Sustainability assessment of agro-eco systems and rural development in mountain areas. Scenarios for Eastern Jotunheimen, Norway.

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Foreword

The research project *BioScene - Scenarios for Reconciling Biodiversity Conservation with Declining Agriculture Use in Mountain Areas in Europe* (2002-2005), funded by the EU 5th Framework Programme, aims at investigating the implications of agricultural restructuring and decline for biodiversity conservation in Europe's mountain areas.

The project takes a case study approach to the analysis of the biodiversity processes and outcomes of different scenarios of agri-environmental change in six countries (France, Greece, Norway, Slovakia, Switzerland and the United Kingdom) covering the major biogeographical regions of Europe. The project is coordinated by Imperial College London, and each study area has a multi-disciplinary team including ecologists, and social and economic scientists, which seek a comprehensive understanding of the drivers for change and their implications for sustainability (i.e. environment, society and economy).

An important part of the project was to carry out a sustainability assessment process for all study areas in the six countries participating in the project. The framework for and input to the sustainability assessment has been worked out by an expert team; Bill Sheate, Susan Dagg and Helen Byron of Imperial College.
This report presents the work and the results of the Norwegian research team and stakeholders' in the study area of North Gudbrandsdalen related to the sustainability assessment process.
Large parts of the material in the report is based on interviews in the Norwegian study area and discussions and statements at stakeholder meetings.

We are extremely grateful to the stakeholders, and also to others that have taken of their time for interviews and information,

The photo visualisations are by Bjørn Egil Flø.

CONTENT

1. The BioScene project

The research project *BioScene - Scenarios for Reconciling Biodiversity Conservation with Declining Agriculture Use in Mountain Areas in Europe* (2002-2005) was funded by the EU 5th Framework Programme, and aimed at investigating the implications of agricultural restructuring and decline for biodiversity conservation in Europe's mountain areas.

The project takes a case study approach to the analysis of the biodiversity processes and outcomes of different scenarios of agri-environmental change in six countries (France, Greece, Norway, Slovakia, Switzerland and the United Kingdom) covering the major bio-geographical regions of Europe. The project was coordinated by Imperial College London, and each study area had a multi-disciplinary team including ecologists, and social and economic experts, which seek a comprehensive understanding of the drivers for change and their implications for sustainability (i.e. environment, society and economy).

Three major scenarios were identified and assessed in all countries; S 1 – "Business as usual" (continuation of current trends); S 2 "Liberalisation of agricultural policies" and S 3 – "Managed change for landscape and biodiversity". In addition, a "Wilding" scenario was discussed, and the Norwegian stakeholders suggested an alternative "Environment and solidarity" scenario.

2. Sustainability Assessment process

Sustainability Assessment is a process which can help inform and improve strategic decision-making. In BioScene it has been used as a systematic process for the assessment of the likely economic, social and environmental consequences of each of Bioscene's scenarios and the combinations of management activities contained in them. The aim of the assessment was to understand the potential impacts of each of the scenarios on wider sustainability objectives and identify changes that will increase desirable and reduce undesirable consequences. For example, enhancing positive effects, mitigating negative effects and avoiding the transfer of negative impacts to future generations. In other words: identifying the most sustainable policy interventions and management activities.

The concept of sustainability in BioScene is fundamentally grounded in the environmental dimension of sustainability, led by the aim of conserving biodiversity. Sustainability Assessment is seeking to identify how to maximise economic and social benefit alongside biodiversity (and other environmental) benefits. Therefore a scenario that is good for economic and social dimensions, but not for biodiversity is unlikely to be an acceptable scenario. However, a scenario that is not viable from an economic and a social perspective is unlikely to be realistic.

The Sustainability Assessment (SA) process involved:

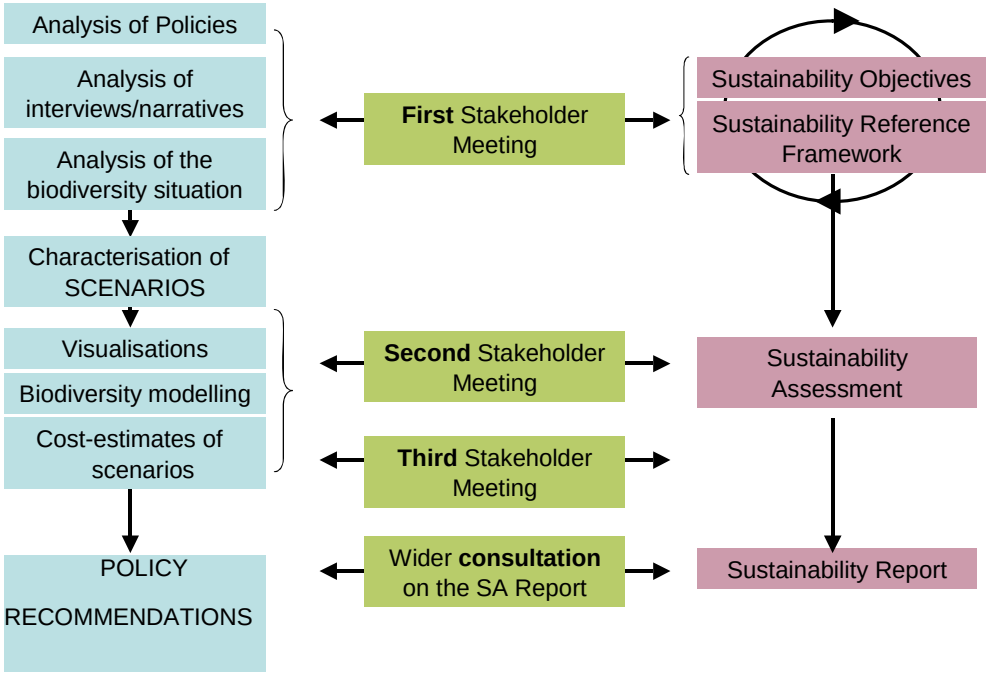
- *Identifying international and country-specific objectives for sustainable development* drawing from a range of published official sources (treaties and policy documents).
- *Defining the key elements of a baseline* that would act as a reference document for the rest of the SA process, highlighting key sustainability issues and current trends.

- *Establishing a framework of locally specific sustainability objectives* (i.e. economic, social, environmental objectives) and associated indicators for each study area. These objectives are tailored to your particular area and are intended to *describe what sustainability means for your study area.*
- *Assessing the scenarios* against the agreed framework of objectives and indicators to see how well they fulfil the sustainability objectives and where improvement is possible. In order to be sustainable, the scenarios should meet these objectives as closely as possible.
- *Writing up the results of the Sustainability Assessment into a country sustainability report* (this report) that documents the sustainability of each of the scenarios and possible improvements and will then be subject to wider consultation.

3. Consultation process

The BioScene SA process includes consultation with members of stakeholder panels established in each study area for the purposes of the project and consultation with a wider range of stakeholders, e.g. experts, organisations and members of the public with an interest in the study area. The purpose of involving stakeholders in the SA is to make sure that the views of the BioScene researchers are complemented by the opinions and values of members of the stakeholder panel and the wider public. Over the course of the Bioscene project there were consultations with the stakeholder panel in the study area. Figure 1 illustrates the input and feedback loops between the various stages of Bioscene and the SA process, highlighting the central role of the three consultations.

Figure 1 BioScene's inputs and feedback loops



(Source: Sustainability Assessment Team, 2004)

Consultation has been with the stakeholder panel which has a total of 14 stakeholders representing a range of different perspectives and has concentrated on eliciting the views of the panel on what matters for sustainability in the area; obtaining feedback from panel

members on the proposed Study Area sustainability objectives and discussing the results of the assessment and identifying key issues and priorities.

Stakeholders were chosen mainly among locals, but also from regional level, and included representatives of officials, farmers, representatives of various organisations and institutions. However, mainly, the stakeholders were to represent themselves. For the Norwegian study, 13 persons agreed on participating as stakeholders, including:

- Representative of a local Norwegian Farmers' Union unit
- Representative of a local Norwegian Farmers' and Smallholders Union unit
- A relatively expansive, 'productivist' farmer
- An organic farmer
- Leaders of two municipal agricultural offices
- Teacher of a vocational school, nature use section
- Regional county agricultural office representative
- Member of National Mountain Board
- State Nature Monitoring Office local representative
- Forest enterprise representative
- Local food initiative representative
- Member of the Local Hunters and Anglers Association

Not all were able to participate at all three stakeholders meetings. One only met once, we therefore in general refer to the group as consisting of 12, although statements from all are included in the report.

Several of the stakeholders were also farmers in addition to other roles, in total 5 of the stakeholders were farmers/part-time farmers. Several of these or their family members were also involved in tourism.

4. Broad Objectives and Current Sustainability Situation

This section provides a summary of the current (2004) situation and major trends for sustainability issues in the Norwegian study area, thus enabling the assessment of scenarios to be compared to the current situation in the region. Table 1 summarises the official objectives for sustainable development in Norway based on analysis of official documentation, policies and legislation. These objectives are defined in five sustainability themes; **biodiversity, sustainable natural resources management, rural and economic development, social development, and institutional capacity for sustainable development**, and were used to provide the starting point for discussion about what sustainability is or should be in the East Jotunheimen study area.

The study area is within the two municipalities of Vågå and Lom in East Jotunheimen in central Norway – see Figure 2 and is 800km^2 in size. It is within the *Mountain and valley areas* landscape region of Norway (Nersten et al 1999) and is among the few mountain valleys in Scandinavia where mountain summer farming (transhumance or seasonal farming and settlement) is still practised actively, although declining. Very limited farm land made grazing, fodder production and summer farming in mountain areas necessary in large parts of Norway, but due to modernisation of agriculture, these practices have more or less disappeared in many parts of the country. The remaining summer farm landscapes represent great cultural heritage as well as biodiversity values.

The climate is continental with a mean annual precipitation of 400-500 mm per annum, which is extremely low for Norway. The vegetation period is only 125 days per annum. The study area consists of valleys and mountains up to 1600 m above sea level. The mountains have an alpine topography and the summer farms are found near, or below, the present tree line (950-1250 m a s l). Located at 62°N it is the most northern of the study areas within the BioScene project.

As can be seen from Figure 2, key biodiversity interests in the study area are linked to the three summer farm valleys of Smådalen, Sjodalen and Griningsdalen – the core ecological study area of the ecological team. However, the viability and sustainability of these summer farms depends on the viability and sustainability of the main farms lower down in the valley, ie in the broader study area of the two municipalities of Vågå and Lom, that the social scientist team focussed on.

