) from E&SEA. Farm management and Technology transfer experts were also in significant numbers (5.3 to 16.9%) from all regions except Oceania (Figure 29).

Importance of the StAnD elements that aim to protect environment and natural resource base

In the *Planet* dimension of sustainability, respondents from the various specializations responded in different ways (Figure 30). Of the 11 elements, respondents from the fields of Socio-economics and Farm management gave lowest score to four elements each. Specialists from the Animal health area consistently gave higher importance to the elements that promote better health of the environment. Respondents from the field of Animal welfare also gave higher importance to these elements



(Table 15). Overall, specialists from the areas of Animal health and Animal welfare appear to be more sensitive than the experts from other fields as far as protection of environment and natural resources is concerned.

Importance of the socio-cultural elements of StAnD that provide benefits for people

The scores given for different elements by respondents from different fields of specialization are given in Figure 31 and salient findings in Table 16. No generalized pattern emerged, as the perceived importance varied a lot and depended on specialization and the element in question.

Importance of the economic elements of StAnD

Respondents from all fields except Farm management and Animal nutrition gave higher importance to the need to take environmental and social costs of negative externalities into total costs. Animal nutrition, Extension and technology transfer, and Animal health specialists gave higher importance to increase in benefit:cost ratio than the global average. The element, Production of StAnD should not enhance volatility in price of feed ingredients, received higher scores (higher importance) from Animal health and Animal nutrition experts (Figure 32).

Table 15. Salient findings on the importance given to elements of the *Planet* dimension by respondents from different specializations

Elements	Fields that gave higher importance than the average	Fields that gave lowest importance
Not use antibiotics and synthetic growth promoters	Animal welfare, Animal health, Farm management, Socio-economics, Extension & technology transfer	Animal nutrition
Preferably use locally available feed resources	Animal health, Extension & technology transfer, Animal nutrition, Animal welfare	Science management & policy-making
Use minimum energy	Science management & policy-making, Animal welfare, Animal health	Farm management
Use minimum water	Science management & policy-making, Animal welfare, Animal health, Socio-economics	Farm management
Minimum carbon footprint	Animal welfare	Farm management
Minimize water pollution	Animal health	Socio-economics
Minimize air pollution	Animal health, Animal welfare, Animal nutrition	Socio-economics
Enhance resilience of livestock production system	Extension & technology transfer, Science management & policy-making, Animal health	Animal welfare
Not lead to deforestation and land degradation	Animal health, Animal welfare, Science management & policy-making,	Socio-economics
Enhance or at least do not decrease biodiversity	Animal health, Extension & technology transfer, Animal welfare	Socio-economics
Respect landscape diversity and aesthetic value	Animal health, Socio-economics,	Farm management

Note: The category 'Other' has not been considered in the above synthesis.

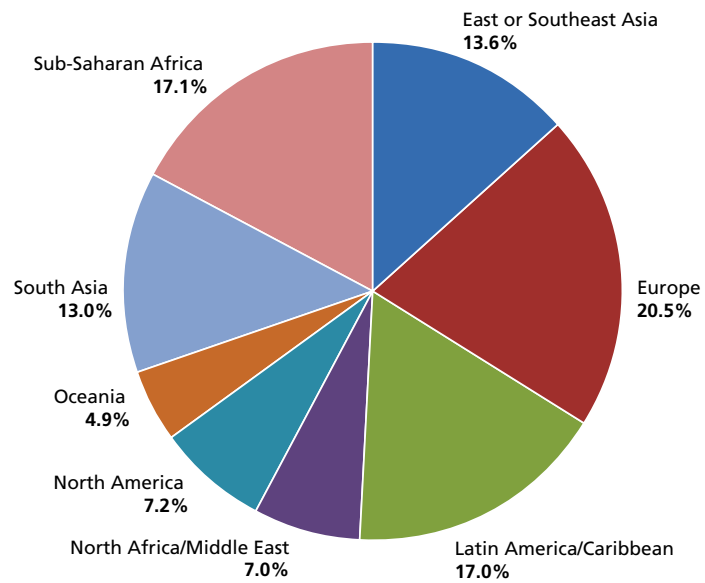
Table 16. Salient findings on the importance given to elements of the *People* dimension by respondents from different specializations

Elements	Fields that gave higher importance than the average	Field that gave lowest importance
Consider social aspects of rearing livestock	Extension & technology transfer, Socio-economics, Animal welfare, Animal health	Farm management
Not be culturally offensive to producers and consumers	Animal health, Extension & technology transfer, Animal nutrition, Socio-economics	Animal welfare
Respect perceptions, beliefs, values, taboos and be socially acceptable	Socio-economics, Animal nutrition, Animal welfare, Animal health, Extension & technology transfer	Animal welfare
Empower women	Extension & technology transfer, Animal health, Socio-economics	Farm management
Break social barriers and promote social harmony	Animal health, Extension & technology transfer, Animal nutrition, Socio-economics	Farm management
Avoid exacerbation of unfavourable legal processes	All except Animal nutrition and Animal welfare	Animal welfare
Be a part of corporate social policy	Socio-economics, Science management & policy-making, Animal nutrition,	Farm management
Promote and preserve local knowledge	Animal health, Extension & technology transfer, Farm management, Animal nutrition	Socio-economics
Not compete with human food	Animal health, Socio-economics, Extension & technology transfer, Animal nutrition	Science management & policy-making
Animal products affordable to consumers	Animal nutrition, Animal health, Extension & technology transfer	Socio-economics

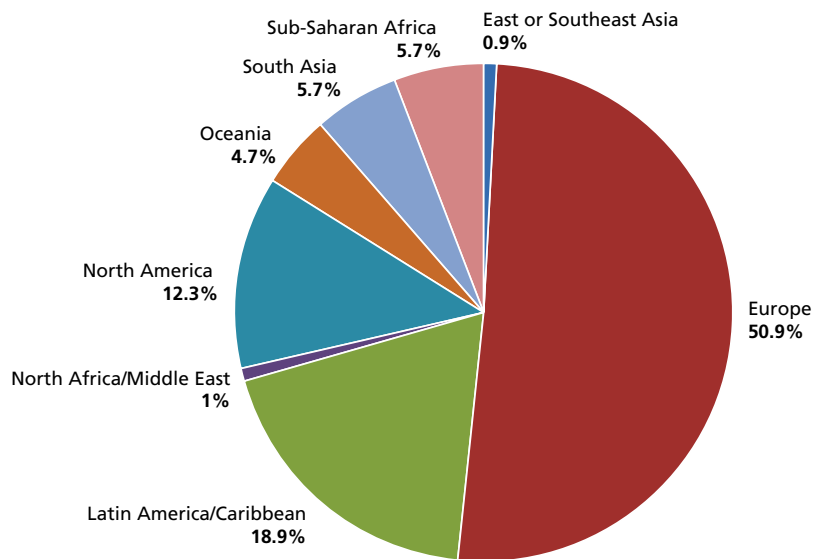
Note: The category 'Other' has not been considered in this synthesis.

Figure 29
Distribution of respondents by field of specialization

Animal nutrition



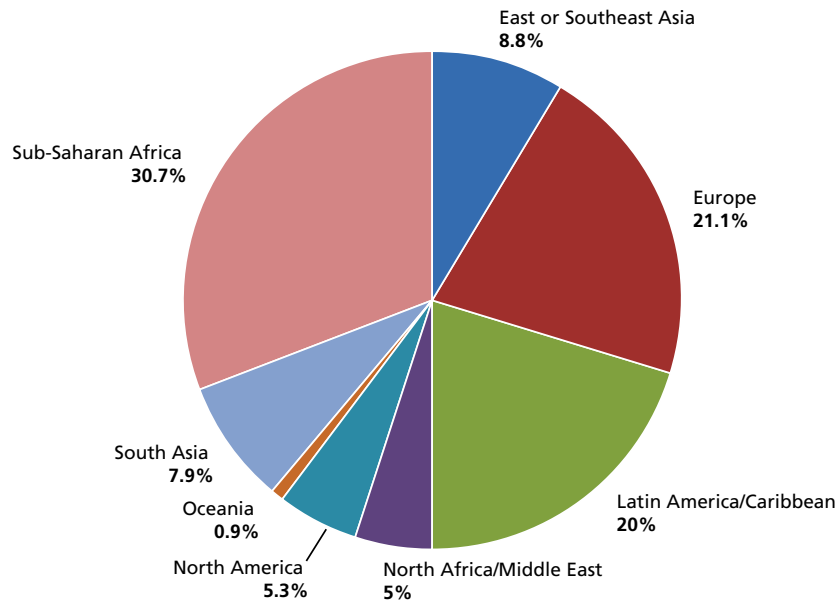
Animal welfare



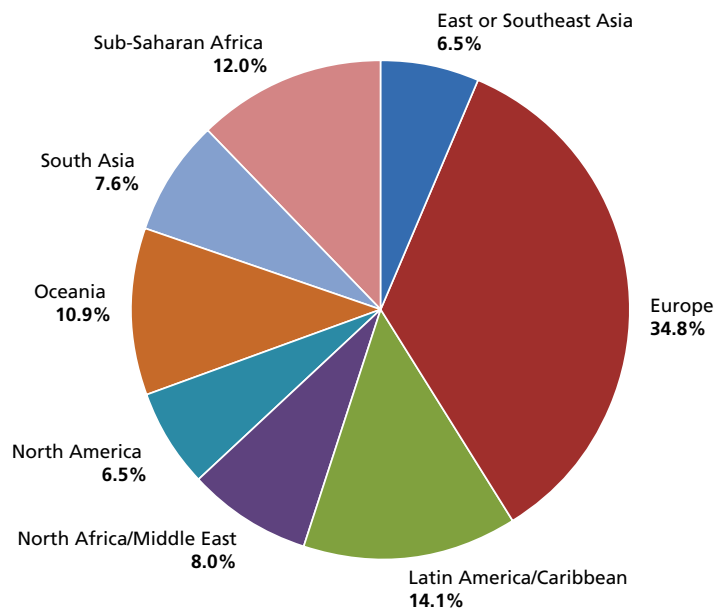
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Figure 29 (cont.)