Figure 2. Map of the Study Area

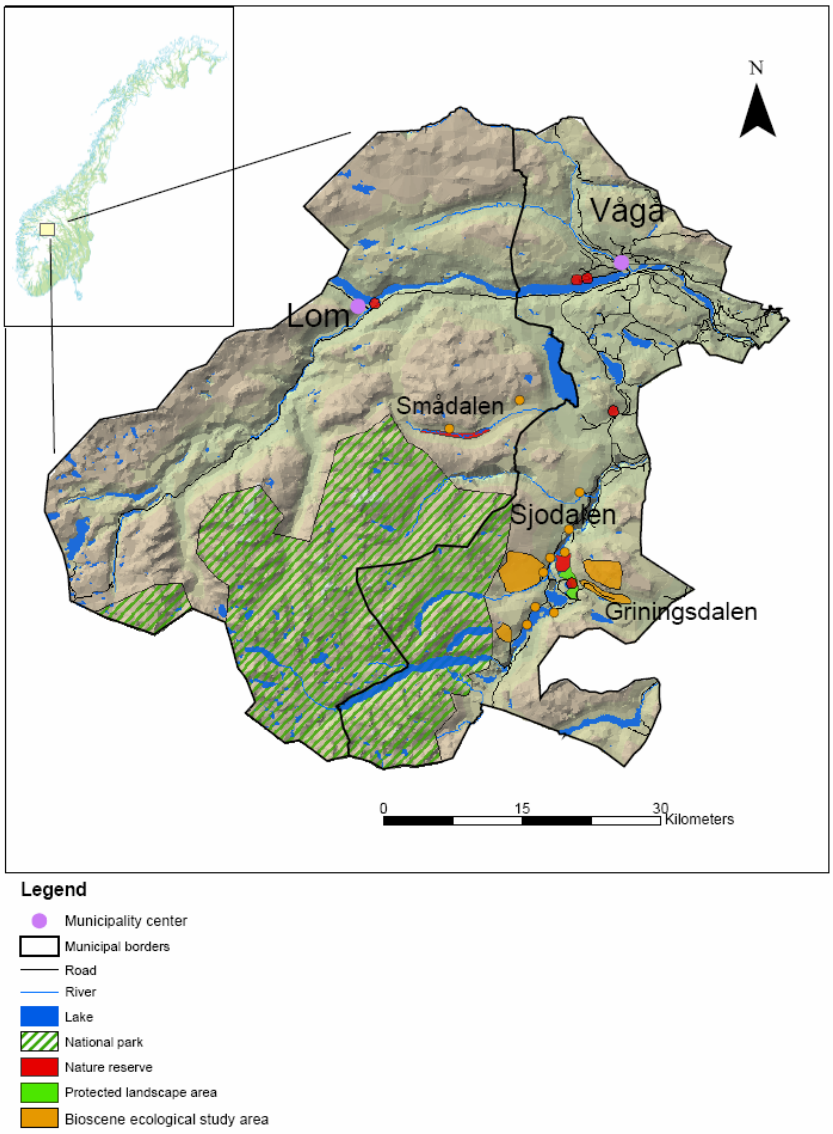


Photo 1: Part of the core ecological study area, Russlia mountain summer farm

Photo: Gunilla A. Olsson

Photo 2: From the valley area where the permanent farms are situated

Photo: Bjørn Egil Flø

Table 1 Official 0bjectives for sustainable development in Norway

CATEGORIES	SUB-CATEGORIES	OVERALL OBJECTIVES	COUNTRY SPECIFIC OBJECTIVES
BIODIVERSITY		To conserve biodiversity	• To ensure viable populations of naturally occurring species (eg wild reindeer and predators) • To maintain biodiversity linked to semi-natural grasslands and agricultural landscapes
		To protect endangered species and habitats	• To maintain and protect endangered and vulnerable species and habitats from negative effects of land use and infrastructure development
		To maintain and enhance networks of sites	• To ensure biodiversity is mapped as a basis for planning
SUSTAINABLE NATURAL RESOURCES MANAGEMENT	Protection of Natural Resources	To promote the sustainable consumption of renewable and non-renewable resources	• To secure and manage sustainable harvesting of natural resources
		To reduce levels of pollution to natural resources and implement pollution prevention techniques	• To reduce levels of pollution to natural resources and implement pollution prevention techniques to reduce pollution
	Energy	To ensure efficient use of energy sources	• To promote utilisation of the natural energy sources based on a sustainable development • To promote the economising of energy use
		To promote renewable forms of energy	• To promote the switch from fossil fuels to alternative renewable energy sources, especially through research and development
RURAL AND ECONOMIC DEVELOPMENT	Agriculture	To promote more sustainable farming practices, maintaining the resource base and ecological processes	• To ensure the continued use of specific farming methods nationwide
		To protect and maintain traditional agricultural landscapes	• To reduce the level of conversion of agricultural land into other land uses, especially to construction works and other non-reversible land uses • To ensure that agricultural holdings are being inhabited and used for living and farming purposes
		To promote sustainable agricultural related policies	• To promote agricultural policies that may uphold environmentally friendly farming nationwide • To promote conversion to organic farming
	Forestry	To promote an environmentally responsible management of forest resources	• To develop a locally adapted and varied economically viable forestry in which threatened and vulnerable species are taken into consideration
		To ensure long-term conservation through sustainable use of the biological diversity of forests	• To ensure consideration of vulnerable species in local forest businesses • To ensure increase in the area of protected coniferous forests to 1% to prevent loss of biological diversity
	Land-use Planning	To promote sustainable land-use planning and rural development	• To maintain the main features of the settlement patterns and ensure good living conditions
		To enhance the quality and distinctiveness of the landscape by restoring degraded land	• To maintain biological diversity and historical and aesthetic value of the landscape • To promote a more concentrated urban development to reduce the pressure on agricultural land and biological diversity
		To improve accessibility to the uplands, forest and agricultural areas	• To improve accessibility to cultural landscapes and the seashore

	Local Economy	To support the viability of local economy and capacity for innovation	• To promote and stimulate renewed and creative economic activity to secure employment • Ensure cooperation between cultural and economic sectors to strengthen both sectors and to increase added value
		To promote environmentally responsible tourism	• To promote simple and environmentally friendly recreational activities
	Employment	To promote new livelihood opportunities based on local resources	• To promote small business establishment based on local resources and markets by simplification of regulations
		To promote training of local communities to ensure skilled human resources	• To ensure a decentralised college structure
SOCIAL DEVELOPMENT	Health	To prevent and minimise threats to public health	• To minimise contamination/pollution by chemicals or other contaminating agents, both at local and global levels
		To promote health care and improve services	• To ensure the welfare state and people's willingness to pay collectively for it
	Equity	To ensure equal rights, besides gender, race, disability, age and sexual orientation	• To ensure that communities are socially inclusive
		To promote equality of opportunity in the delivery of and access to services and environmental goods	• To ensure that woman are equal partners in all sectors
	Culture	To maintain distinctive culture and identity of communities	• To maintain and develop culture as a crucial part of regions and local communities
		To promote traditional knowledge and ensure that historic sites are recognised and preserved	• To ensure preservation of cultural heritage and cultural landscapes • To ensure maintenance and development of knowledge and handicrafts related to regional and local resource use
		To improve educational achievement and opportunities for lifelong learning	• Ensure regional colleges and free access to education for all young people • Implement new measures to secure possibilities for adults to increase competence level to help create new jobs, ensure quality of life and prevent new class distinctions
INSTITUTIONAL CAPACITY FOR SUSTAINABLE DEVELOPMENT	Local Engagement	To increase awareness of local communities on issues relating to environmental protection and use of natural resources	• To increase awareness on the inclusion of environmental factors in all consumption and production activities
		To enhance participation of local communities in local decision-making processes	• To ensure participation of children and youths
	Institutional Involvement	To improve governance and accountability among local administration and rural organisations	• To provide decentralised structures of administration
		To provide institutional support for long-term management in relation to land tenure and natural resource ownership	• To improve cooperation between farmers/land owners and public administration and various organisations, and right holders

Following the identification of sustainable development categories and sub-categories, the overall project objectives were developed through the co-ordinated gathering of information relating to: sustainable development and related strategies, agriculture and agricultural policy and sustainable development, biodiversity and mountain biodiversity, and rural policy. Information was from various reference sources e.g. EU, national and

international Policy, legislation etc. Relevant issues from the various sources were highlighted and key objectives identified as a result.

The country specific objectives are defined in a number of White Papers (*St.meld.*) related to the environment, conservation of biological diversity, predators, agriculture, sustainable development, the Kyoto protocol, regional policies, land use planning etc. (Ministry of Environment [Miljøverndepartementet]: St.meld. nr 15 (2003-2004 Rovvilt i norsk natur, St.meld. nr 42 (2000-2001) Biologisk mangfold. Sektoransvar og samordning, St.meld. nr 39 (2000-2001) Friluftsliv, St.meld. nr 24 (2000-2001) Regjeringens miljøvernpolitikk og rikets tilstand, St.meld. nr. 43 (1998-99) Vern og bruk i kystsona, St.meld. nr.29(1997-1998) Norges oppfølging av Kyotoprotokollen, St.meld. nr. 58 (1996-1997) Miljøvernpolitikk for en bærekraftig utvikling, St.meld. nr. 35 (1996-97) Om rovviltforvaltning, St.meld. nr.29 (1996-97) Regional politikk og arealpolitikk, Ministry of Agriculture [Landbruksdepartementet]: Multifunctional agriculture – the case of Norway, St.meld. nr.19 (1999-2000) Om norsk landbruk og matproduksjon; www.agenda21.no).

Below, the background for and implications of the defined objectives are further described and elaborated.

4.1. Biodiversity

The ecological study area borders Jotunheimen national park in which the highest mountain peaks in Scandinavia are found (Glittertind 2464 m a s l and Galdhøpiggen 2469 m a s l). However, the topography within the key ecological study area is less pronounced and over the last 3-4 centuries the Sjodalen valley the side valleys Smådalen and Griningsdalen have been and are still being used (as pastures and range grazing) for mountain summer farming - a form of mixed farming system which includes seasonal movement of livestock between the lowland valleys and the mountain valleys (transhumance) (Price 1981, Allan et al. 1988). Livestock grazing in combination with mowing for hay, and the collection of wood for fuel on summer farms did prevent forest expansion. The semi natural habitats (grasslands and heathlands) in mountains have a high diversity of plant species (some endemic), many of which are now vulnerable.

Today the Sjodalen valley is one of the few regions in the Norwegian mountains where summer farming still takes place. While reported still an important resource base for many farmers, the summer farm activity is declining in terms of number of active summer farms and grazing and hay cut. Summer farms both inside and outside the ecological study area have been abandoned and birch and pine forest has expanded and established in the earlier areas of open semi-natural habitats. If livestock grazing decreases further, or is abandoned, this will have large-scale effects on biodiversity. The landscape pattern which now is characterized by a high diversity of habitats (woodlands, grasslands, heathlands, and wetlands) will change into a more homogenous pattern. The woodlands will increase at the expense of the open grasslands and heathlands. Loss and fragmentation of these habitats will affect the populations of and may even cause extinction of plant species dependent upon open habitats.

Regarding predators, wolves, bears, lynx and wolverines exist in Norway, and their numbers have been increasing since the mid 1990ies, when systematic registrations were started, especially wolverines have had a strong increase (St.meld.15 (2003-2004)).

Within the study area, wolverine and lynx are found. Several other areas in Norway are worse off in terms of losses, however, stakeholders reported some loss of sheep and lamb to wolverines, and with substantial variations on farm level; from none to relatively high losses.

Tables 3 and 4 summarise information about habitats and species which may be negatively affected by agricultural decline.

Table 2: Habitats negatively affected by agricultural decline (Wehn and Hanssen, 2004)

Habitat	Current status of the habitat
grasslands in mountains; subalpine and alpine	Subalpine: Decline; Habitat needs grazing for maintenance Alpine: No change
heathlands; subalpine and alpine	Subalpine: Decline; Habitat needs grazing Alpine: Decline; due to increased tree line (reduced grazing)

Table 3: Species negatively affected by agricultural decline

Species	Current status of the species	Habitat	Status of habitat
Primula scandinavica	Endemic to Scandinavia, main populations in Norwegian mountains; needs disturbances or grazing for long-term survival	Semi-natural grasslands and other open habitats in mountains;	Decline
Gentiana nivalis	Present in Scandinavian mountains on calcareous bedrock and under influence of grazing or other disturbances. Present also in a few other European mountain sites. Very rare in several European countries; 2 sites in UK	Semi-natural grasslands and some grazed alpine heathlands in mountains; favoured by grazing	Decline
Carex norvegica, Botrychium boreale, Gentianella tenella,	Rare to rather rare in calcareous mountain grasslands in Norway	Semi-natural grasslands in mountains and in alpine sites; Favoured by grazing	Decline
Alchemilla alpina, Antennaria alpina, Astragalus alpinus, Bartsia alpina, , Bartisia alpinaB. Lunaria, Carex atrofusca, Carex capillaris, Equisetum variegatum, Erigeron borealis, Euphrasia frigida, G. campestris, G. amarella, Gnaphalium norvegicum, Luzula frigida, Luzula spicata, Pedicularis oederi, Phleum alpinum, Poa alpina, Polygonum viviparum, Sassaurea alpina, Selaginella selaginoides, Sibbaldia procumbens, Silene acaulis, Thalictrum alpinum, Veronica alpina, Viola biflora,	Relatively common in mountain grasslands in Norway	Semi-natural grasslands in mountains and in alpine sites; Favoured by grazing	Decline
Pulsatilla vernalis	This species is declining since its habitats are declining in Norway.	Open, (semi-natural) heathlands	Decline

Photo 3 : One of the habitat study areas in the Sjodalen valley

Photo: Gunilla A. Olsson

4.2. Sustainable Natural Resources Management

The natural resources in the study area are mainly linked to the outfields including the mountains, forests and grasslands, fishing and hunting resources, and especially their value for nature conservation and recreation. The use of outfields resources are changing. Reduced harvesting of grass (grazing, hay cut, fodder collection) and reduced use of local firewood leads to forest succession and more homogenous landscape, with negative effects for biodiversity, recreational experiences and access.

Several national regulations during the last decades have led to a decrease in problems of pollution from agriculture. The farming systems are in general not very intensive in the study area, thus pollution from agriculture is thus not considered a major problem.

In general, the energy consumption is high in Norway, however, private cars are seen as necessary in rural areas. The main energy sources are hydro-power electricity and wood. Although many in the study area hold rights in the commons on cutting wood for heating, wood is, according to informants, increasingly being imported from Baltic countries due to lower prices. However, recently initiatives are taken for bioenergy utilization.

4.3. Rural and economic development

4.3.1. Land Use

Most of the information is based on minicipality plans and agricultural plans from the study area (e.g. Vågå kommune 2000; Lom kommune 2003), as well as personal communication with municipality representatives, Forestry Common and State common representatives, as well as other stakeholders and informants.

3% of the land use in Vågå and 1% in Lom is agricultural land (for Norway as a whole 3% is farmed land). The rest of the land consists mainly of barren mountains, some with coniferous forest and in higher areas scrub and mountain birch. Still, agriculture makes out 16-18% of the employment in the two municipalities and is still the single most important factor for employment and income. Many farmers, men and women hold part-time jobs and off-farm jobs within transport and the tertiary sector, including tourism. Forestry employs approximately 50 persons. Niche food production is seen as an important strategy for some farmers, but the majority still relies on conventional bulk production, delivering meat and milk to the farmers' owned cooperatives for processing and distribution.

One important element in trying to attract new types of business, is the Vågå municipality's "Vågå 24" strategy. By providing better services and infrastructure for new businesses, IT-based businesses and others that are not dependent on very central localisation, are encouraged to relocate to Vågå.

4.3.2 Agriculture

Although agriculture has been relatively stable in the study area due to lack of alternative jobs and probably also very strong farm attachment, the trends are that increasingly farmers close down, rent out the best land and give up and abandon some of the most important land in terms of biodiversity and recreation interest, i.e. mountain summer farm meadows and pastures, and marginal and steep land on the permanent farms in the main valleys. There is a steady decline in numbers of active farms and farmers and a general trend towards fewer and larger holdings with more rented land from neighbours who have stopped farming themselves. In Lom, more than 30 % of the farmed land is rented.

Farm income is considerably lower than within other sectors in Norway. However, most farm households have a more or less comparable economic situation to that of other family households, due to part-time and off-farm income (both men and women) and lower housing expenses.

Overall, agriculture as an economic activity is vulnerable in this area, as farming is expensive and difficult, as in most parts of Norway, due to cold climate, short growing season and long transport distances. Farm units are small and labour-demanding. The current agricultural system fully depends upon agricultural support, and the international and national legitimacy of this support is being weakened. As timber prices for a long period also have been low (many farmers also own some forest), this affects total farm household income.