Animal health



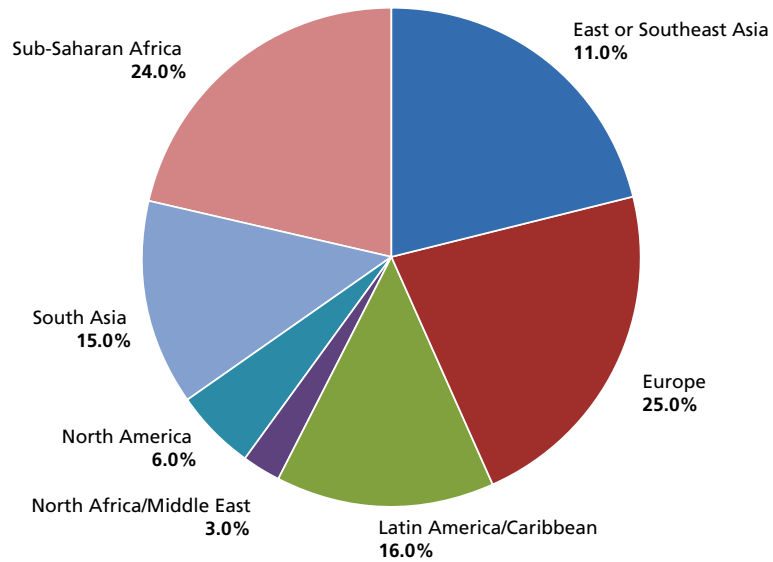
Farm management



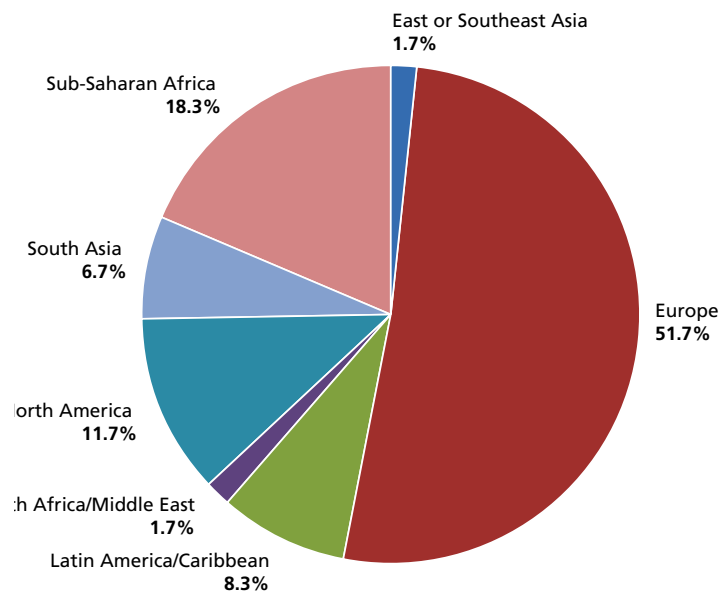
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Figure 29 (cont.)

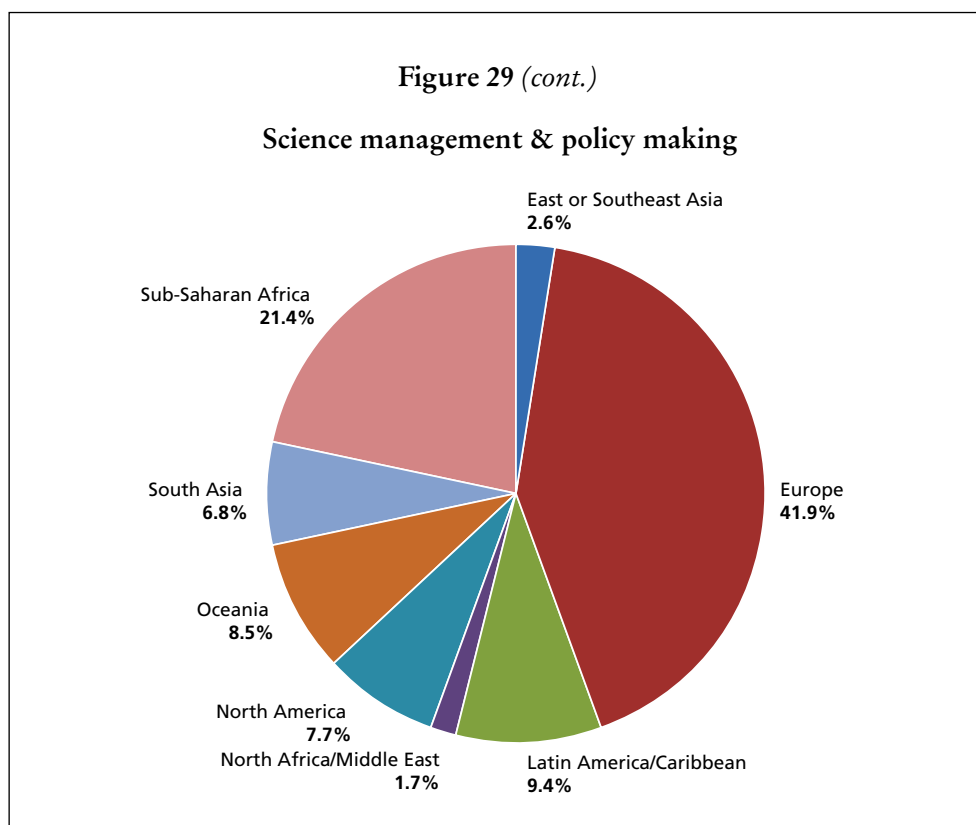
Extension/technology transfer



Socio-economic



(cont.)



Importance of the miscellaneous elements of StAnD

Individual scores to each element are given in Figure 33 and salient findings from this figure in Table 17. Animal welfare experts appear to be less inclined to Use of grains, GMO, and Feed ingredients produced through high-input agriculture in animal diets. Here also, Use of food waste as animal feed received a high score from experts of all areas. The overall acceptability to grain use in the diets of ruminants was lower (Table 17).

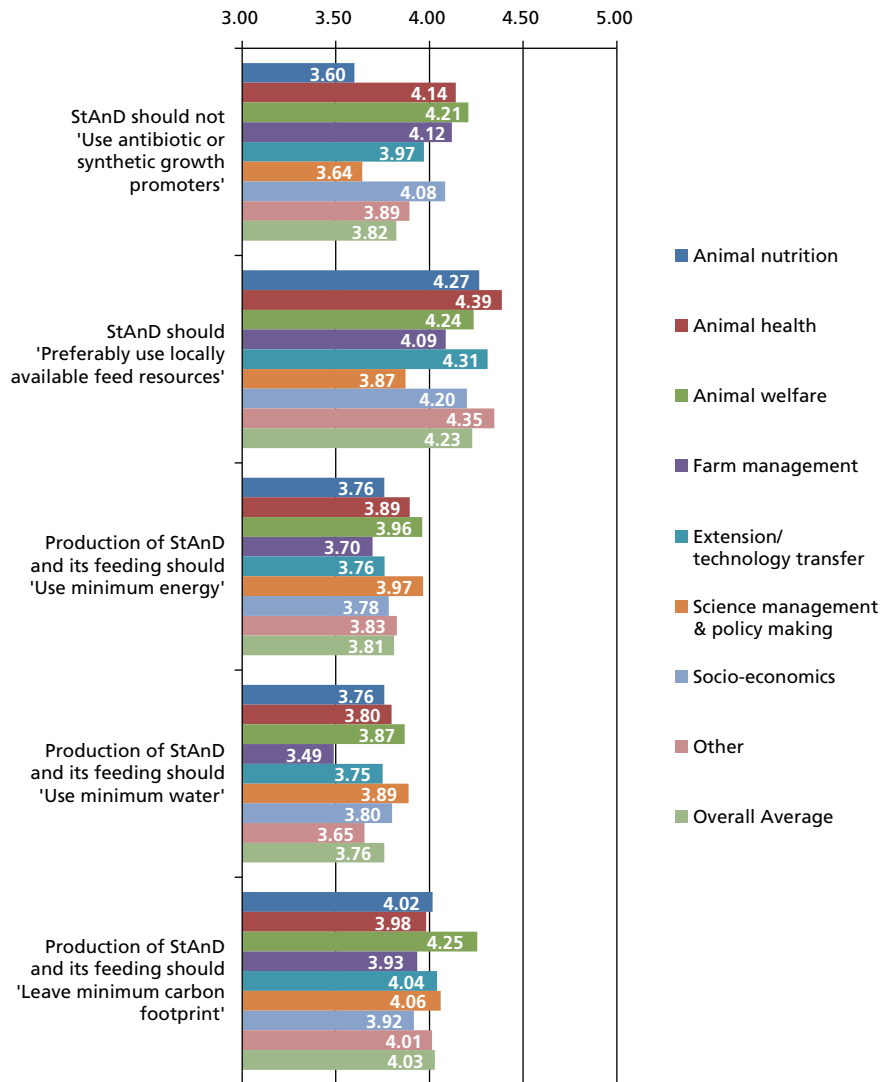
Table 17. Salient findings on the importance of other elements of Sustainable Animal Diets (StAnD)

Elements	Fields that gave higher importance than the average	Field that gave lowest importance
Contain a feed ingredient produced using public subsidies	Animal health, Animal Nutrition, Extension & technology transfer	Science management & policy-making
Re-use food waste after ensuring its safety	Animal health, Animal Nutrition	Farm management
Use food grains in monogastric feed	Animal nutrition, Animal health	Socio-economics
Use food grains in ruminant feed	Extension & technology transfer, Animal health, Animal nutrition	Animal welfare
Should use GMO in feed	Animal nutrition	Animal welfare, socio-economics
Should use feed ingredients produced through high-input agriculture	Animal health, Extension & technology transfer	Animal welfare
Production of StAnD be given incentives	Animal health, animal nutrition, Extension & technology transfer	Socio-economics
Use of StAnD be given incentives	Animal health, Animal nutrition, Extension & technology transfer	Farm management

Figure 30

Importance of the elements of Sustainable Animal Diets (StAnD) that aim to protect environment and natural resource base (*Planet* dimension of sustainability)

Key: 1 = Not important; 2 = Somewhat Important; 3 = Reasonably important; 4 = Important; 5 = Extremely Important.



(cont.)

Figure 30 (cont.)

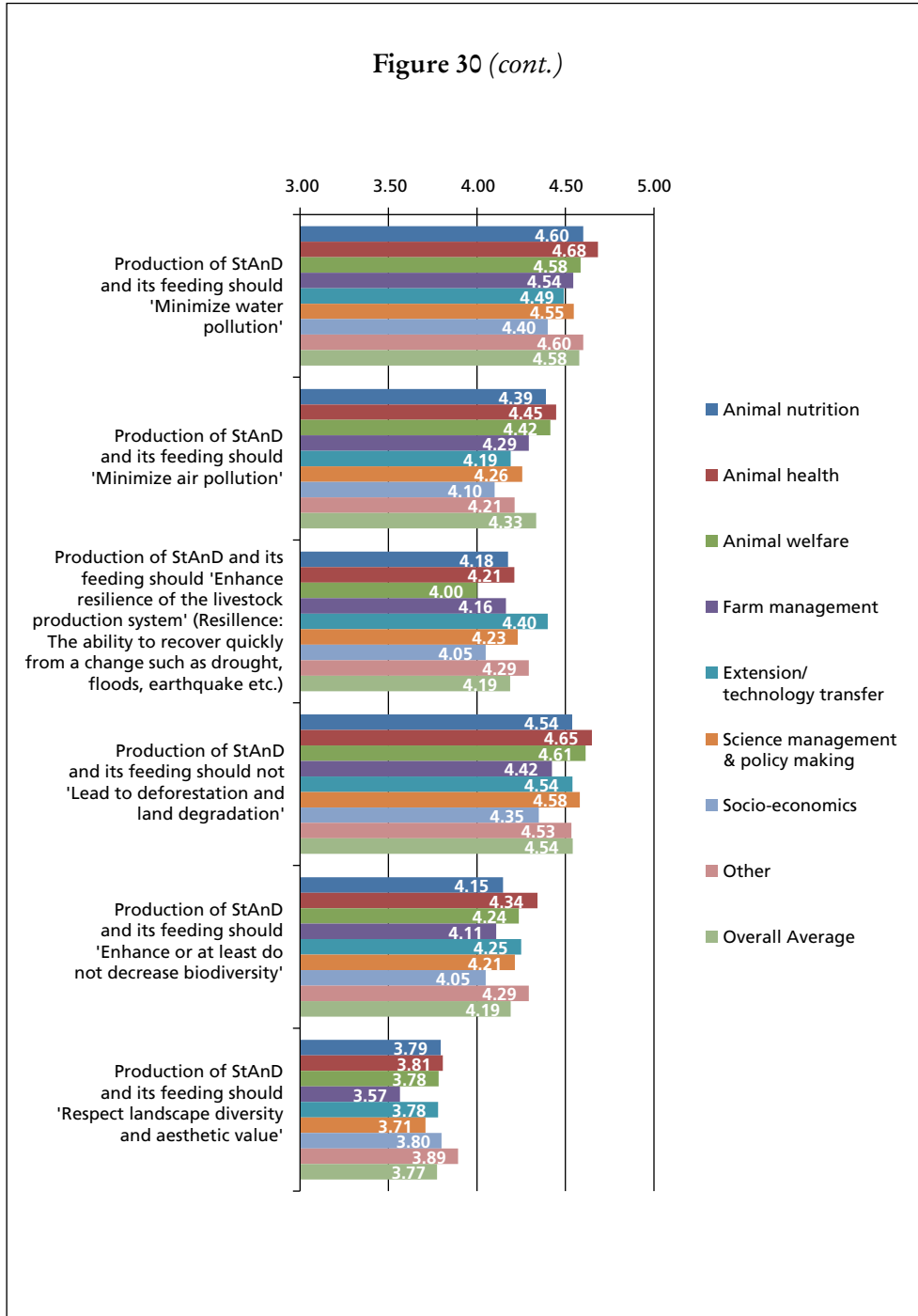
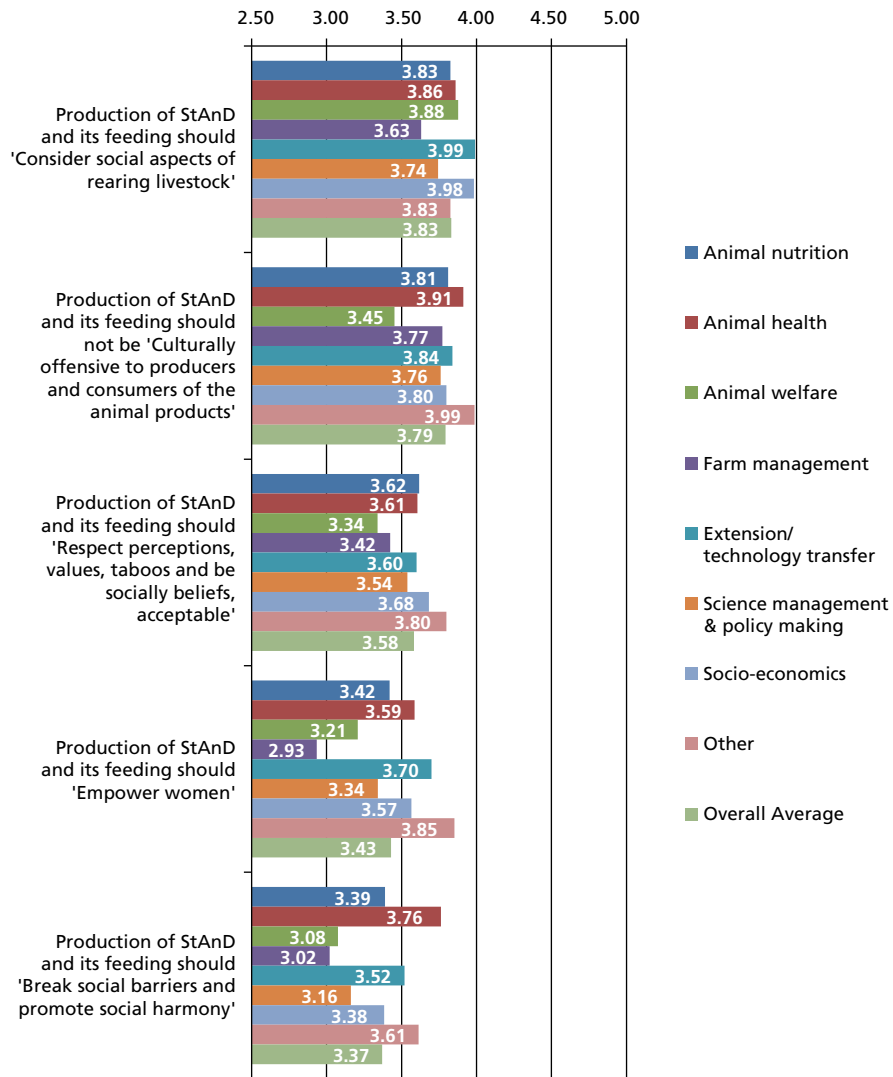