The dominant agricultural production in mountain regions is animal husbandry - sheep and dairy (milk) production. There are over 4500 winter fed sheep in Vågå and about

3000 in Lom. With lambs, nearly 10,000 sheep from these two municipalities graze the mountain areas in summertime. Additional sheep also come from surrounding municipalities to graze. There is also some goat milk and pig production within the study area. Grass and fodder production dominates on arable land, with some limited grain production. Most farms are conventional, only eleven were registered as organic in 2004. The need for spraying is, however, relatively limited due to the cold climate. During the 20th century, there has been a strong increase in the number of sheep and some increase in milking cows in Vågå, and a strong decrease in the number of goats.

Due to limited fertile arable land, the *outfields* (*utmark* - forest, less productive forest and mountains) have been a necessary extension of farm resources: for summer farming (production of cheese during summer on these summer farms has been of great importance), grazing, harvesting, berry picking, fire woods, hunting and fishing. This is the case particularly for upland and mountain communities. Mountain summer farming is still active in Vågå and Lom and several farms still rely on the mountain summer farm in terms of providing grazing and winter fodder. The summer farms are located 50-70 km from the permanent farms in the lowland valley of Vågå and Lom. The enclosures at the summer farms are on average about 4 ha. There are today a total of 60 active summer farms in Vågå and Lom. A recent survey among Norwegian farmers with summer farms in operation showed that for the majority, the summer farm was considered a central part of their farming system; without the summer farm they would not have a sufficient resource basis for managing the farm itself (Norsk senter for seterkultur 1999). Thus, the summer farms constitute an important part of functional farming systems. For example, 22% of the total agricultural land in Vågå is located in the mountains. The mountain summer farms and the related activities have been crucial in shaping the landscape, it is of great historical and cultural importance, and ecosystems and species depend on these land use systems. Further, the mountain summer farming is still important as a part of the practical and economic farming systems to many farmers (Daugstad 2000).

Cooperation farming or joint farming – *samdrift*, in France termed *group farming* - between farms, in which two or more farmers farm together, has become relatively common in recent years. The main reasons are to reduce workload, to be able to maintain milk quotas while tending off-farm jobs and to reduce individual risks connected to investments in buildings. Joint farming (s*amdrift)* may have some negative landscape effects as they lead to larger units and more industrialised farming, but considering the small size of Norwegian farms (on average 15 cows) it may be the only survival strategy for many farmers and necessary in order to maintain farm land and open landscapes.

The budgets for "strict" agri-environmental schemes (notably STILK - *Payment for Special Measures in the Agricultural Landscape including Protected and Protection Worthy Buildings*, later reorganized and renamed SMIL) are modest in Norway. The STILK funding has been limited to NOK 100 million a year (approx. Euro 13,5 mill) for the whole of Norway, of this Vågå and Lom received 1,485,000 in 2002. Most farmers who receive such payments see them as useful support for carrying out measures to which they otherwise would not be able to give priority.

In order to receive such payments, until recently the property had to be a part of an active farming system. Payments for maintaining biodiversity and landscape management payments for abandoned areas or land with very low degree of use for farming, are more or less non-existent in Norway. The Ministry of Environment does not dispose of such

funds, and the Ministry of Agriculture and Food's schemes are directed towards registered agricultural businesses.

The major agricultural scheme, the General Acreage and Cultural Landscape scheme (AC), which contributes up to 40% of farmers' income, has some general environmental and landscape prescriptions and is of major importance for upholding agriculture and open landscapes in a country where regrowth and forest colonisation is seen as one major threat for biodiversity and cultural landscapes.

4.3.3 Forestry sector

Forestry is relatively important in the study area. Within the study area there is one large state owned forest[1] and forestry enterprise - *Langmorkji skogsalmenning* - with a saw mill which is of significant importance for employment in the area. In total, over 50 people are employed within the forestry sector in Vågå and Lom. In general, most Norwegian farmers own some forest that they may utilise when they need additional income, cutting it themselves, or leaving it to forest enterprises. The activity in private farm forests has been low in recent years, probably due to low timber prices, cheap imports from Eastern Europe, and more income generating activities off the farms. Lack of wood deliveries causes problems for the saw mills and economic activities linked to the forestry sector, which in the end is affecting local and regional economies. It is therefore seen as important to increase the activity level in forestry. Public grants and various regulations encouraging thinning and planting have been altered and partly withdrawn in recent years. This has also led to reduced activity in forestry in the study area (personal communication, forestry representative).

4.3.4 Business development linked to secondary and tertiary sector

There are two major economic strategies in the study area; trying to attract new businesses to the area, and to develop tourism further. Vågå municipality's "Vågå 24" strategy is attempting to attract private businesses to the area. By offering building lots or already existent office buildings, providing better services and infrastructure for new businesses, IT-based businesses and others that are not dependent on very central localisation, are encouraged to relocate to Vågå. Further, Vågå 24 aims at getting better in serving existent businesses' infrastructure needs (personal communication, municipality representative).

Camping and cottage rental is a traditional additional income for farmers along major transport routes and tourist destinations. 15 farmers in Vågå and 11 in Lom had such additional income in 2002. Further, there is are a number of tourist cabins run as hotels, and several with a more simple standard, also some by the Norwegian parallel to the British Ramblers' Association – the Norwegian Trekking Association (DNT), Norway's major outdoor activities organisation. Cabin development has been relatively modest in the study area, and conflicts between grazing and cabin owners have been limited; in Lom, there are 278 cabins, currently another 42 are planned. There has been an increase in various wilderness and nature adventure related tourism entrepreneurs during the last 15 years, white water rafting being the most prominent example with several rafting businesses using the Sjoa river which is considered to be one of Europe's best rivers for rafting. Tourism has become an activity of some importance for some of the summer farm owners in Sjodal. Summer farm tourism actually represents an old tradition, as the first mountaineers and tourists in these areas were accommodated on summer farms

[1] state commons, in which locals have various grazing and hunting rights

(Daugstad 2000). Further, several of the permanent farms have started up cultural heritage based tourism linked to the cultural landscape and especially the built heritage of old wooden timber buildings.

To date, commercialisation in the form of a professional large scale outlet of hunting and angling has not taken place in the study area. The great local interest for pursuing these activities themselves, and also a more culturally based reluctance towards commercialisation are major factors. However, signals indicate that the interest in commercialisation is increasing. The implications of this increase in commercialisation for environmental and sustainability issues are increased disturbance of wildlife, especially linked to cabin development. The two municipalities have had a restrictive approach to private cabin building, as they have wanted to encourage the existent tourism related to hotels and mountain tourist huts, ecotourism and various types of small-scale tourism. Further, they want to avoid the conflicts and problems related to land use, infrastructure and energy consumption accompanying large scale cabin development.

4.4. Social Development

4.4.1. Health

There is a general trend towards less activity and less outdoor activities in the general population, and obesity is an increasing health problem, as in many other countries. There is also a tendency that children living in rural areas are more exposed to inactivity and obesity, probably due to more car and bus transport than children in urban areas that to a larger extent walk or use bicycle to school and activities. Diabetes is increasing in the population, also among children (St.meld. nr 21 (2004-2005)). Encouraging people to use the nature for recreation and sports is seen as positive both for increasing individuals' health, as well as promoting fondness of nature, positive place attachment and positive attitudes towards nature protection. One concern among representatives of the local hunter and angler association is that the younger generations are less willing to endure hardship and long walks to pursue especially angling activities, but prefer places that are more easily accessible, increasing the pressure on those.

4.4.2. Equity

In principle, democratic local participation functions relatively well. However, important local institutions have very low women representation. Especially institutions linked to important natural resources such as the Mountain Board and the Board of Outfield Commons have poor women representation. The same is the case for the local association of the National Farmers' Union. The difficulties in getting a good representation of women in the stakeholder panel for the BioScene project may be an indication of this. Other local political institutions have a good representation of both men and women. One hypothesis may be that institutions dealing with natural resources are still seen as representing a 'masculine' sphere.

4.4.3. Culture

Nationally, the study area is viewed as an area of cultural importance: both for its well maintained 'traditional' agricultural landscape with well preserved buildings, as well for its 'wild' mountains and the mountain summer farm landscape. Lom was elected the 'Norwegian Mountain Municipality of the Year' in 2002. The study area has some of the best preserved farm timber buildings in the country. Several farms in the study area date back to the Viking age and have yielded rich archaeological findings. One farmer

interviewed counted his family thirteen generations back on his farm. A large part of the buildings in the area are either well preserved with architectural roots in 17th century or new constructions are modified to adapt to the old local tradition. However, in order to make the study area attractive for present and potential inhabitants we believe that it is important to focus on cultural activities in general, especially on young people's needs and interests.

Photo 4: Some of the many preserved and still used farm timber buildings

Photo: Bjørn Egil Flø

Photo 5: The wooden stave church in Vågå, from the 17th century, parts of it probably from an older stave church at the same site, early 12th century
Photo: Gunilla A. Olsson

4.5. Institutional Capacity for Sustainable Development

The Norwegian local government is well developed with a relatively high degree of local autonomy through its over 430 municipalities, and with a well developed institutionalised system of hearings for municipality land use plans etc. However, the municipalities have to a large extent only been implementing national and regional policies. In 2004, a process of delegation of previously national and regional tasks to regional and local level was started. This means that the municipalities will have much more influence than previously on agricultural and environmental policies, schemes and its implementation. There is a need for increased local competence in order to fulfil these management tasks in a sustainable way.

There are three types of commons within the study area; the state owned common represented by the Mountain Council, the Langmorkji state forest common and the community common. The Mountain Councils in Vågå and Lom administrate most of the land use rights within the state commons, such as small game and angling. The mountain councils, with local delegates, are according to the Mountain Act to administrate and manage user rights to mountain summer farms, grazing, hunting and angling, and "in a way that is encouraging the economic development in the community and maintain nature" (www.vaga-fjellstyre.no). Farmers have a set of land use rights in the commons, and locals are favoured in terms of hunting and angling licences, although also non-

residents may buy such licences. As much as 76% of the land area of Lom is within state owned commons, in Vågå about 66%.

The two different farmers' organisations (the Norwegian Farmers' Union and the Norwegian Farmers and Smallholders' Union) have local organisations in both Vågå and Lom municipalities. The Norwegian Hunters' and Anglers' Association has an active local association within the study area. There is also a local tourism business organisation (*Reiselivslaget*) in the area involved in developing new forms of tourism, eg wilderness tourism etc.

5. Study Area Objectives

Table 5 presents a list of locally specific sustainability objectives and associated indicators for the study area which are intended to describe what sustainability means for the Norwegian study area. These were derived from analysis of national sustainability objectives (see Table 12 above), analysis of the current (2004) situation and major trends for sustainability issues in the Norwegian study area (summarised briefly above), and stakeholder inputs. Stakeholders discussed key sustainability issues for the area in the second of the three stakeholder panel meetings and subsequently provided feedback on proposed draft objectives by completing and returning a questionnaire.

Table 4: Study Area sustainability objectives and indicators

CATEGORIES	SUB-CATEGORIES	STUDY AREA OBJECTIVES	INDICATORS
BIODIVERSITY		O1 - To ensure viable populations of species sensitive to agricultural decline	To stop abandonment of grazed land and meadows in the mountains. Indicator for this; e.g. stop decline in Primula scandinavica (termed mayflower by locals) an Gentiana nivalis)
		O2 - To ensure viable populations of other naturally occurring species	• Wolverine, lynx and eagle at the present level • Prevent establishment of wolves • Maintenance of existing deer and grouse stock
SUSTAINABLE NATURAL RESOURCES MANAGEMENT	Protection of Natural Resources	O3 - To ensure a sustainable use of outfield resources linked to fishing, hunting, grazing, forestry, recreation and tourism	• Fishing – increase fishing in "overpopulated" waters (too many small fishes) • Game – maintain shooting at a level that secures stable reproduction and stable populations • Grazing – secure grazing with different types of animals to prevent forest colonisation and to secure threatened habitats • Recreation – ensure that the outfields still have a high value for recreation and give varied nature recreational opportunities • Tourism – channel tourism activities to prevent damage on nature and disturbance of wildlife
		O4 - To reduce pollution and implement pollution prevention techniques to reduce pollution. Agriculture has a special responsibility for reducing leakage of nutrients and chemicals from silage	Introduce new technology and regulations for handling silage, manure, garbage and other unaesthetic elements in the landscape
	Energy	O5 - To encourage harvesting and processing of natural resources managed at the local level to reduce transport	To encourage and promote as much as possible processing of local resources at the local level

CATEGORIES	SUB-CATEGORIES	STUDY AREA OBJECTIVES	INDICATORS
		O6 - To develop alternative energy sources, and better utilisation of local wood	Increase the use of local wood for local use for bio-energy
RURAL ECONOMIC DEVELOPMENT	Agriculture	O7 - Maintain family farming, incl. mountain summer farming and a varied animal husbandry as important economic activities based on local grazing resources	Number of active farms and summer farms
		O8 - To promote the development of local brands/niche products	Number of local niche products, economy in businesses
		O9 - Develop viable business networks for mountain summer farming, local foods and tourism	Complexity and integration of networks
	Forestry	O10 - To uphold forestry activities to maintain forestry as a source of income and for providing timber to local sawmills	m^3 timber cut annually Area covered by thinning
		O11 - Develop alternative forest products (e.g. from birch, specialised products, slow growing pine etc.)	Number and volume of new products
	Business development	O12 - Promote the establishment of service businesses for the private sector, including tourism businesses	Increase in number of businesses and number of people employed connected to these businesses.
		O13 - Promote the establishment of tourism based on the natural and cultural resources of the area, incl. mountain summer farms	Increase in number of businesses and number of people employed connected to these businesses.
		O14 - To create jobs for highly educated people so the local community is able to offer local youth and incomers work after ended education	Number of highly educated persons working in relevant jobs
SOCIAL DEVELOPMENT	Health	O15 - To encourage all, but especially the young, to actively participate in outdoor activities using the nature	Number of persons and number of daytrips on cross country skis and hiking tours per year Number of fishing cards sold
	Equity	O16 - To ensure that all groups have an influence in decision-making processes and a just share in the distribution and access to services and goods	Number of organisations taking part in local plan hearings Various groups' and stakeholders' representation in political decision making processes (age, gender, business, interests)
	Culture	O17 - To develop cultural activities as an asset for life quality and attractiveness of the community	Number of people, and especially number of young people, taking part in number of activities/events Number of people visiting the area due to these events/activities
	Local Engagement	O18 - To enhance participation and cooperation of local groups, esp. youths, children and women, organisations and interests	Number of organisations taking part in local plan hearings Various groups' and stakeholders' representation in political decision making processes (age, gender, business, interests)
	Institutional Involvement	O19 - To strengthen the co-operation between farming/rural communities and public agencies, especially environmental authorities and organisations	Joint plans for environmental, agricultural and rural development
		O20 - To make the local authorities capable to take more responsibility concerning the governance of local resources	Education level of staff Increase in municipality staff

In the Sustainability Assessment process the components of the scenarios (see section 6) were assessed against the agreed objectives/indicators to see how well they fulfil the

objectives and where improvement is possible. The results of these assessments are recorded in assessment matrices – see below.