Figure 31

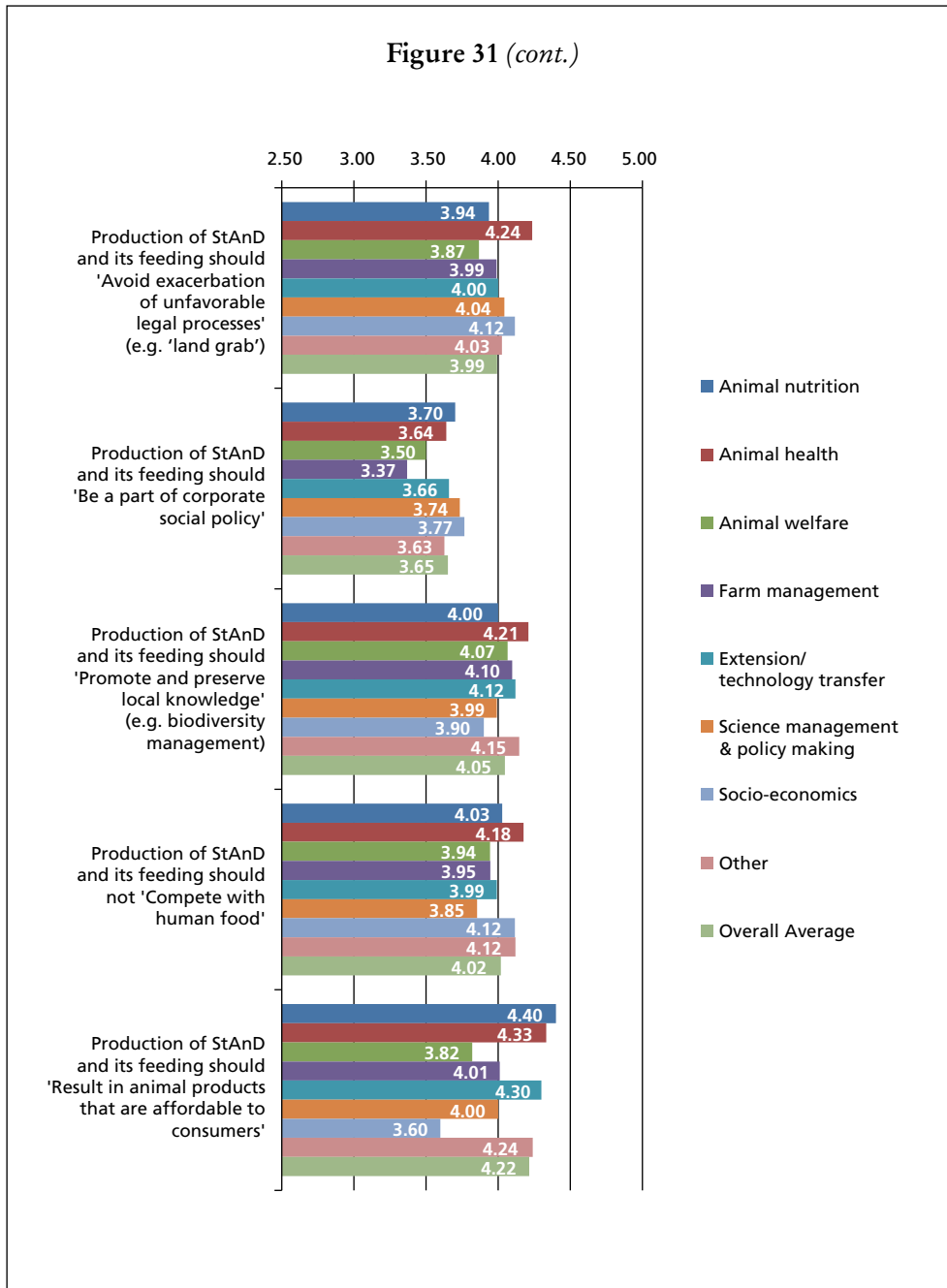
Importance of the socio-cultural elements of Sustainable Animal Diets (StAnD) that provide benefits for people (*People* dimension of sustainability)

Key: 1 = Not important; 2 = Somewhat Important; 3 = Reasonably important; 4 = Important; 5 = Extremely Important.



(cont.)

Figure 31 (cont.)



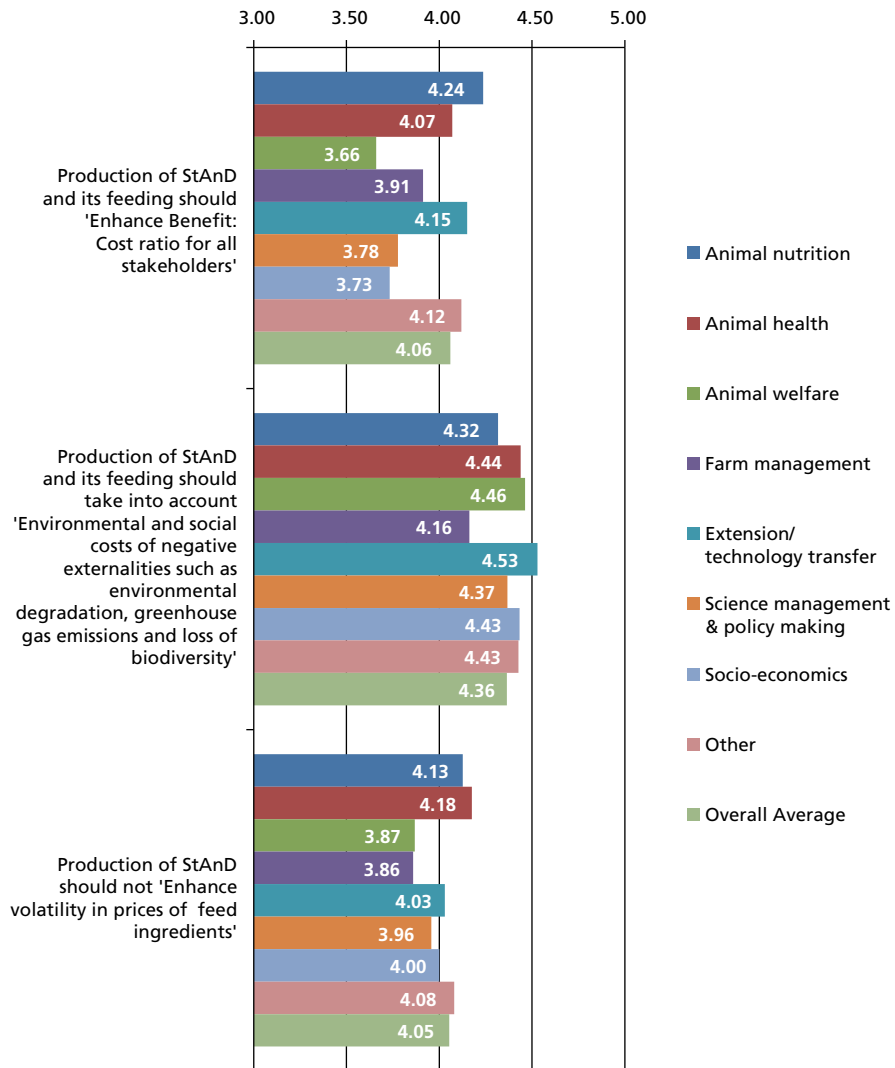
Extent of agreement of stakeholders on integration of the ethical dimension into StAnD

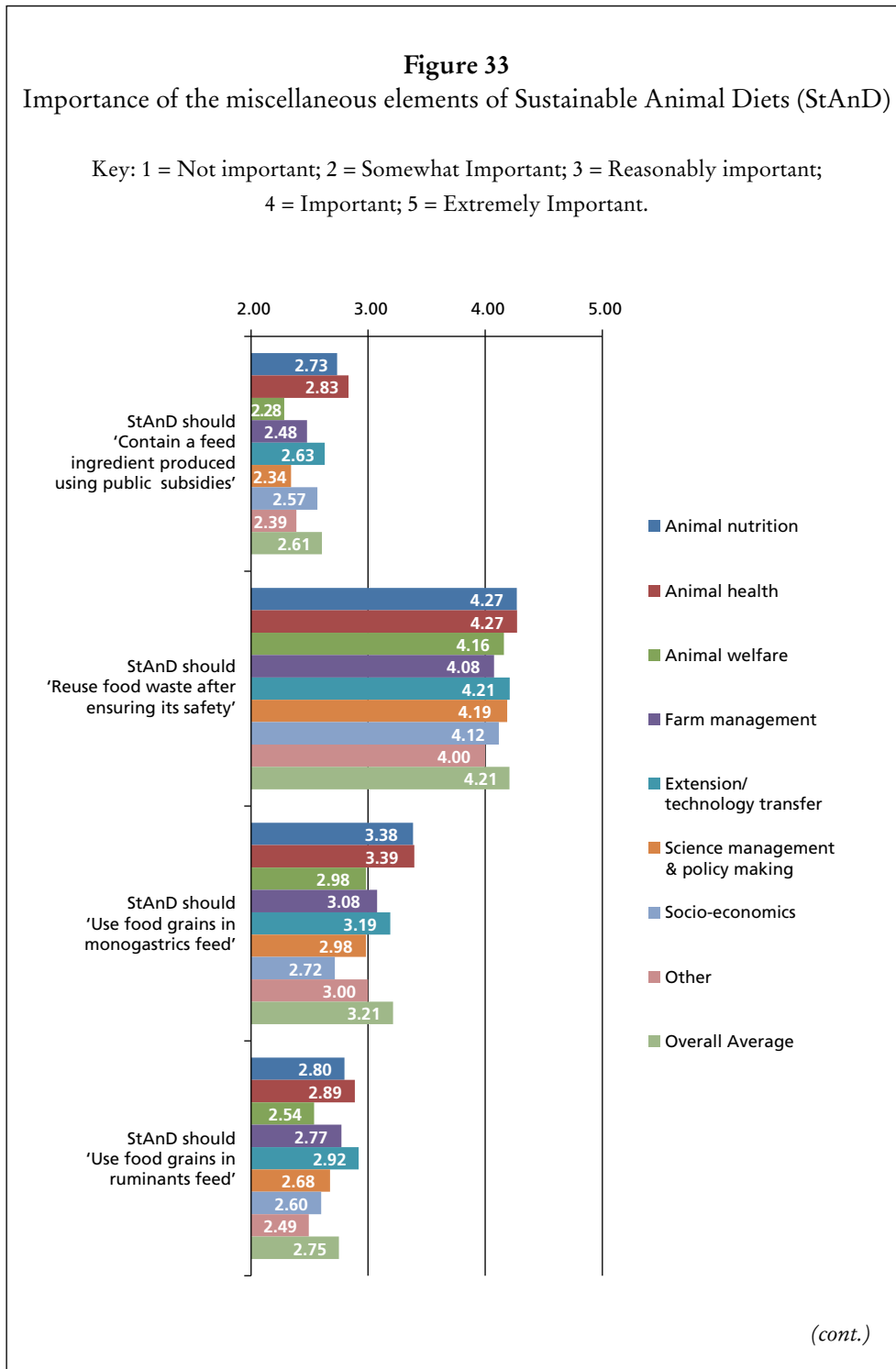
Experts from almost all fields gave a high score, close to the global average, for the integration of ethical dimensions into StAnD. Animal welfare experts gave highest importance to this parameter. More than 80% of the experts from all the fields agreed that ethical dimension should be integrated into StAnD. Nevertheless a substantial percent of animal nutritionists, farm management experts and socio-economists (12–18%) were indecisive on this issue (Figure 34).

Figure 32

Importance of the socio-cultural elements of Sustainable Animal Diets (StAnD) that provide benefits for people (*People* dimension of sustainability)

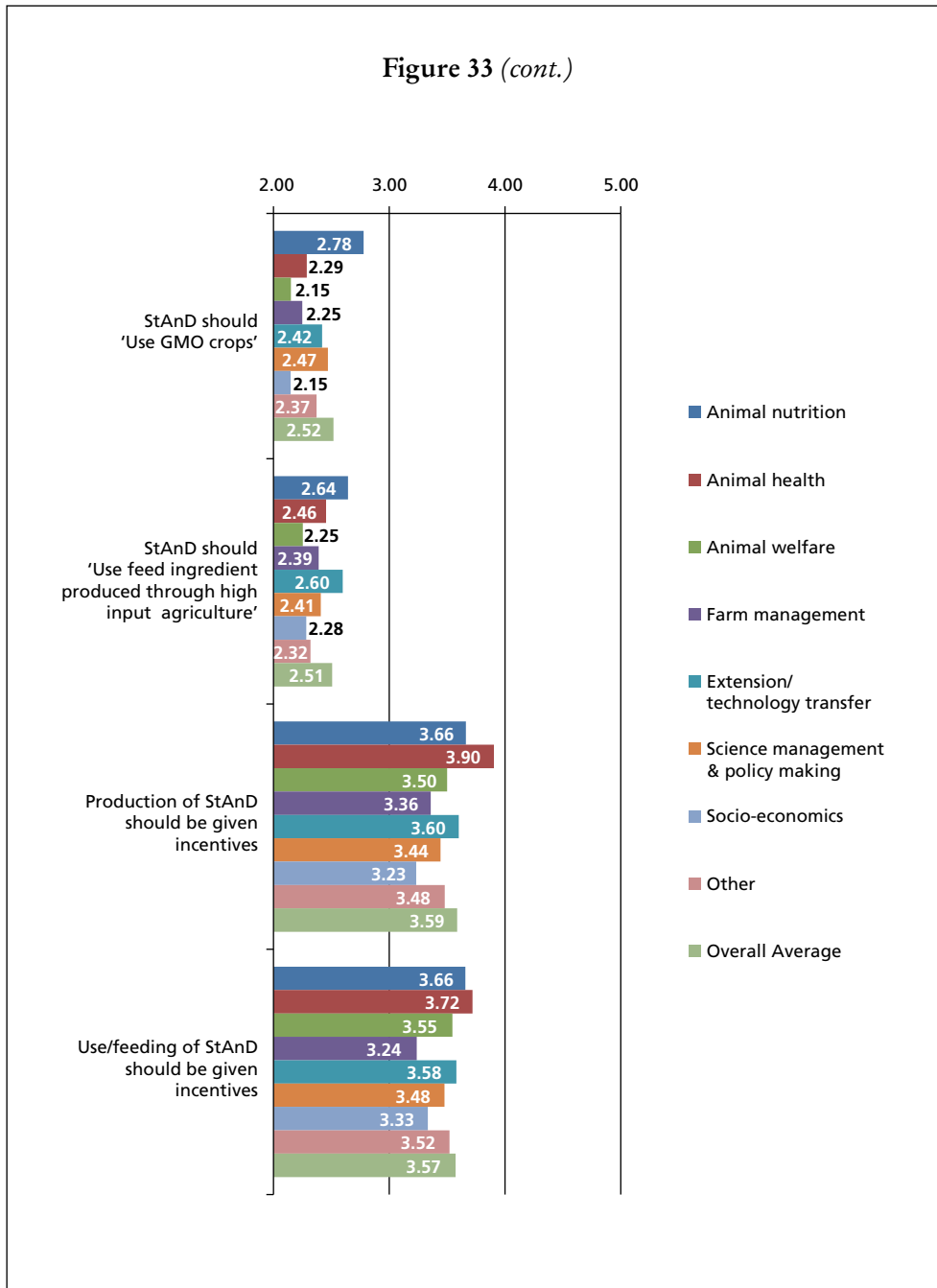
Key: 1 = Not important; 2 = Somewhat Important; 3 = Reasonably important; 4 = Important; 5 = Extremely Important.





Who should take initiative first to re-structure the feed production system for meeting the StAnD requirements?

According to Animal welfare experts, action should first be taken by Consumers, Farmers and farmers’ associations, and Regulatory bodies to re-structure the feed production system, while Science managers and policy-makers indicated that Industry should take the lead. Animal nutritionists and Animal health experts felt that



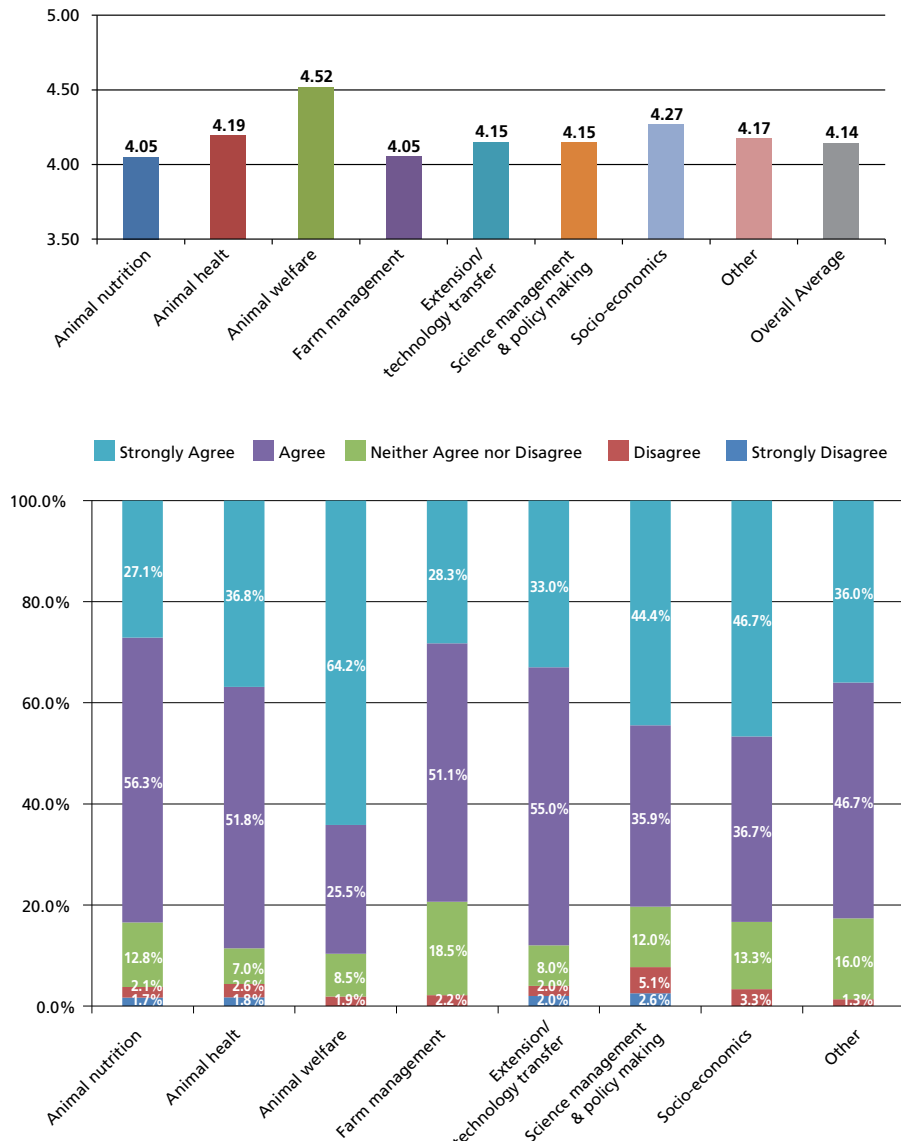
Academia should drive the change, and in the opinion of Socio-economists, Civil society should take initiative to bring the desired change (Figure 35).

Modalities through which the StAnD concept can be put into sound management practices

The details of the scores (reflection of ranking) from stakeholders from different areas of work are presented in Figure 36. Irrespective of the field of specialization, the modalities expected to be effective are: Development of guidelines and good practices, Encouragement to Industry to develop voluntary guidelines, Making

Figure 34
Extent of agreement on integration of ethical dimension into Sustainable Animal Diets

Key: 1 = Strongly Disagree; 2 = Disagree; 3 = Neither Agree nor Disagree; 4 = Agree; and 5 = Strongly Agree



consumers and civil society aware of StAnD benefits, Creation of environmental certifications for products obtained by StAnD, and Securing corporate commitment to StAnD (Table 18). These are in general agreement with those identified earlier in Parts 1 to 3.

Figure 35
 Bodies and organizations that should take the initiative
 to re-structure the feed production system for meeting the requirements
 of Sustainable Animal Diets

Key: 1 = Not important; 2 = Somewhat Important; 3 = Reasonably important;
 4 = Important; 5 = Extremely Important.