5.1. Analysis of Study Area Objectives

5.1.1. Consistency between objectives

Generally the Study Area objectives are consistent with each other and there are synergies between some of the objectives where achievement of one objective contributes to achievement of another objective. For example between O1 (To ensure viable populations of species sensitive to agricultural decline), O3 (To ensure a sustainable use of outfield resources linked to fishing, hunting, grazing, forestry, recreation and tourism), O7 (Maintain family farming, incl. mountain summer farming and a varied animal husbandry as important economic activities based on local grazing resources) and O14 (To create jobs for highly educated people so the local community is able to offer local youth and incomers work after ending education). Also between O16 (To ensure that all groups have an influence in decision-making processes and a just share in the distribution and access to services and goods), O18 (To enhance participation and cooperation of local groups, esp. youths, children and women, organisations and interests) and O19 (To strengthen the co-operation between farming/rural communities and public agencies, especially environmental authorities and organisations).

There are no major conflicts between the study area objectives and the objectives at higher (overall and country) levels. Although there are some country level objectives for which there is not a comparable study area objective, eg for land use planning. This is not to suggest that land use planning is not a sustainability issue which is relevant for the study area, but rather that it is not a key priority – as the list of twenty study area objectives sought to represent the key sustainability issues in the area. We would rather draw the attention to the mismatch regarding the objectives defined for maintaining cultural landscapes and their interlinked biodiversity and the possibilities for doing so. Although highly threatened, there have been no relevant conservation or management measures to secure these values. The new regional and municipality environmental programs introduced from 2004 and 2005 may improve this situation. The Oppland county regional programme will focus on summer farm landscapes.

The identified threatened species in the study area are not included on the national red list, and we conclude that this is due to the low status of cultural landscape related biodiversity within biodiversity conservation in Norway and internationally.

5.1.2 Analysis of the preferences expressed by stakeholders

The three study objectives which the stakeholders identified as their top priorities were:

- O7 (Maintain family farming, incl. mountain summer farming and a varied animal husbandry as important economic activities based on local grazing resources),
- O3 (To ensure a sustainable use of outfield resources linked to fishing, hunting, grazing, forestry, recreation and tourism), and
- O14 (To create jobs for highly educated people so the local community is able to offer local youth and incomers work after ending education), which as noted above are inter-related.

The questionnaire shows that the following functions of agriculture in the study area had the highest rating: “Conservation of the traditional cultural landscape” and “Securing the settlement” (mean value 1,92). Then followed “Maintaining an attractive landscape for tourism” (mean value 1,83). “Preservation of traditions and cultural heritage” scored (1,58), and higher than “Securing the diversity of species”, although that also received a relatively high score (mean value 1,25). An important conclusion is that the stakeholders see the landscape as an expression of the overall situation in the study area, linked to livelihoods, social, cultural and aesthetic/visual aspects, and do not consider biodiversity as the major issue. However, they did identify certain plants as valuable or dear to them. Biodiversity can probably rather be seen as a function of the overall landscape; it is interesting to note that all stakeholders believed that biodiversity was highest in a small-scale cultural landscape (mean value 2,00).

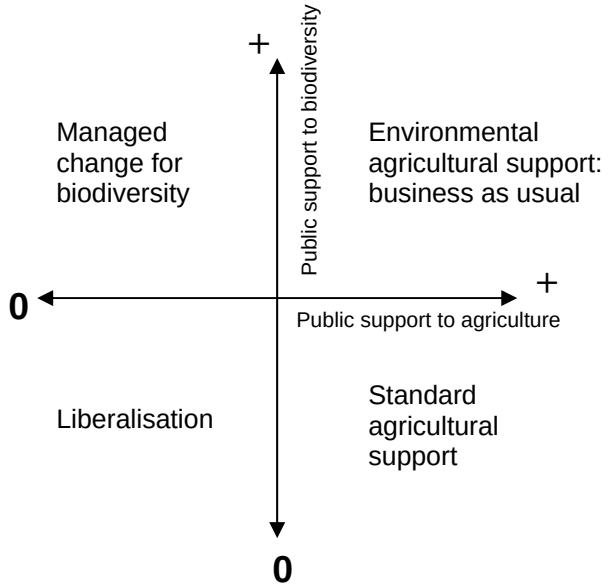
6. Introduction to the Scenarios

Three different scenarios of possible future development in the study area were developed in order to explore possible implications on biodiversity, agriculture/livelihoods and sustainable development over a time span of 25 years ie 2030, as follows:

1. A *business as usual* (BAU) scenario which assumes a continuation of current trends, that is, continued support both to agriculture and biodiversity conservation
2. A *liberalisation* (LIB) scenario in which agricultural markets are completely liberalised and no public support is given neither to agriculture nor to biodiversity conservation
3. A *managed change for biodiversity* (MCB) scenario in which no public support is given to agriculture and agricultural markets are totally liberalised, yet high support is given to biodiversity conservation.

Figure 3 below illustrates the relationship between the general drivers of change and the scenarios. A fourth possible scenario, standard agricultural support, is not considered here, as BioScene is concerned with a situation of agricultural decline in mountain areas.

Figure 3 Relationship between the general drivers of change and the scenarios



A conservation sub-scenario of MCB that focussed on non-intervention wilderness, assuming a liberalisation of agricultural policies with withdrawal also of agri-environmental payments was also presented, but rejected by the stakeholders.

- Non-intervention wilderness (Wilding)

During the discussion at the second stakeholder panel meeting, the stakeholders formulated a fourth, alternative, scenario:

- Environment and solidarity,

  assuming that global environmental, energy and food crises would lead to the need for low intensive environmentally friendly farming methods in which increased self sufficiency for poor farmers in third world countries was a major consideration. These four scenarios (excluding the wilderness scenario) are introduced below.

Each scenario was characterised by production of a flowchart, which illustrates the relationships between the key drivers of the scenario and their impacts and land use consequences in the form of causal chains.

6.1. Business as Usual

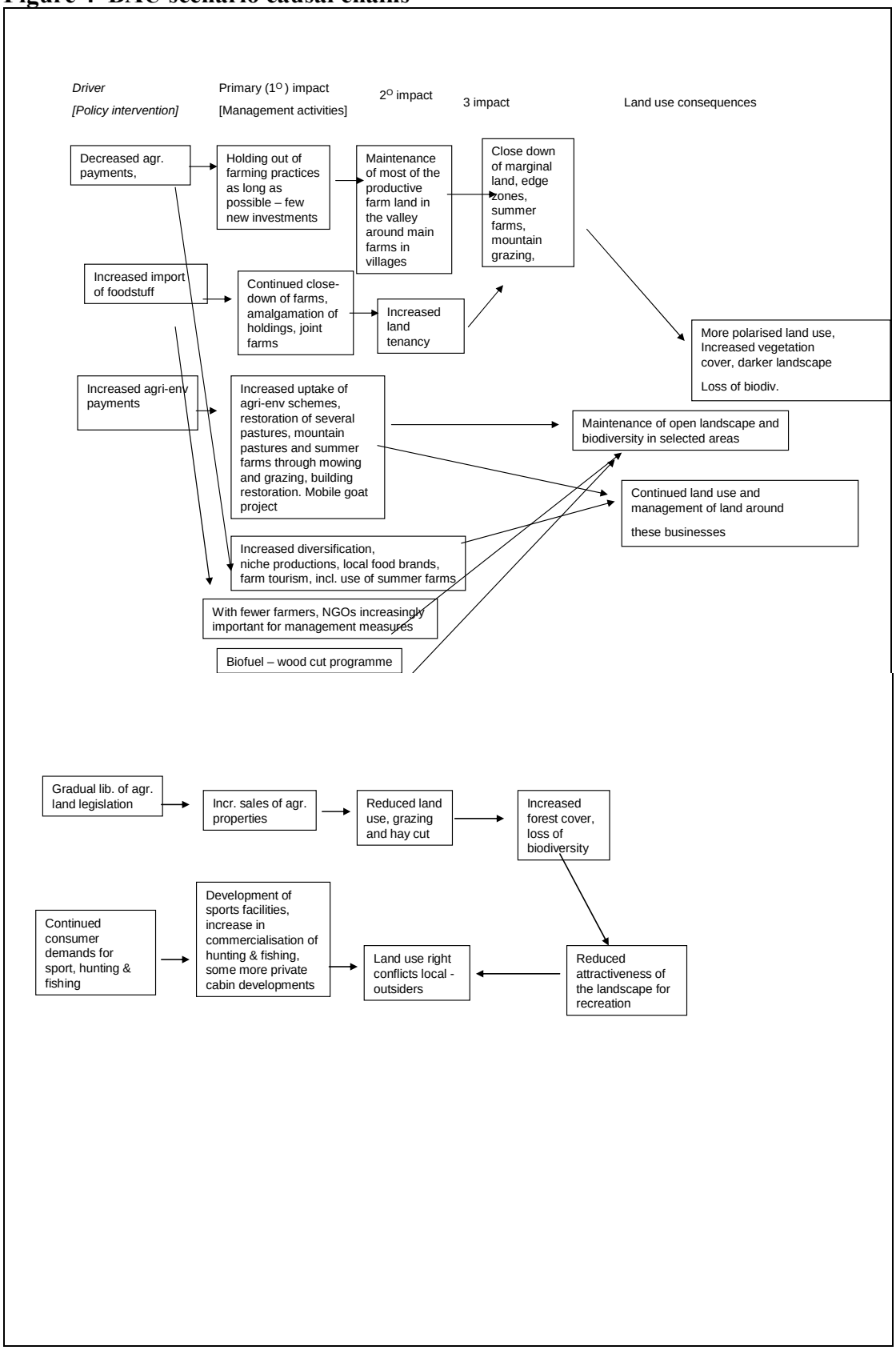
The assumptions behind this scenario is that there are continuation of different trends at the same time, both towards rationalisation and large scale farming, meaning fewer and bigger farms, and diversification of farm income and rural entrepreneurship linked to the farms, the outfields and the mountains. The major driver is reduced acceptance for production linked subsidies and import restrictions, and this will only partly be replaced by an increase in agri-environmental payments.
There will be a certain increase in farm tourism, mountain summer farm tourism and food tourism, and the development of local foods, which has a very good starting point in the study area. The attempts of creating “the Nordic Toscana” are carried on, and food products from the area develop into strong brand names. Further, there will be an increase in more extreme tourism and wilderness tourism, and the more ordinary hiking tourism. Agricultural payments will be gradually reduced, and remaining subsidies will be increasingly attached to environmental and landscape measures, which become more targeted than earlier. Summer farm areas will be given priority as well as other landscapes of high national importance, while areas not listed will receive less general payments than earlier and will not be entitled to special conservation/management payments.