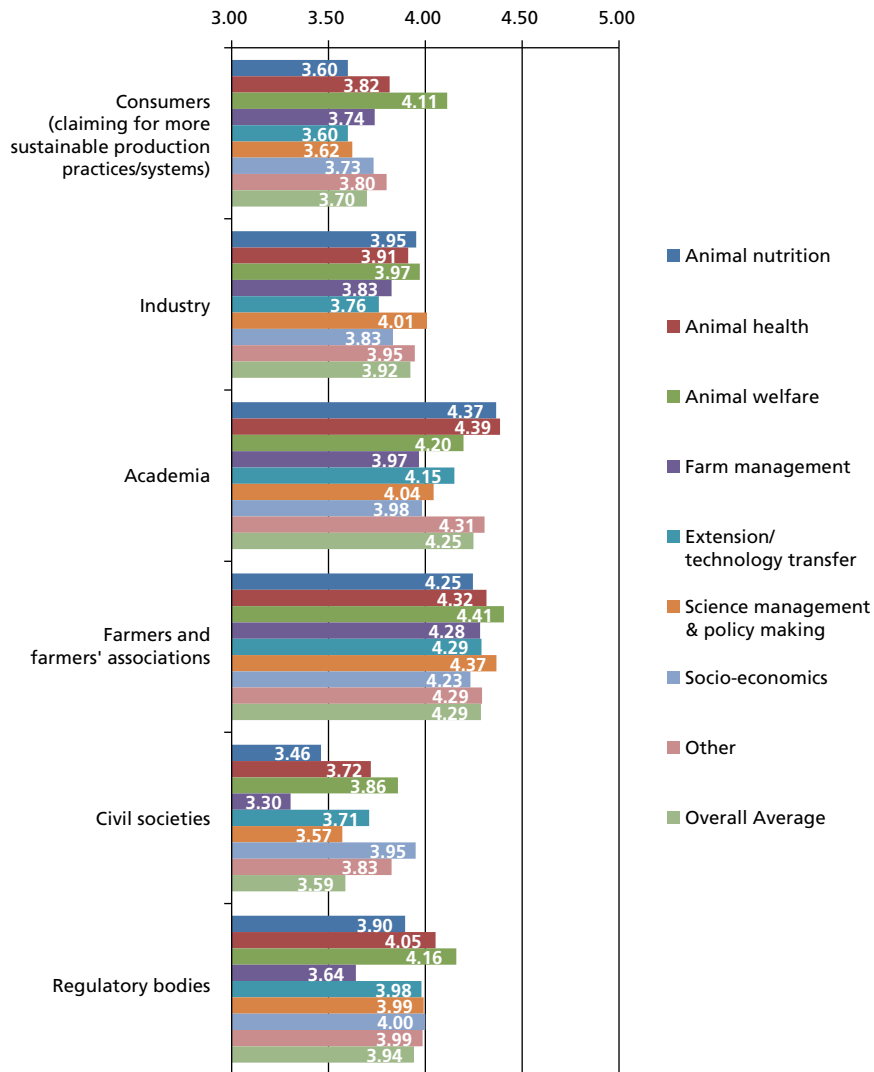
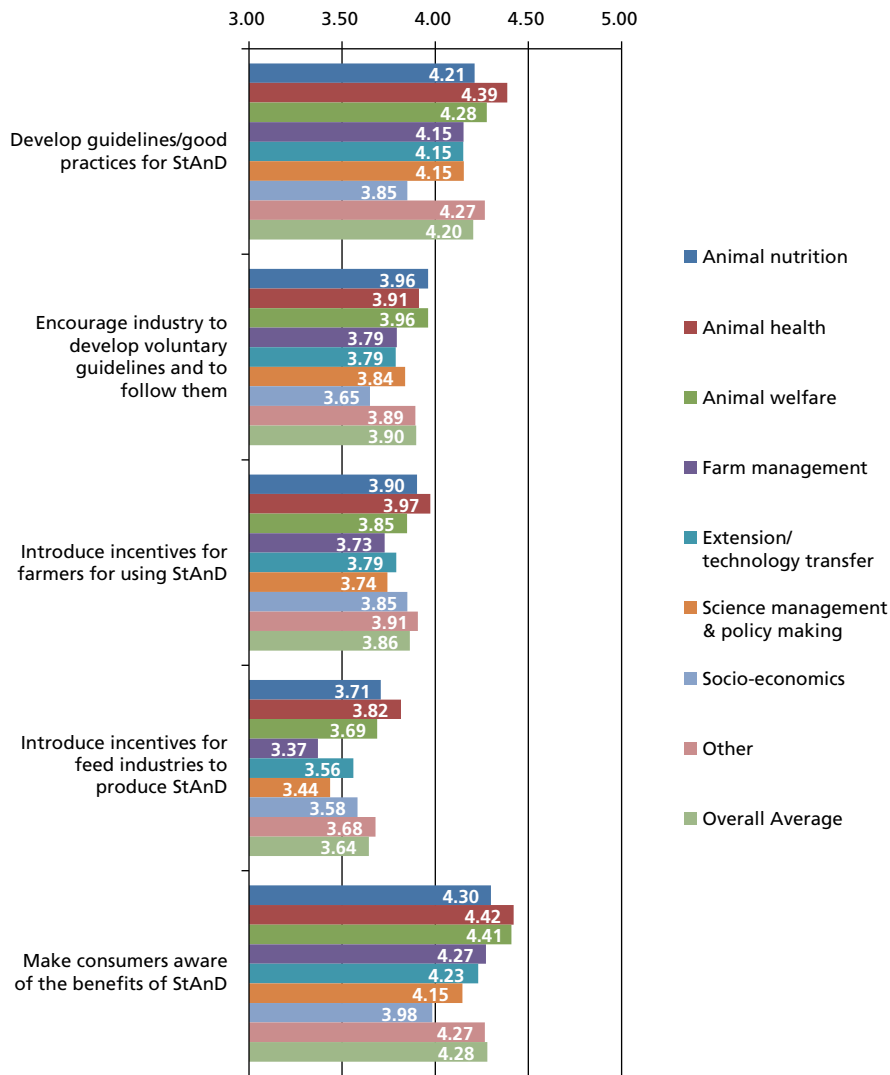


Figure 36

Modalities for incorporating the concept of Sustainable Animal Diets (StAnD) into sound management practices

Key: 1 = Not important; 2 = Somewhat Important; 3 = Reasonably important; 4 = Important; 5 = Extremely Important.

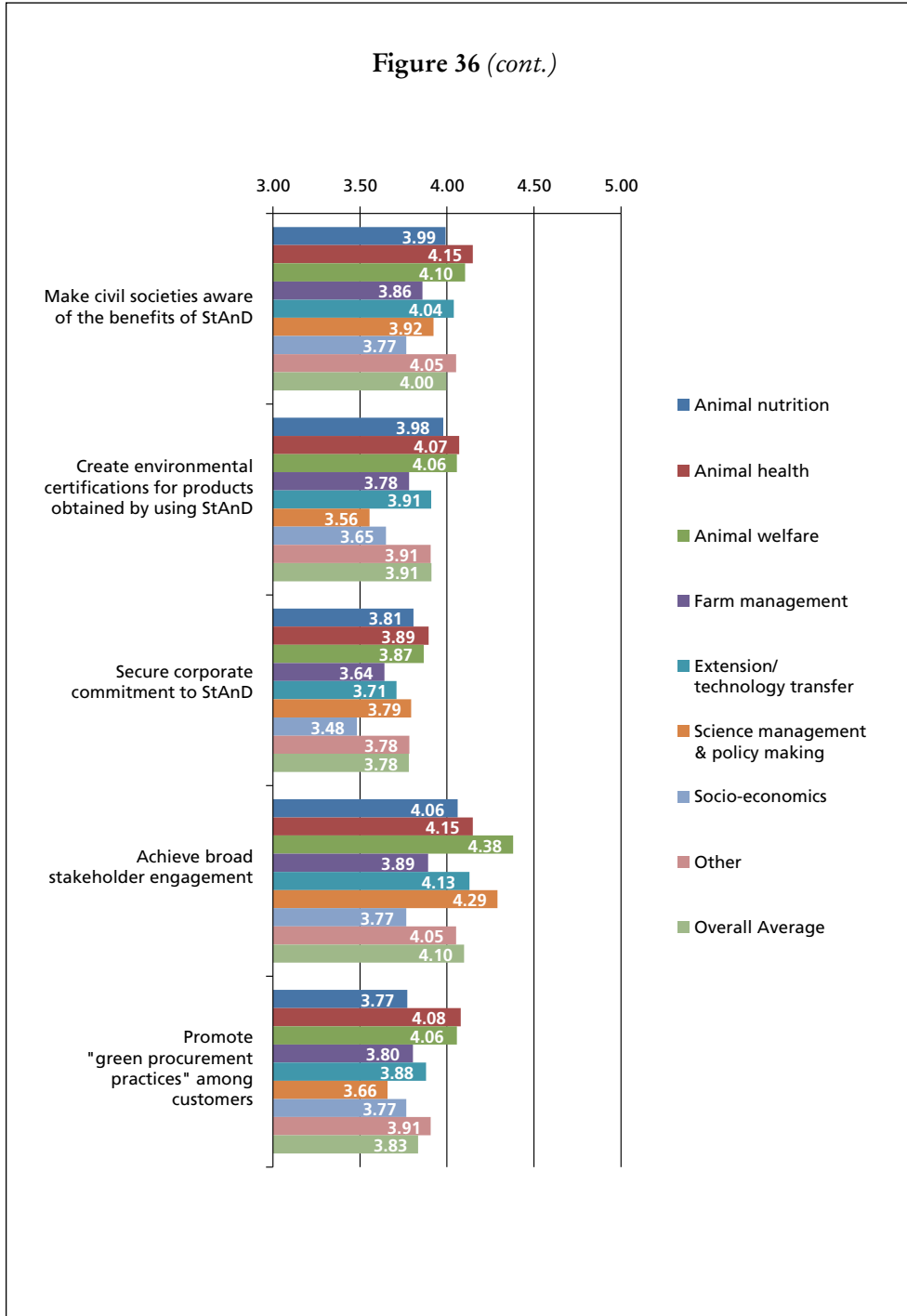


(cont.)

Shift in the importance of Planet, People, Profit and Ethical dimensions of StAnD

Under both current and ideal situations, the overall weighing given to all dimensions of StAnD by all the groups was consistent (Table 19). Animal welfare group stood out among all the groups in two respects: highlighting the need to give higher

Figure 36 (cont.)



importance to integration of ethics into StAnD, and reducing profit. All the expert groups were of the opinion that *People*, *Planet* and *Ethic* dimensions are currently being neglected, and higher importance should be given to them. At the same time, too much emphasis is given to generation of profit. Again, these findings are in agreement with those listed earlier.

Table 18. Suggested modalities that could contribute to putting the Sustainable Animal Diet (StAnD) concept into practice

Field of specialization	Suggested modalities
Animal nutrition	Development of guidelines and good practices; Encouragement to Industry to develop voluntary guidelines; Make consumers aware of StAnD benefits; Create environment certifications for products obtained by StAnD; Secure corporate commitment to StAnD
Animal health	Development of guidelines and good practices; Encouragement to Industry to develop voluntary guidelines; Make consumers and civil society aware of StAnD benefits; Create environment certifications for products obtained by StAnD; Secure corporate commitment to StAnD; Promote 'green procurement practices' among customers
Animal welfare	Development of guidelines and good practices; Encouragement to Industry to develop voluntary guidelines; Make consumers and civil society aware of StAnD benefits; Create environment certifications for products obtained by StAnD; Secure corporate commitment to StAnD; Achieve broad stakeholder engagement; promote 'green procurement practices' among customers
Extension & technology transfer	Promote 'green procurement practices' among customers
Science management & policy-making	Achieve broad stakeholder engagement

Table 19. Percentages of votes allocated in both current and ideal situation to each element of Sustainable Animal Diets according to the field of specialization of the respondents

Field of specialization	People		Planet		Profit		Ethics	
	Current	Ideal	Current	Ideal	Current	Ideal	Current	Ideal
Animal nutrition	25.8	29.5	20.9	29.8	39.8	22.6	13.4	18.1
Animal health	25.1	28.8	20.9	32.3	42.7	19.1	11.3	19.7
Animal welfare	20.2	25.5	19.4	32.1	45.3	15.1	15.1	27.3
Farm management	23.7	27.9	24.2	30.8	36.9	22.7	15.2	18.5
Extension & technology transfer	24.0	28.1	21.6	32.7	42.0	20.8	12.5	18.4
Science management and policy-making	25.8	28.8	21.4	33.3	38.8	17.8	13.9	20.1
Socio-economy	20.0	28.2	23.7	33.5	44.7	16.6	11.7	21.7
Overall average	24.7	28.8	21.4	31.1	40.4	20.6	13.5	19.6

To summarize, from all regions, most respondents were from the field of animal nutrition. On a regional basis, most animal health experts were from SSA followed by LAC, while Animal welfare experts were highest from Europe and lowest from E&SEA. Farm management and Technology transfer experts were also in considerable numbers from all regions except Oceania. Animal health specialists consistently gave higher importance to the elements that aim to better environmental health. Animal welfare experts also gave higher importance to these elements. For the elements of the *People* dimension, no generalized field-related pattern emerged. Respondents from all fields except Farm management and Animal nutrition gave a higher score to the need to incorporate environmental and social costs of negative externalities in

total costs. Animal nutrition, Extension and technology transfer, and Animal health specialists gave higher than the global average importance to increase in benefit:cost ratio. Animal health and Animal nutrition experts gave higher score to the production of StAnD without enhancing volatility in price of feed ingredients.

Animal welfare experts appear to be less inclined to include grains, GMO and feed ingredients produced through high-input agriculture in animal diets. Re-use of food waste as animal feed received a high score by experts of all the areas. Overall tolerance to grain use in the diets of ruminants was lower. Experts from almost all fields were in strong agreement to the integration of ethical dimensions into StAnD. Among all the expert areas, Animal welfare experts gave highest importance to this element.

According to Animal welfare experts, action should first be taken by Consumers, Farmers and farmers' associations and Regulatory bodies to re-structure the feed production system for meeting StAnD criteria, while Science managers and policy-makers were of the opinion that Industry should take the lead. Animal nutritionists and Animal health experts felt that Academia should drive the change, and in the view of Socio-economists, Civil society should take the initiative. Irrespective of the field of specialization, the modalities that were expected to be effective in implementing the StAnD concept are: Development of guidelines and good practices, Encouragement to Industry to develop voluntary guidelines, Making consumers and civil society aware of StAnD benefits, Creation of environmental certifications for products obtained by StAnD, and Securing corporate commitment to StAnD.

Overall, the weight given to all the dimensions of the StAnD concept by all the groups was of similar magnitude. All the expert groups were of the opinion that currently *People*, *Planet* and *Ethic* dimensions are being neglected and higher importance should be given to them. At the same time, too much relative emphasis is currently placed on profit generation. The drive to increase profitability in the short-term could lead to negligence of other sustainability dimensions of StAnD. The need of change in *Profit*, *People*, *Planet* and *Ethic* dimensions of StAnD, from current and ideal situations, demonstrated by all the groups was similar to those identified in the Global, Regional and Sectoral analyses. A strong agreement emerged from all regions, all sectors and experts from all areas regarding the desired changes implicit in implementing the StAnD concept.

The way forward

The elements and criteria for StAnD discussed in this report should be further validated. For each of the StAnD elements, indicators need to be identified, developed and given weight for ranking diets as to their sustainability. Methodologies for indicator measurement also should be identified and developed. If methodologies are not available, proxy parameters need to be identified. Since the concept of Sustainable Animal Diets has the *Three-P—Profit, People and Planet*—dimensions and an additional ethical dimension, the relative importance of the indicators and weight given to them is expected to differ between regions. There will always be tradeoffs between these dimensions. The prioritization of the indicators in different regions may assist in balancing the objectives of sustainable diets. It is impossible to define a standard or an ideal StAnD, and this is not the objective of this concept. The aim should be to move towards diets based on the agreed indicators of the StAnD concept.

THE DESIRED CHANGE

The implementation of the StAnD concept is not a destination but a journey, following a path of desired change that all stakeholders converge on. It is based on the principle of respecting the manner in which animal diets are prepared and fed. However, it directs the stakeholders to compete with each other or one self, aiming to improve with time, by embracing a direction of positive change. The realization of the positive change could be monitored by measuring the indicators of each element of the StAnD concept.

The concept places animal diets in a holistic sustainability context. The survey shows a strong agreement among all stakeholders, irrespective of region, sector or field of specialization, concerning the direction of positive change they would wish to follow in the production and feeding of StAnD. The positive change is dictated by higher importance to the *Planet, People* and *Ethic* dimensions of StAnD, and less to the *Profit* dimension (Figure 1). An important message that could be derived from the survey is that making profit is important and this drives the production system, but making profit at the cost of the environment, socio-cultural benefits to people and animal welfare and other ethical aspects of raising livestock may not be appropriate. Decrease in importance to *Profit* dimension does not imply that livestock farming will be less profitable. The profitability could be achieved by better consideration of the other dimensions of the StAnD concept, and ensuring that there is equitable distribution of profit and that not one segment of the stakeholders only benefit.

POLICY DIMENSIONS AND DECISION TOOLS

Proper policies need to be formulated and applied to stimulate the further development and use of the StAnD concept. Currently, in most situations, most policies support enabling the environment to maximize yields and profits by the livestock producers, rather than delivering sustainability of the production systems in terms of the *Three-P* dimensions. The ‘Pressure Phenomenon’ seen to affect policy decisions

in various sectors affects the livestock sector as well: 'there is pull of market demand and economic benefits and push of the technologies that promise rapid growth'. Rapid increase in demand and prices of livestock products is resulting in pressure to take steps that would increase production rapidly. The first component that is affected in this cascade of events is the 'Animal Diet', since it has a major impact on performance of animals and its cost forms a major part of the total cost of production, with decisions being made at the cost of sustainability. There is therefore a need for policies that address various components of StAnD, which have been elaborated and prioritized through this survey. This would require involvement of all stakeholders, including Ministries of Agriculture, Finance, Environment and Culture; private Industry, including feed industries; NGOs; and national and International organizations. Also, various bodies and organizations identified and prioritized through this survey for taking the initiative to implement the StAnD concept, should act and work in tandem. Also the stakeholders should make use of various respondent-suggested modalities, such as Development of guidelines and good practices, Encouragement to Industry to develop voluntary guidelines, Making consumers aware of StAnD benefits, and Securing corporate commitment to StAnD in order to put the StAnD concept into practice. Two cross-cutting themes, Gender (ensuring that gender equality becomes a regular feature of the work) and Governance (focusing on mechanisms that improve interactions between multiple actors) are integral to achievement of StAnD. Desired impact cannot be realised without making practical changes by the stakeholders in the manner the feed is produced and fed. There were somewhat different views (by actor, region) with respect to the importance of the various StAnD elements and about who should take the lead to operationalize the StAnD concept. Setting up of a multi-stakeholder process to manage multi-stakeholder dialogues, with the objective to achieve common agreement would be an important step towards operationalization of the StAnD concept.

Comparison of diets based on sustainability criteria would be easier than arriving at a decision as to whether a diet is sustainable or not, since fulfilling the criteria implicit in the StAnD concept requires critical decisions, such as regarding the levels of agro-chemical, energy and water use, and on how to measure biodiversity and resilience of production systems, amongst many others. Decision tools and methodologies, e.g. for assessing the carbon footprints of production and use of feeds and associated environmental costs, to measure the resilience of production systems and to assess their impacts on biodiversity need to be developed. The availability of the tools or improvement in the tools and methodologies should not impede the implementation of the StAnD concept. A move towards positive change can still be made using the available tools and methodologies.