Photo 6: The Solsiden area today

Photo 7: The Solsiden area under the Business as Usual Scenario

Photos and manipulation: Bjørn Egil Flø

Figure 4 BAU scenario causal chains



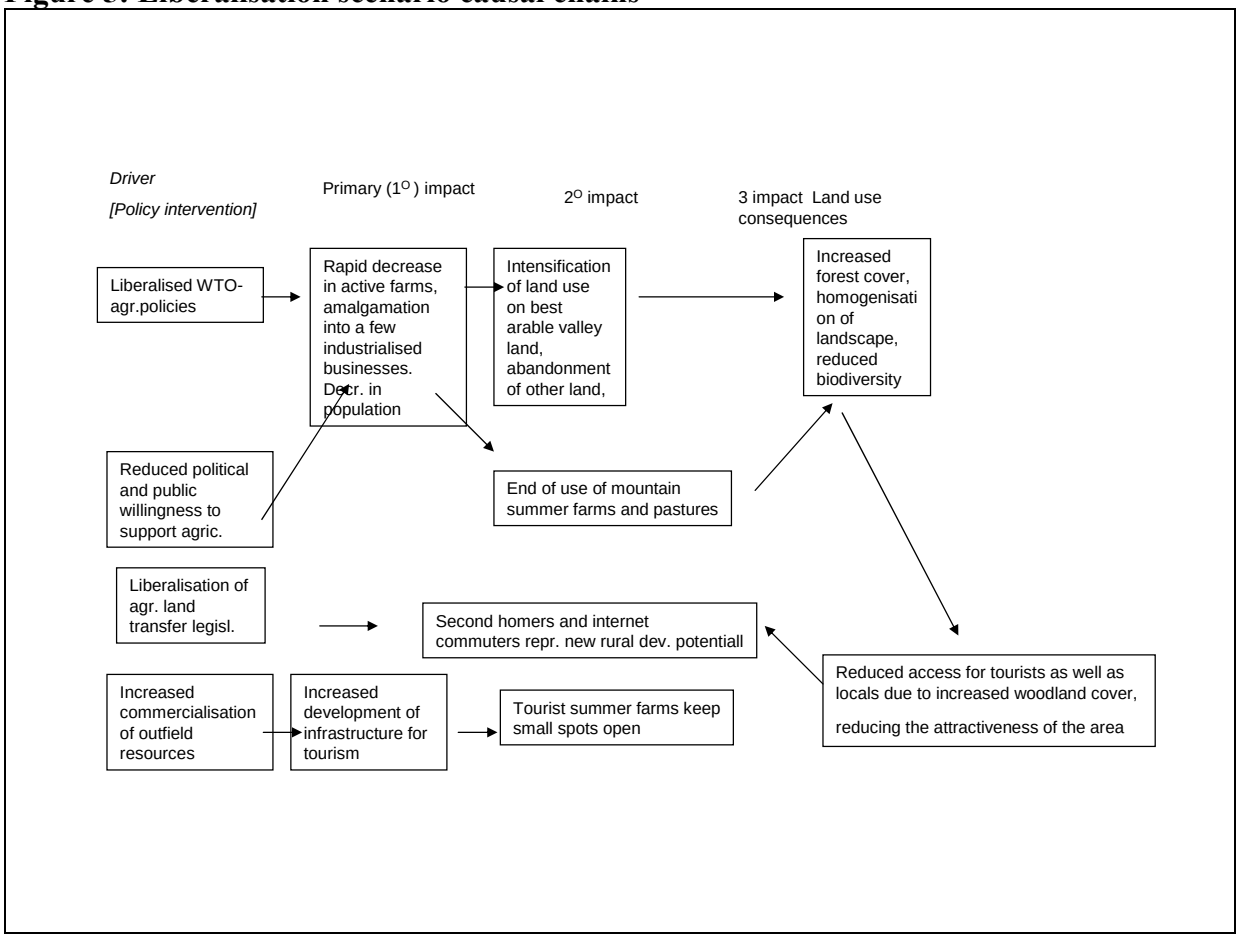
6.2. Liberalisation

The assumptions are that a full agricultural liberalisation scenario would include removal of agricultural support, trade and toll barriers, removal of cultural landscape payments and other types of environmental payments that today are paid over the Ministry of Agriculture's budget. Several of the land use related acts and regulations are directly coupled to agricultural policies, aiming at benefiting agriculture and securing family farms, agricultural structures and production. This legislation was already under revision in the beginning of the 21st century, and were given up before 2010 as the agricultural policies they were serving no longer existed. If the February and slightly revised March 2003 WTO-proposal is to become the final result of the WTO-negotiations, estimates show that most Norwegian farmers will face negative income, and would mean the close down of most farms within the study area.

There will be strong concentration of agricultural production to the best areas (around the Oslofjord, the Trondheim fjord and the Stavanger-Jæren region in the southwest), with a few, large farms in each region. Animal husbandry would probably return back to the central Oslofjord area (*Østlandet* – South Eastern Norway), away from the mountain, forest and coastal areas as well as Northern Norway. These areas will se rapid decrease in active farms.

Photo 8: Visualisation of the Liberalisation scenario

Figure 5: Liberalisation scenario causal chains



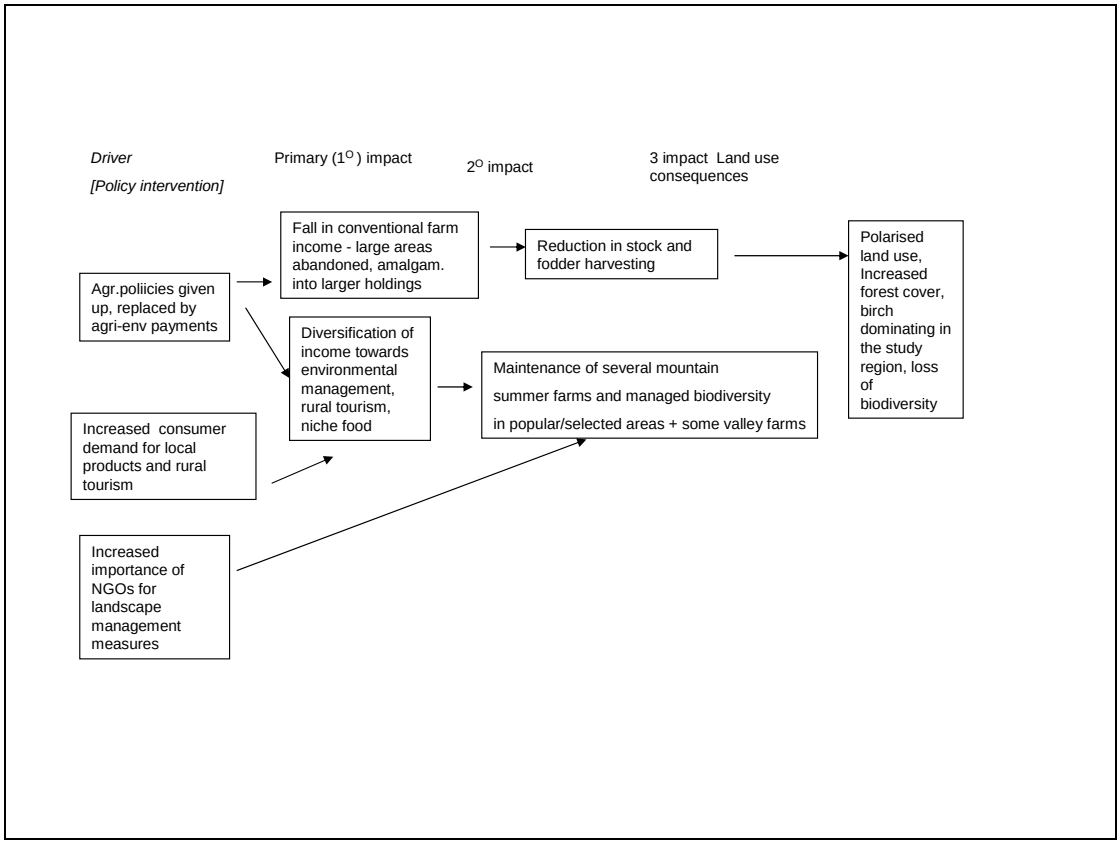
6.3. Managed Change for landscape and biodiversity

(Managed agro- and non-agrobiodiversity) - MCB

This scenario rests on the back of the agricultural liberalisation scenario, and we are thus assuming the removal of all support to agriculture. However, there will be increased public support for biodiversity, wild nature *and* semi-natural agriculturally linked biodiversity. Subsidies to the agricultural sector is only justified as 'farm biodiversity' and ‘cultural landscape ‘payments that are paid from the Ministry of Environment, and may be seen as a ‘preserve-the-best-forget-about-the-rest’-scenario.

Photo 9 : Visualisation of the MCB scenario

Figure 6: Managed Change for Biodiversity scenario causal chains



6.4. Wilding

This scenario is based on stricter conservation and environmental legislation, as well as removal of agricultural subsidies. So while under the 2) Liberalisation scenario some farmers will have the possibility to expand and develop large scale, industrialised units under this 3b) Wilding scenario, the conservation and environmental legislation will set obstacles for intensification and very industrialised production methods.

There will be higher demands for investments for controlling leakage of manure, silage etc; animal welfare organisations will lead to stricter demands for herding (to avoid sheep being taken by predators), which will increase the costs for farmers (wages are very high in Norway due to high costs of living and relatively low degree of wage differentiation), further, more conservation areas with stricter conservation regulations will also reduce farmers' possibilities for farming and utilizing the area in different ways. This will lead to more farmers give up. Without any types of landscape management incentives, land will increasingly become abandoned, leading to a 'wilding' process of spontanous bush and forest recolonisation.

The stakeholders rejected this scenario, however, we have summarised the various comments and reactions that emerged regarding this scenario at all the three stakeholders meetings:

Landscape and biodiversity, livelihood and social aspects
From a biodiversity point of view some thought the wilding scenario may lead to increasing numbers of predators, however, in general they thought the biodiversity values would be reduced due to forest recolonisation. The landscape values would decline strongly, and access would get increasingly difficult.

Although many tourists are coming because of the mountains, the stakeholders believed that the cultural landscape with still open land and its traditional buildings were a major part of the experience visiting this area, and that rewilding would decrease the scenic qualities and potential for tourism related income.

Although actually none of the participants said they felt there should not be any predators in Norway in general or in their area, there was little interest in seeing their numbers increasing locally.

The potential for wilderness tourism and extreme tourism was pointed out by a couple of the stakeholders, and also the attractiveness and potential of predators was pointed out by one person. However, also these informants saw the forest recolonisation of the cultural landscape as negative for rural livelihoods and the landscape. The remaining job potential after the decline of farming and the cultural landscape was considered low.

Visualisations were not made for the Wilding scenario, it would, however, be relatively similar to that of liberalisation, but with even less farmed and open areas.

6.5. Environment and solidarity

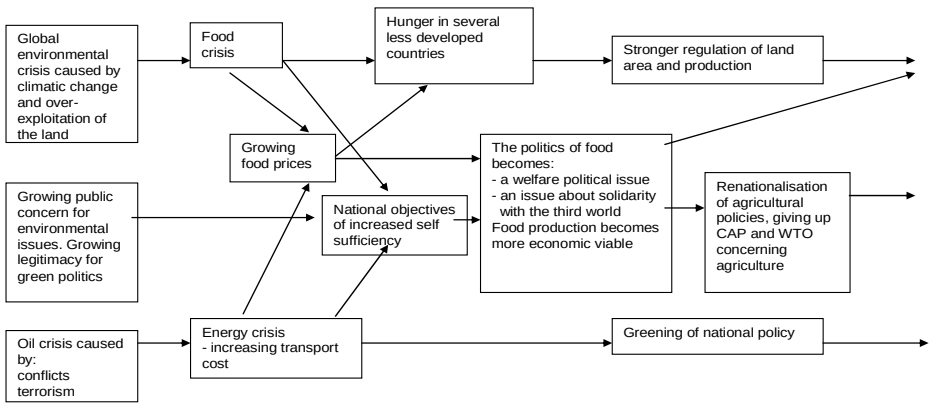
The discussions regarding the above presented scenarios, in which the stakeholders actually rejected them all, showed a general understanding of the global environmental situation and situation of lack of equity and fairness, also in terms of the possibility for production of food for own consumption in the developing world. This led to the development of an alternative scenario, termed Environment and Solidarity scenario.

This scenario is based on the assumption that an international crisis will come as a consequences of environmental problems leading to the degradation of soil in many important food producing countries, increased environmental awareness, stricter environmental regulations, increased oil/fuel prices leading to much higher transport costs, and increased demands for increasing self sufficiency with food stuff through utilising local resources. For Norway this means utilising local grass resources for dairy and beef production through low-intensive, environmentally friendly farming methods, meaning incresed demand for taking into use again previously abandoned and marginalised farm land. There will also be an increased level of local processing.

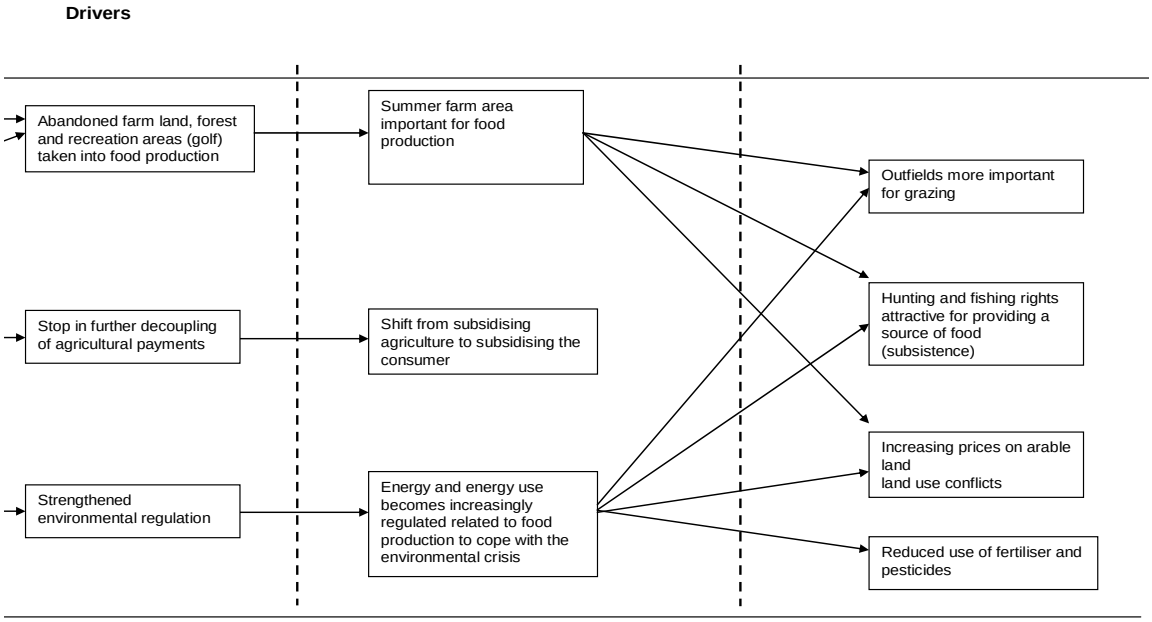
Visualisations were not developed for this sceneario, it would however, mean a more open landscape with more land utilised for grazing, hay cut as well as grain production, and less forest and scrubs.