The role of research organizations is equally important, for example the 'desired change' requires feeding systems for both monogastric and ruminants animals that use no grains or low amounts of grains. The challenge for the researchers is to identify novel, alternate feedstuffs that do not compete with human food and their incorporation in the diets results in feed use efficiency as high or greater than that obtained using grain-containing animal diets currently in-use. Some encouraging developments have been made lately, showing that decreasing grains and increasing fibre in the diets of animals including monogastrics enhance both animal welfare and animal production (FAO, 2012; Souza da Silva *et al.*, 2012, 2013). There is a possibility that in future due to increasing cost of inputs and on-going climate

change, consideration of the costs of repairing the socio-environmental damage and reflecting that in the total cost of production might not be sufficient for producing animal products in a sustainable manner. Also implementation of options, identified through this study, in conjunction with each other is expected to have higher impact than the application of an option in isolation. Studies to gain a better insight into these challenges are required.

MULTI-FUNCTIONAL FEEDING SYSTEMS AND MULTI-CRITERIA FEED EVALUATION SYSTEMS

Currently the feeding systems are based on evaluation of feed ingredients and formation of animal diets based on the nutrient composition and nutrient availability (chemical composition of the feed, digestibility, intake, feed conversion efficiency, etc.). However, to face new and emerging challenges that the livestock sector faces (elaborated earlier in the Introduction section), it is important to integrate the dimensions of StAnD into feed evaluation and feed formulation systems. This survey has laid the foundation for development of a global framework for multi-criteria evaluation of feed resources, based on the core principles of sustainability integrated with ethics and animal welfare, and with the current feed evaluation system based on feed composition and nutrient availability; and then for putting the framework into practice. Certainly this would require criteria and indicators and methodologies to measure them, based on all the dimensions of sustainability (environmental, social and economics integrated with ethics and animal welfare).

A FRAMEWORK FOR RESEARCH AND KNOWLEDGE

The survey results could form the basis for monitoring of the research and development priorities of research and development organizations and donors, and to align them to the needs of the livestock production system, as perceived by the stakeholders. The survey analysis could also pave the way for developing a framework for future research and development needs and priorities. Extending the stakeholders' sentiments, expressed in this StAnD survey, to sustainability of the entire livestock production system might be appropriate.

Conclusions

For enhancing sustainability of animal farming systems, this study focused on an array of issues towards implementation of the StAnD concept, which is based on the *Three-P* dimensions of sustainability (*Planet, People* and *Profit*) and complemented by a further vital aspect, namely the ethics of using a feed.

The study has:

- established a direction for positive change that should be followed for enhancing sustainability of animal production systems;
- prioritized various elements of the concept;
- proposed sectors that should take the initiative for implementation of the concept; and
- identified modalities to put the concept into practice.

The outcomes of the study when put into practice would contribute to enhancing sustainability of livestock systems as well as have laid foundation for developing:

- a global framework for multi-criteria evaluation of feed resources;
- a system for monitoring of the R&D priorities of organizations and donors, and to align them to the needs of the animal production system; and
- a framework for future R&D needs and priorities, driven by sustainability principles.

Society expects animal agriculture to provide safe and affordable animal products, while maintaining environmental quality and biodiversity. The use of Sustainable Animal Diets is an important step towards achieving this. Sustainable Animal Diets are expected to be beneficial for the animal, the environment and society, and are likely to generate socio-economic benefits, furthering poverty alleviation and food security efforts. This requires active participation of researchers, extension workers, science managers, policy-makers, industry and farmers.

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Annex

Towards Sustainable Animal Diets

BACKGROUND INFORMATION

Many current livestock production systems need redefining and re-structuring if they are to meet sustainably the present and future demand for animal products, because they demand high energy, land, chemicals and water which are increasingly becoming scarce. We are in the process of developing and refining a concept on Sustainable Animal Diets which integrates the importance of efficient use of natural resources, protection of the environment, sociocultural benefits, and ethical integrity and sensitivity in addition to currently recognized nutrition based criteria of delivering economically viable safe animal products by producing safe feed. The concept is based on the *Three-P* dimensions of sustainability (*Planet, People* and *Profit*) complemented by a further key aspect of animal nutrition, namely the ethics of using a particular feed (see Figure A1.1).

Figure A1.1
Conceptual framework of Sustainable Animal Diets



WHY ARE WE FOCUSING ON SUSTAINABILITY OF ANIMAL DIETS?

Animal feed and feeding impacts animal productivity, health and welfare, product quality and safety, producers' income, household security, land use and land use change, water pollution and green house gas emission. Also feed is financially the single most important element of animal production, forming up to 70% of the cost of production. The purpose of this questionnaire? Through this questionnaire, we are seeking your help to prioritize the main constituent elements/components of the concept and also to take your opinion on how to translate this concept into action by integrating its elements/components into sound management practices.

The results of this survey will also form the basis for an Experts Meeting to be held in Rome this year, to decide the next course of action. Besides completing the survey, should you wish to express views on the issues raised in the questionnaire, you are encouraged to write to: Harinder.Makkar@fao.org

While completing the questionnaire please keep in mind both the feed production and feeding to livestock. The survey comprises 10 questions, and will take approx. 20 minutes to complete.

QUESTIONNAIRE

1. In which region are you currently living? *Please select from list*

2. In which sector are you currently working? *Please select from list*
If not in list, then please specify:

3. Rate the importance of the following elements of Sustainable Animal Diets (StAnD) that aim to protect environment and natural resource base (*Planet* dimension of sustainability)

	Not important	Somewhat important	Reasonably important	Important	Extremely important
StAnD should not 'Use antibiotic or synthetic growth promoters'					
StAnD should 'Preferably use locally available feed resources'					
Production of StAnD and its feeding should 'Use minimum energy'					
Production of StAnD and its feeding should 'Use minimum water'					
Production of StAnD and its feeding should 'Leave minimum carbon footprint'					
Production of StAnD and its feeding should 'Minimize water pollution'					
Production of StAnD and its feeding should 'Minimize air pollution'					
Production of StAnD and its feeding should 'Enhance resilience of the livestock production system' (Resilience: The ability to recover quickly from a change such as drought, floods, earthquake, etc.)					
Production of StAnD and its feeding should not 'Lead to deforestation and land degradation'					
Production of StAnD and its feeding should 'Enhance or at least do not decrease biodiversity'					
Production of StAnD and its feeding should 'Respect landscape diversity and aesthetic value'					

4. Rate the importance of the following socio-cultural elements of Sustainable Animal Diets (StAnD) that provide benefits for people (*People* dimension of sustainability)

	Not important	Somewhat important	Reasonably important	Important	Extremely important
Production of StAnD and its feeding should 'Consider social aspects of rearing livestock'					
Production of StAnD and its feeding should not be 'Culturally offensive to producers and consumers of the animal products'					
Production of StAnD and its feeding should 'Respect perceptions, beliefs, values, taboos and be socially acceptable'					
Production of StAnD and its feeding should 'Empower women'					
Production of StAnD and its feeding should 'Break social barriers and promote social harmony'					
Production of StAnD and its feeding should 'Avoid exacerbation of unfavourable legal processes' (e.g. 'land grab')					
Production of StAnD and its feeding should 'Be a part of corporate social policy'					
Production of StAnD and its feeding should 'Promote and preserve local knowledge' (e.g. biodiversity management)					
Production of StAnD and its feeding should not 'Compete with human food'					
Production of StAnD and its feeding should 'Result in animal products that are affordable to consumers'					

Comments:

5. Rate the importance of the following economic elements of Sustainable Animal Diets (StAnD) (*Profit* dimension of sustainability)

	Not important	Somewhat important	Reasonably important	Important	Extremely important
Production of StAnD and its feeding should 'Enhance Benefit:Cost ratio for all stakeholders'					
Production of StAnD and its feeding should take into account 'Environmental and social costs of negative externalities such as environmental degradation, greenhouse gas emissions and loss of biodiversity'					
Production of StAnD should not 'Enhance volatility in prices of feed ingredients'					

6. Rate the importance of the following elements of Sustainable Animal Diets (StAnD):

	Strongly disagree	Disagree	Neither agree nor disagree	Strongly agree	Agree	I do not know
StAnD should 'Contain an ingredient produced using public subsidies'						
StAnD should 'Re-use food waste after ensuring its safety'						
StAnD should 'Use food grains in monogastrics feed'						
StAnD should 'Use food grains in ruminants feed'						
StAnD should 'Use GMO crops'						
StAnD should 'Use feed ingredient produced through high-input agriculture'						
Production of StAnD should be given incentives						
Use/feeding of StAnD should be given incentives						

Comments:

7. To what extent do you agree that the ethical dimensions must be integrated into Sustainable Animal Diets?

Strongly disagree	Disagree	Neither agree nor disagree	Strongly agree	Agree	I do not know

8. In order to re-structure the feed production system for meeting the requirements of Sustainable Animal Diets, the initiative should first be taken by:

	Strongly disagree	Disagree	Neither agree nor disagree	Strongly agree	Agree	I do not know
Consumers (claiming for more sustainable production practices and systems)						
Industry						
Scientists						
Farmers and farmers' associations						
Civil society						
Regulatory bodies						

Comments:

9. How to put the concept of Sustainable Animal Diets (StAnD) into sound management practices?

	Not important	Somewhat Important	Reasonably important	Important	Extremely Important
Develop guidelines/good practices for StAnD					
Encourage Industry to develop voluntary guidelines and to follow them					
Introduce incentives for farmers for using StAnD					
Introduce incentives for feed industries to produce StAnD					
Make consumers aware of the benefits of StAnD					
Make civil society aware of the benefits of StAnD					
Create environmental certifications for products obtained by using StAnD					
Secure corporate commitment to StAnD					
Achieve broad stakeholder engagement					
Promote "green procurement practices" among customers					

10. Sustainable Animal Diets has four pillars: *Planet*, *People*, *Profit* and *Ethics*. If you have 100 votes, how many votes will you cast to each of these pillars (please ensure that columns add up to 100):

	Current	Ideal
Planet		
People		
Profit		
Ethics		

Comments:

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