Figure 7: Environment and solidarity scenario causal chains

Meta drivers (the overall picture)



National and local level



7. BioScene Scenario Assessments

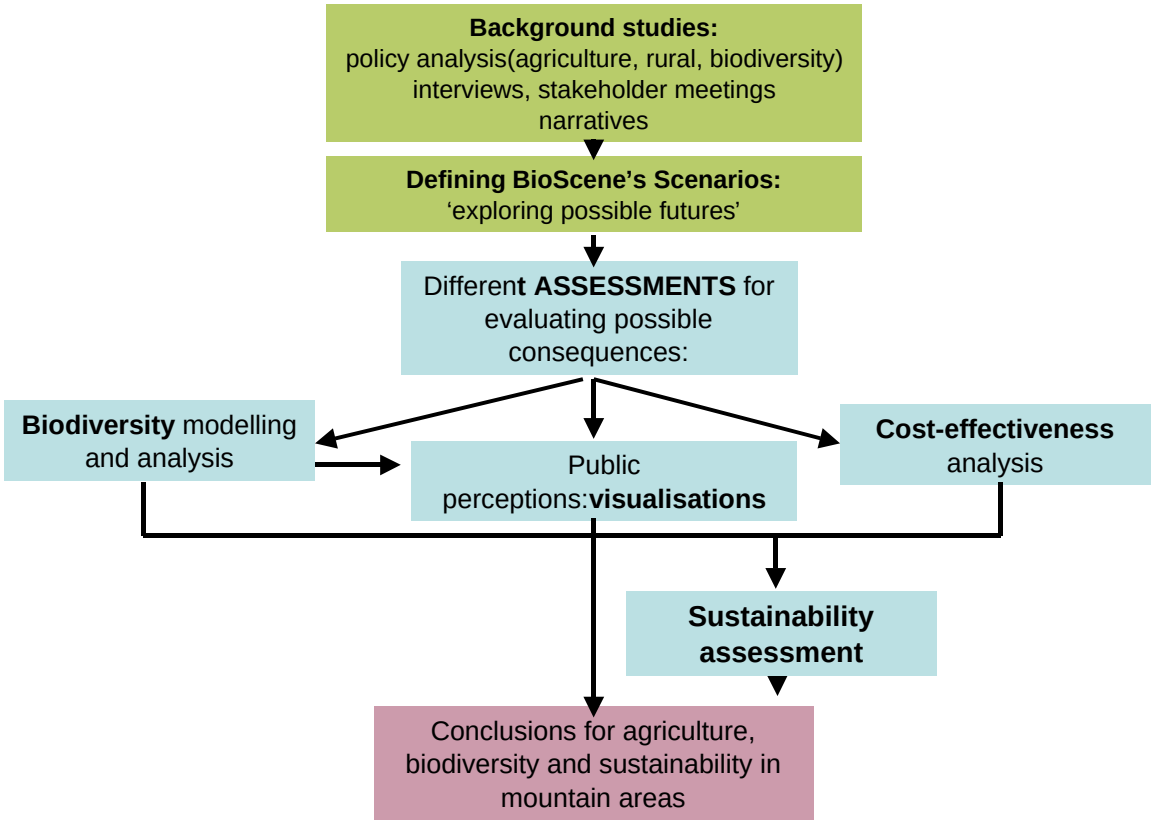
7.1. Introduction

The implications of the BioScene scenarios have been assessed using a range of approaches and techniques:

- Sustainability Assessment matrix-based evaluation, identifying the contribution or conflict with sustainability objectives, and including stakeholder input
- Biodiversity (D21), assessing the likely consequences of the scenarios on selected species and habitats
- Socio-economic research methods applied at the Stakeholder Meetings, including deliberative group discussions, a structured questionnaire, landscape scenario visualisation using photo manipulation, and rating tasks. Thematically this research focused on stakeholders' perceptions and assessments of landscape changes.
- Cost estimates (D9), estimating the amount of agricultural support to the study area.

The following sections will present the results of the SA matrix-based evaluations and when appropriate, will also refer to the results of the other BioScene assessments (see Figure 8).

Figure 8 The different assessments of BioScene's Scenarios



(Source: Sustainability Assessment Team, 2004)

7.1.1. Sustainability Assessment

For each scenario the drivers which have been identified as likely to have the greatest influence and their associated causal chains were assessed against the objectives and the results recorded in the initial assessment matrices. This assessment involved the BioScene country project team using their expert judgment to decide how each driver (and/or causal links) relates to an objective and the related indicators: whether it will contribute positively to a particular objective or whether it is likely to conflict, compared to the trends outlined in the baseline information over the timeframe for the scenarios ie to 2030.

To promote consistency, the assessment was made using a 5 point scale supported by comments explaining the rationale behind a particular scale (as necessary):

- ++ (green) – driver makes a major positive contribution
- + (light green - driver makes a positive contribution
- 0 (white/blank) - driver has no significant contribution
- - (pink) - driver conflict with objective
- -- (red) - driver is major conflict with objective
- Uncertainty about the likelihood of an impact - shown in yellow.

The final column in the initial assessment matrices (see sections 7.2.1, 7.3.1 and 7.4.1) contain the aggregated results of the effects of each scenario on each of the objectives and is the starting point for the Scenario Comparison Matrix (see section 8), which

compares the effects of the different scenarios against the same objectives. The aggregation of the effects of different scenarios is strictly a qualitative description, rather than an attempt to express impacts quantitatively.

To introduce further rigour the matrices were initially completed separately by the BioScene country Partner and by the BioScene SA Team. The results were then compared and discussed to enable the production of combined versions of the matrices, key elements of which were presented and discussed with the stakeholder panel.

7.1.2. Other evaluations

Biodiversity evaluation

The research carried out for the ecological work package 350 of Bioscene (Wehn 2005a,b) has provided detailed information on the potential impacts of the scenarios on species and habitats (see table 1). Analysis of this information supported the expert assessment used to undertake the SA matrix analysis.

Table 5 Effect assessment on biodiversity consequences.
Colours indicate the effect; dark green: very positive, green: positive, yellow: no effect, pink: negative, red: very negative on the species and the sum on the biodiversity (=biodiversity consequences) due to the three scenarios (Sølvi Wehn)

	Business as usual	Liberalization	Agri-environmental
Pine (abundant sp)	Positive	Positive	Positive
Birch (abundant sp)	Positive	Positive	Positive
Primrose (rare sp)	Negative	Very negative	Very positive
Pulsatilla (abundant sp)	Negative	Very negative	Negative
Junipers and Willows (abundant sp)	Negative	Positive	No
Greater Duck (threatened sp)	No	No	No
Golden Eagle (threatened sp)	No	No	No
Biodiversity consequences	Negative	Very negative	Positive

The different selected species is affected differently by land-use. The forest species Pine and Birch has potentially habitats covering the whole area of the summer-farm valleys. They have however been regulated by grazing animals (first wild ungulates later also domestic animals) and other land use related activities ever since their invasion and the landscape has long been a mosaic of open and forested patches. The bush species Junipers and Willows establish in open habitats after disturbances (such as grazing) before the tree species succeed them. Also these species has been regulated by grazing but tree and bush species have never been too heavily exploted to cause any threats towards forest existence. (However, an old pine forest in Sjodalen was protected in 1983).

The herbs Primrose (*Primula scandinavica*) and Pulsatilla (*Pulsatilla vernalis)* included in the analyses are dependent upon open habitats to establish. If all land-use is abandoned there might naturally be too few open patches and the distance between them might be too long for dispersal and establishment of new individuals. Today these species are not regarded as threatened, which maya be due to little attention in Norway on semi-natural species.

The bird species included in the species list were concluded not to be influenced by summer-farm practises. The Greater Duck do occur in wetlands in a part of the study area and this wetland has been managed as a reserve since 1990. Individuals of Golden Eagle do also occur in Eastern Jotunheimen, but their nests are at higher elevation (above the tree-line) than the summer-farms and are thus not directly affected by agricultural land-use.

The overall effect on biodiversity is worst in a scenario where there is no agricultural land-use. To reverse the trend of biodiversity decline in Eastern Jotunheimen, farming with grazing by domestic animals need to be maintained, and summer-farms with abandoned use, should be revived.

Socio-Economic evaluation

A comparison of government funding for agriculture across the study areas of the BioScene project was carried out (Haddock et al, 2005), and the Norwegian results of this are referred to here.
The research carried out in the socio-economic work packages provided detailed insight into stakeholders' perceptions of landscape changes and their assessments of visual, socio-economic, cultural and ecological aspects of the scenarios. A rating exercise was used to assess the acceptability of the three first scenarios (S1 - Business as Usual, S2 - Liberalisation and S3 - Managed Change for Biodiversity and Landscape) to stakeholders.
Further, the stakeholders were to evaluate various narratives, and finally, during the third stakeholder meeting they were to give feedback on the sustainability assessments that the researchers had developed for four scenarios, including the stakeholders' own Environment and Solidarity scenario.

1. Rating of the scenarios

The stakeholders' ratings of the scenarios, i.e. how the liked/disliked the visualisation of the scenarios, presented below.

Photo 10: Current situation and three scenarios for Sollia

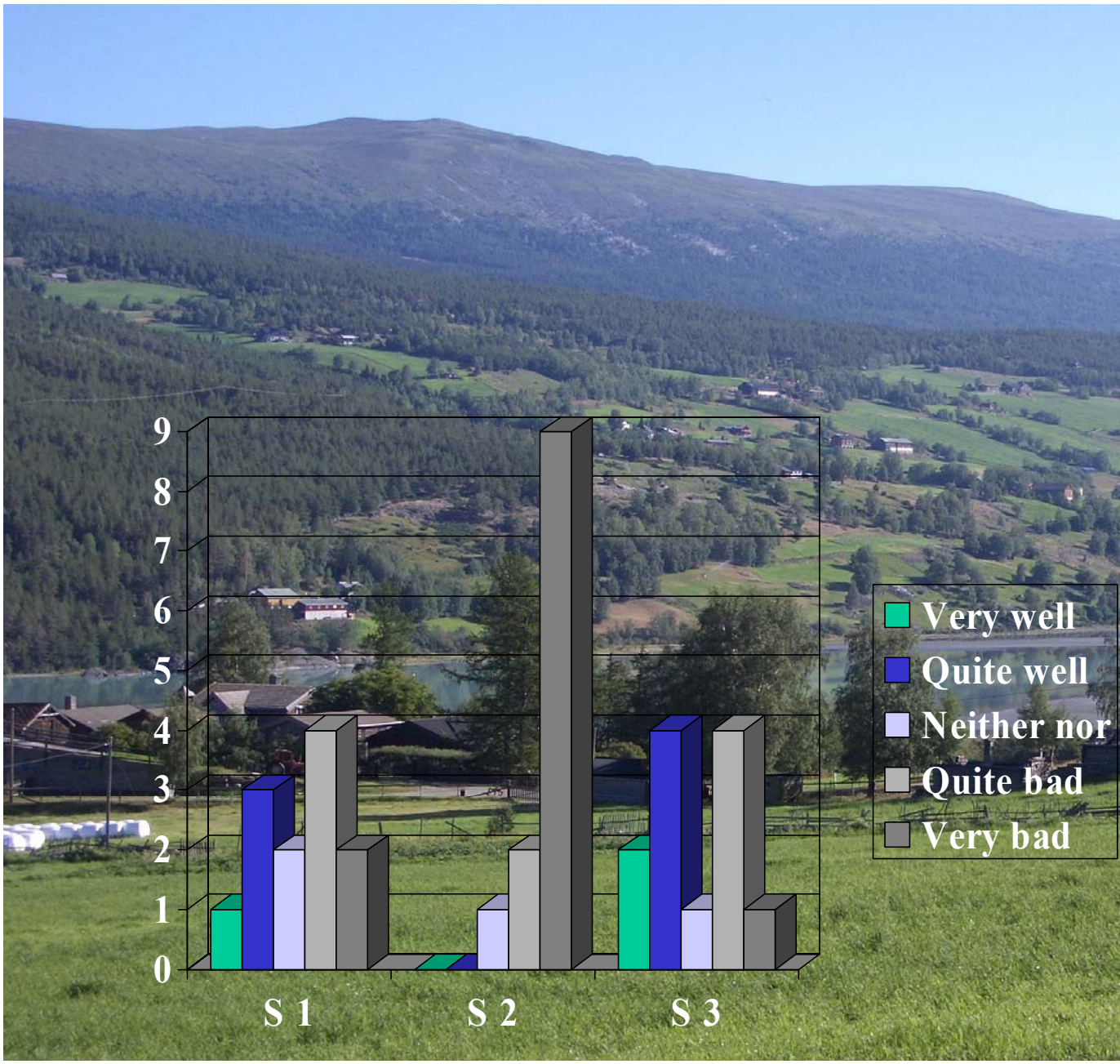


Figure 9: Stakeholders like/dislike of the visualisation of the scenarios for Sollia

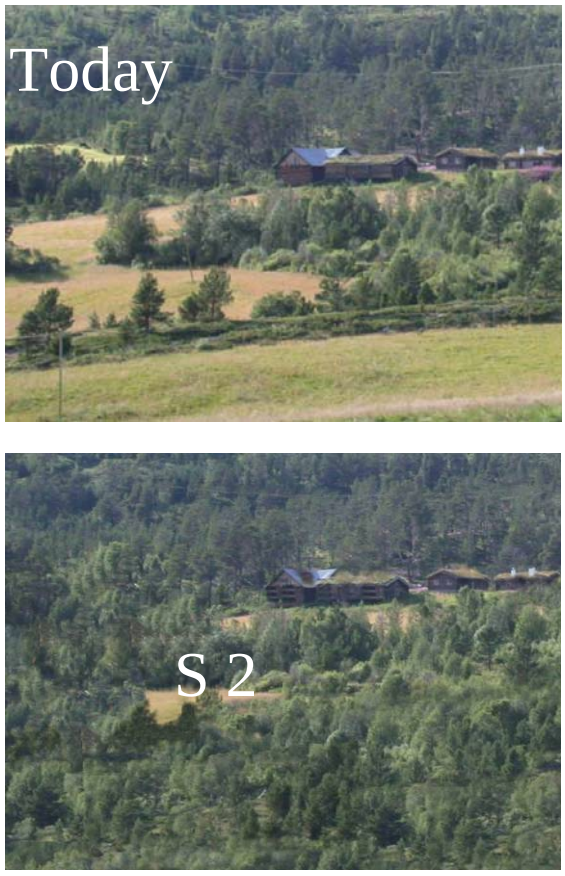


Photo 11: Current situation and three scenarios for Austre Hindsæter summer farm

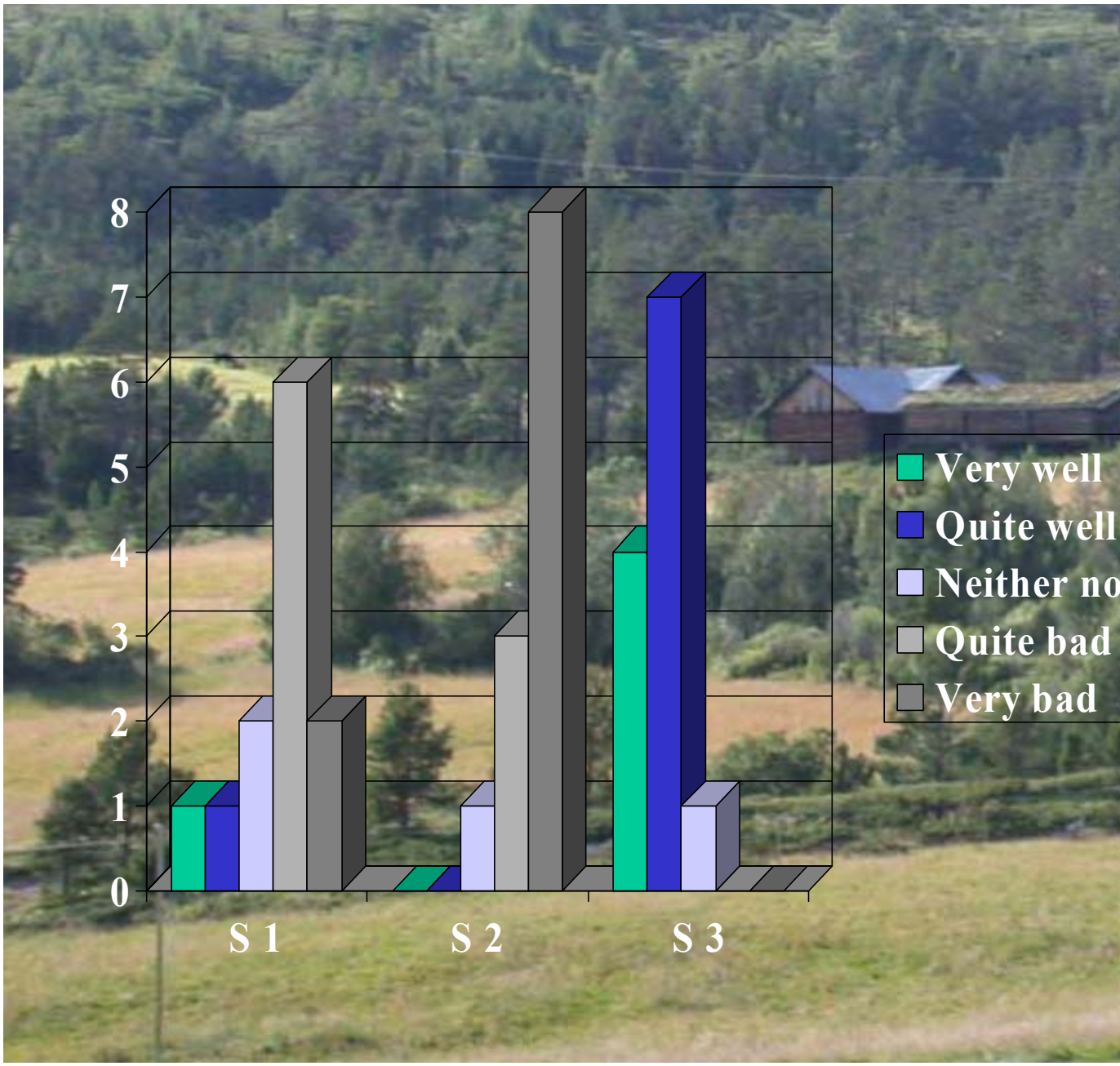


Figure 10: Stakeholders like/dislike of the visualisation of the scenarios for Austre Hindsæter summer farm

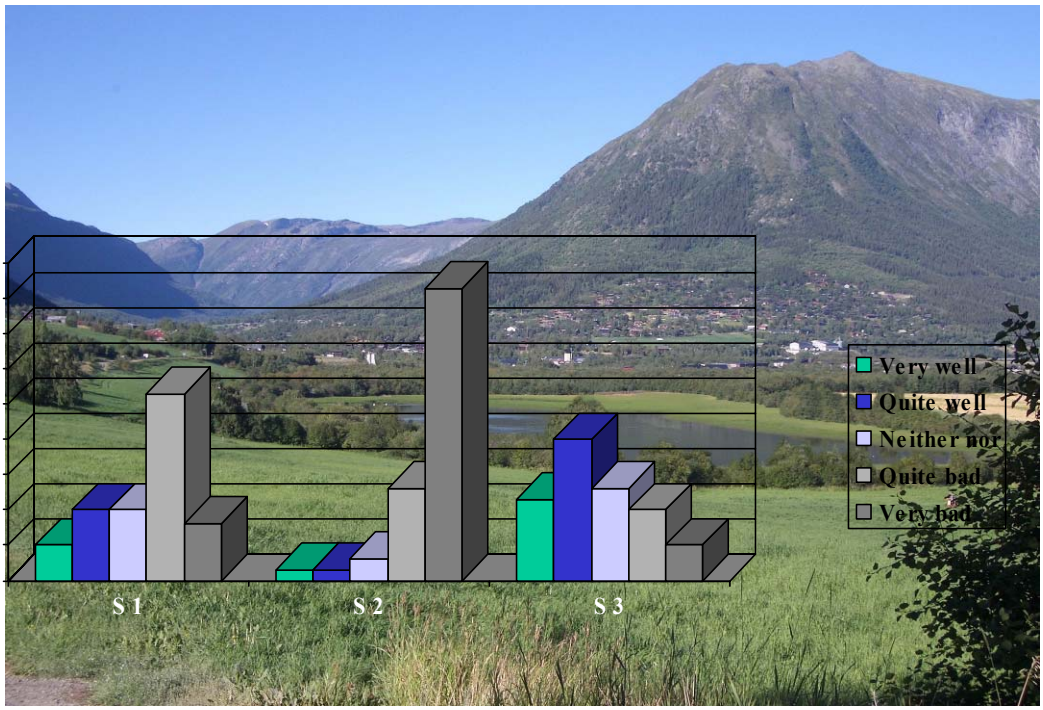


Figure: 11: Stakeholders overall like/dislike of the visualisations of the three scenarios

2. Rating of narratives

The stakeholders were to respond on five different narratives on how the landscape in the study area has developed and is going to develop in the future.

(The narratives are only briefly summoned here.)

a) The rational and robust farming system narrative

"A good and efficient Norwegian agricultural production is necessary for producing sound and healthy food, and to contribute to employment and settlement. A beautiful cultural landscape is a positive side effect, but producing landscapes for its own good is meaningless. People in the world are starving, it is therefore necessary to have an efficient agricultural production in which we cover a substantial part of our food needs ourselves. Increasingly rationalised farming will make us more robust to meet the future, and we will continue to adjust. However, if Norwegian agriculture and rural communities are to survive in the future, the society must continue to ensure the existence of clever farmers a certain agricultural support."

Agree highly	Quite agree	Neither/nor	Quite disagree	Highly disagree
6	5	1		

b) The small-scale farming narrative

"The Norwegian agriculture is environmentally friendly, producing landscapes, cultural heritage, biodiversity, recreational areas, settlement and employment in rural areas. Especially the summer farm areas are of great importance. In order to maintain the multifunctionality of Norwegian agriculture, small-scale, environmentally friendly farming must be maintained, and it is the Government's responsibility to secure these farms. The payments should be changed more towards environment and landscape support."

Agree highly	Quite agree	Neither/nor	Quite disagree	Highly disagree
6	6			

c) The commercialisation of cultural landscapes and heritage narrative

”The area has beautiful villages, cultural landscapes and especially summer farm landscapes with rich historical traditions, and good potential for development of farm tourism, summer farm tourism, nature tourism, Quality niche food etc. Good and innovative farmers and others willing to invest and try, there are good possibilities in this new market that is opening. ”

Agree highly	Quite agree	Neither/nor	Quite disagree	Highly disagree
1	**6**		**3**	

(2 did not respond on this)

d) The productivist forest enterprise narrative

”With its forest resources, good foresters and traditions, the region should see the potential in developing its forest resources much better than what has been true in the recent years. Poor economy in agriculture and abandonment of agricultural land represents a possibility for developing the forestry sector much better. Productive forest is beautiful forest.
Further, the forest and outfields represent good possibilities for letting out hunting and fishing, which has a potential for related business development. The many new conservation designations in recent years make it more difficult for rual communities to live of the forest resource.”

Agree highly	Quite agree	Neither/nor	Quite disagree	Highly disagree
2	**1**	**2**	**4**	**3**

e) The liberalisation and wilding narrative

”Close down of agriculture is no tragedy for Norway nor for Vågå and Lom. On the contrary, it represents a new possibility for regaining some of the wilderness that was lost to industrialisation and modernisation. This will promote biodiversity and
The situation for many threatened species, inclusive the four large predators. Sensitive wilderness tourism based on knowledge about nature may generate new income. Although regrowth lead to that some species disappear, this is a natural process, and it is artificial to try to maintain it through agricultural subsidies, and it is much more important to maintain the wild species.”

Agree highly	Quite agree	Neither/nor	Quite disagree	Highly disagree
			3	**9**

3. Cost Effectiveness

The cost-effectiveness is here related to the current expenditures for agriculture in the study area. Based on 2004-figures, for Scenario 1, Business as Usual, the total costs in terms of payments to farmers are estimated at about 11 mill. euro (€ 11 331 470). In terms of saving money, the Scenario 2, Liberalisation scenario, would be the most cost-effective one, as all agricultural payments would be removed, and the savings would represent the same amount as the total agricultural payments today (€ 11 mill.). For Scenario 3, Managed Change for Biodiversity and Landscape, it is suggested as unrealistic that the same amount would be used for biodiversity and landscape payments. Fifty per cent would also be a very high estimate, but we have here defined that as a precondition for that scenario, i.e. euro (€ 5,5 mill.) is the cost of Scenario 2. So in terms of monetary costs, this would be a more efficient alternative than Scenario 1, but less efficient than Scenario 3.

The stakeholders did not relate to the cost-effectiveness of the various scenarios. However, they made it very clear that unless some type of active farming remained, linked to the production of beef and milk and keeping up grazing, it would be unrealistic to maintain landscape and biodiversity in the area. Further, the whole infrastructure of the area was seen as dependent on agriculture.

7.2. Business as Usual

This Section presents the results of the matrix-based assessment done as part of the SA process for BioScene. It also records the most significant aspects raised by the stakeholders in the two meetings (on the sustainability objectives and on the SA matrices), and relates the outcome of the matrix assessments with relevant findings from the ecological and socio-economic investigations, including the assessment of visualisations of changes to the landscape resulting from the three scenarios.

7.2.1. Overview

Business as Usual		Driver/chain 1 – Decreased agricultural payment	Driver/chain 2 – Increased import of foodstuff	Driver/chain 3 – Increased agri-envtal payments	Driver/chain 4 – Gradual liberalisation of agricultural land legislation	Driver/chain 5 – Continued consumer demands for sport, hunting & fishing	Aggregated results per scenario
Biodiversity	**O1 -** Ensure viable populations of species sensitive to agricultural decline	- -	- -	+ +	-	0	- -
	O2 - Ensure viable populations of other naturally occurring species	?	0	0	0	? -	0
Sustainable natural resource management	**O3 -** Ensure sustainable use of outfield resources linked to fishing, hunting, grazing, forestry, recreation and tourism	-	-	+ +	-	+	-
		?	?	?	? +		? +
	O4 - To reduce pollution and implement pollution prevention techniques. Agriculture has a special responsibility for reducing leakage	+	+	? +	0	? -	+
	O5 - To encourage harvesting and processing of natural resources is managed at local level to reduce transport	-	- -	+	-?	- -	-
	O6 - Develop alternative energy sources, and better utilisation of local wood	-	0	+	?	0	?
Rural and economic development	**O7 -** Maintain family farming, incl. mountain summer farming and a varied animal husbandry as important economic activities based on local grass resources	- -	--	+	--	+	- -
	O8 - To promote the development of local food brands/niche food products	-	--	?	0	+	-
	O9 - Develop viable business networks for mountain summer farming, local foods and tourism	- -	-	? +	0	+	?
	O10 - To upheld forestry activities to maintain forestry as a source of income and for providing timber to local sawmills	0	0	0	? +	0	?
	O11 - Develop alternative forest products	0	0	+	0	+	+

	O12 - Promote the establishment of service businesses for the private sector, including tourism businesses	? +	?	? -	+	+	+
	O13 - Promote the establishment of tourism based on the natural and cultural resources of the area, incl. mountain summer farms	-	-	+	0	+	?
	O14 - To create jobs for highly educated people so the local community is able to offer locals youth and incomers work after ended education	-	0	+	+	+	+
Social development	**O15 -** To encourage all, but especially the young, to actively participate in outdoor activities using the nature	0	0	+	0	+	0
	O16 - To ensure that all groups have an influence in decision making processes and a just share in the distribution of access to services and common goods	0	0	+	0	-	0
	O17 - To develop a diversity of cultural activities as an asset for life quality and attractiveness of the community	-	-	+	0	+	0
Institutional capacity for SD	**O18 -** To enhance participation and co-operation of local groups, esp. youths, children and women, organisations and interests	0	0	0	-	-	-
	O19 - To strengthen the co-operation between farming/rural communities and public agencies, esp. environmental authorities and organisations	?	-	+	0	0	0
	O20 - To make the local authorities capable to take more responsibility concerning the governance of local resources	-	-	+	0	0	-

Table 6 Matrix based assessment of BAU

The main drivers for this scenario were: decreased agricultural payments, increased import of foodstuff, increased agriculture-environmental payments, gradual liberalisation of agricultural land legislation, and continued consumer demand for sport, hunting and fishing. Their implications for the sustainability themes and objectives can be summarised as follows:

- **Biodiversity:** a generally negative effect with the objectives;
- **Sustainable natural resources:** a generally balanced contribution;
- **Rural and economic development:** negative effects related to the maintenance of family farming, which again has negative effects for the whole community, due to its relative dependence upon agriculture;
- **Social development:** no significant contribution overall, however, it is uncertainty linked to the possible negative effects of agricultural decline if that cannot be compensated by other types of development;
- **Institutional capacity:** some conflict with the objectives, although in general very little contribution.

In general the BAU scenario does not contribute positively towards the achievement of the study area's sustainability objectives. The objectives which appear to be the most negative, relate to biodiversity, sustainable natural resource management and rural and economic development, in particular O1 (To ensure viable populations of species sensitive to agricultural decline), O5 (To encourage harvesting and processing of natural resources is managed at local level to reduce transport) and O7 (To maintain family farming, including mountain summer farming and a varied animal husbandry as important economic activities based on local grass resources). Although there are a few areas that contribute positively (in particular O11, O12, and possibly for O14), overall the implications of BAU are generally negative.

Better and expanded landscape management schemes may improve the situation for biodiversity (O1) in certain areas. Further, there is a potential for the development of bioenergy (O5, O6), which may be seen in relation to landscape management, and keeping the landscape open, which would be positive for recreation and access (O15).

7.2.2. Stakeholder views

None of the stakeholders saw this scenario as a sustainable one for the study area, neither in terms of biodiversity and landscape nor for livelihoods and cultural aspects. So the degree of satisfaction with the current situation and trends was low; there was a general pessimism expressed by all stakeholders.

7.2.3. Other evaluations

The key results of the other evaluations used for the sustainability assessment can be summarised as follows (see 7.2.1):

Biodiversity; negative.

Socio-economic; negative, however this depends strongly on to what extent new businesses and jobs may be developed.

Cost effectiveness; Negative (€ 11 mill.).

7.2.4. Conclusions

Biodiversity and Landscape
Regarding the prospects for biodiversity and landscape, all informants were negative and pessimistic. With declining number of active farmers, the landscape was going through a very negative development with abandonment of summer farms and outfields, as well as margins and edges around the main farms, leading to regrowth and forest re-colonisation.

Regarding biodiversity at species level, several stakeholders were pointing out certain flowers that were becoming more rare due to reduced grazing and hay cut. Some also pointed out the plants that the biologists have identified as threatened in the area.

In general, other species that were threatened were not seen as having any positive or negative dependence on or relation to the farmed landscape. For example would reduction in farming probably not lead to any increase in predators (lynx and wolverines are common while bear and wolves are rare in this area. As the latter two prey on sheep, farming in terms of stock keeping may be an advantage for them).

In general it is the loss of or reduced scenic qualities that stakeholders regret the most. *"The birch is like weed"*, and *"the landscape is getting darker and uglier"* were some descriptions of the development that all were regretting, also those with no connection to farming.

Another, practical aspect of this is that access is getting more difficult due to shrubs taking over in several areas, including the mountain areas around the summer farms that are popular for hiking and cross country skiing for locals.

Livelihoods and cultural aspects
However, it may not only be the scenic qualities per se, but also the fact that it symbolises a whole sector and way of life with long traditions that is becoming marginalised. It was expressed considerable concern regarding decline in agriculture and its consequences for the rural community, due to its dependency on agriculture. (16-18 per cent of the population is working in agriculture, in addition comes the multiplier effect, which is considerable.) So at the same time the social and cultural values and the viability of the rural community as a whole is threatened, and the increasing forest and scrub cover visualizes this development.

All pointed out that continued farming was needed, but some of the non-farmers also had some critical comments to the way farming was carried out due to the subsidy system.

Negative developments in some of the mountain summer farm areas during the 1970s were pointed out, due to subsidies some of these got higher standard road connection, and mires were cultivated to increase the fodder production, including transport and use of fertilizers etc., while some summer farms were closed down. The poor societal economy in such activities at 1100 masl was pointed out, and further, that these intensified land uses have reduced the use of the outfields for grazing, contributing to negative landscape changes and loss of species.

Positive aspects of the major agri-environmental scheme STILK (now renamed SMIL) was pointed out; it has led to the restoration of numerous traditional farm buildings, including some mountain summer farms and fences. Although these were single objects,

there had been a high level of activity and improvement in the area that was visually very noticeable.

Also several overgrown pastures have been restored due to this scheme, partly by the farmers alone, partly together with organisations etc. However, there was no belief in that the major landscape changes could be handled by such measures or by other groups than farmers in any scale that would reduce these ongoing processes of landscape change.

It was not directly mentioned, but clearly several of the farmer stakeholders believed their businesses would survive somehow by increasing off-farm income but still remain in the farming business. Because farmers see that agricultural subsidies are reduced or changed, and also because the political signals from the Ministry of Food and Agriculture are very much encouraging diversification, mainly rhetorically, but also through various types of grants, their innovative abilities are being challenged, which may contribute in making some rural winners on the one hand, but also more losers among a large group of farmers that do not have the necessary resources, neither in terms of economic resources or socio-cultural capital. So although the general attitude is pessimistic for the long-term sustainability of the community and the landscape as a whole, most of the stakeholders foresee some type of farming related future for themselves within BAU. So, are the farmer stakeholders in this group the winners of agricultural restructuring? There are indications that those who agreed to participate as stakeholders at the meetings are relatively resourceful or at least more outgoing types with a certain self confidence and some innovative abilities. Most of the farmer stakeholders or someone in their household, were engaged in other types of income or diversification. However, all farm businesses rely on a continued relatively high level of agricultural subsidies. The households' total resources, usually meaning the spouses' (usually the wives') income, as well as their own possibilities for off-farm income, are important for most farms.

In general we believe that the pessimistic attitudes that were being expressed was very much related to the fact that they saw neighbours giving up farming and they were working more to maintain their income themselves. A very important factor is to have a network of farming colleagues, to have someone to discuss farming issues and problems with, to know that there are someone there to ask for assistance and so on. When there are fewer farmers left, this social and professional network is eroding. What we have observed in this area, and also elsewhere in Norway, is the issue of the "disappearing middle", the intermediate farms that have no time or resources to go into diversification etc. This phenomenon has also been described in the US (Kirschenmann et al, 2005).

7.3. SA of Liberalisation

This Section presents the results of the matrix-based assessment done as part of the SA process for BioScene. It also records the most significant aspects raised by the stakeholders in the two meetings (on the sustainability objectives and on the SA matrices), and relates the outcome of the matrix assessments with relevant findings from the ecological and socio-economic investigations, including the assessment of visualisations of changes to the landscape resulting from the three scenarios.

7.3.1. Overview

Liberalisation		Driver/chain 1 – Liberalised WTO agr policies	Driver/chain 2 – Reduced political willingness to support agriculture	Driver/chain 3 – Liberalisation of agricultural land legislation	Driver/chain 4 – Increased commercialisation of outfield resources	Aggregated results per scenario
Biodiversity	**O1 -** Ensure viable populations of species sensitive to agricultural decline	--	--	-	+	--
	O2 - Ensure viable populations of other naturally occurring species	0	0	0	0	0
Sustainable natural resource management	**O3 -** Ensure sustainable use of outfield resources linked to fishing, hunting, grazing, forestry, recreation and tourism	-	- ?	- ?	? +?	? -
	O4 - To reduce pollution and implement pollution prevention techniques. Agriculture has a special responsibility for reducing leakage	- +	- +	- +	0	-
	O5 - To encourage harvesting and processing of natural resources is managed at local level to reduce transport	--	--	-	+	--
	O6 - Develop alternative energy sources, and better utilisation of local wood	0	0	0	-?	0
Rural and economic development	**O7 -** Maintain family farming, incl. mountain summer farming and a varied animal husbandry as important economic activities based on local grass resources	--	--	--	?	--
	O8 - To promote the development of local food brands/niche food products	--	--	0	+	-
	O9 - Develop viable business networks for mountain summer farming, local foods and tourism	?	?	? +	+	? +
	O10 - To upheld forestry activities to maintain forestry as a source of income and for providing timber to local sawmills	0	0	0	0	0
	O11 - Develop alternative forest products	0	0	0	? +	0
	O12 - Promote the establishment of service businesses for the private sector, including tourism businesses	+	+	+	+ +	+
	O13 - Promote the establishment of tourism based on the natural and cultural resources of the area, incl. mountain summer farms	--	-	0	+ +	-
	O14 - To create jobs for highly educated people so the local community is able to offer locals youth and incomers work after ended education	-	0	+	+	+

Social development	**O15 -** To encourage all, but especially the young, to actively participate in outdoor activities using the nature	-	0	0	+	0
	O16 - To ensure that all groups have an influence in decision making processes and a just share in the distribution of access to services and common goods	0	0	0	-	-
	O17 - To develop a diversity of cultural activities as an asset for life quality and attractiveness of the community	--	--	-	+	--
Institutional capacity for SD	**O18 -** To enhance participation and co-operation of local groups, esp. youths, children and women, organisations and interests	-	-	-	-	-
	O19 - To strengthen the co-operation between farming/rural communities and public agencies, esp. environmental authorities and organisations	-	-	0	0?	_
	O20 - To make the local authorities capable to take more responsibility concerning the governance of local resources	--	-	0	-	-

Table 7: Matrix based asssessment of the Liberalisation scenario

The main drivers for this scenario were: liberalised WTO agricultural policies, reduced political willingness to support agriculture, liberalisation of agricultural land legislation, and increased commercialisation of outfield resources. Their implications for the sustainability themes and objectives can be summarised as follows:

- **Biodiversity:** a generally negative effect with the objective, although no particular contribution in terms of ensuring viable populations of other naturally occurring species;
- **Sustainable natural resources:** a generally negative contribution;
- **Rural and economic development:** a generally negative contribution;
- **Social development:** a negative contribution;
- **Institutional capacity:** overall conflict with the objectives.

In general the Liberalisation scenario does not contribute positively towards the achievement of the study area sustainability objectives. The majority of the objectives are negative. The most negative being O1 (To ensure viable populations of species sensitive to agricultural decline), O5 (To encourage harvesting and processing of natural resources is managed at local level to reduce transport), O7 (To maintain family farming, including mountain summer farming and a varied animal husbandry as important economic activities based on local grass resources), O8 (To promote the development of local food brands/niche food products), O17 (To develop a diversity of cultural activities as an asset for life quality and attractiveness of the community). The only areas with some positive contribution relate to economic development, in particular O12 (To promote the establishment of service businesses for the private sector, including tourism businesses) and O14 (To create jobs for highly educated people so the local community is able to offer local youths and incomers work after ended education). Overall the implications of Liberalisation are negative.

Are there any possible measures/actions which could be taken to lessen the negative effects on objectives?
For O1, this would be very difficult. One option could be totally new, very large scale schemes that would have to be designated by the Ministry of Environment, which does not have any budgets for cultural landscape management. Steered reindeer grazing could possibly be a solution for maintaining some of the threatened plants and for keeping some of the higher land open, but this would only solve a small part of the biodiversity challenges. For O5, the development of local bio-energy plants utilizing scrubs and trees for bio-energy could be an option. For O7, this scenario would be devastating, however, for O8 there may be a potential linked to developing exclusive, high priced niche products. However, the potential market for high priced products will probably be limited. Regarding O17 (To develop a diversity of cultural activities as an asset for life quality and attractiveness of the community) the area has a certain potential. The area already is a brand name connected to history, culture and mountaineering. However, one should note that this history is to a large extent also coupled to agricultural traditions and activities. If that disappears also the basis, or infrastructure, for new developments disappear.

7.3.2. Stakeholder views

The Liberalisation scenario was the scenario that the stakeholders feared the most, and they were all negative towards this scenario, also those with no farming interests and also those that were critical towards the current agricultural policy. They believed it would not have any benefits for neither biodiversity, landscape, livelihoods, nor social and cultural aspects.

7.3.3. Other evaluations

The key results of the other evaluations used for the sustainability assessment of the Liberalisation scenario can be summarised as follows (see 7.2.1):

Biodiversity: Negative

Socio-economic: Negative

Cost effectiveness: Positive

7.3.4. Conclusions

In general, this scenario is negative for biodiversity, landscape, livelihoods, and cultural aspects. One issue arising is how fast a liberalisation is to take place. If very quickly, adaptation processes will not be able to meet the challenges, and consequences may be as devastating as stakeholders pointed out. However, if a gradual liberalisation takes place, and which is actually one way of describing scenario 1, Business as Usual; there will be time to adapt for several groups in the local communities, and also for policies and decision makers in terms of redirecting policies. Already, there is a process going on in terms of developing various types of alternative income and diversification, and some of these businesses may survive even under a Liberalisation scenario. However, the farmed landscape constitutes a basic infrastructure – technically, practically, visually, aesthetically and so on for most of these activities, and if that cannot be upheld somehow, the prospects for these diversification and new business developments may be questioned. The major mitigation measures will therefore be to allow time for redirecting

of policies, schemes and various types of new measures in order to develop new businesses as well as for maintaining the landscape, however, the realism in large-scale landscape management is very low. However, bio-energy production based on scrubs is a possibility, although it will during a relatively long starting phase be dependent upon state subsidies. One suggestion within this scenario is to allow for more cabin developments that may attract a semi-permanent settlement of second home dwellers (retired people, pc commuters etc), that may be important for generating income locally. Further, to set a number of requirements for landscape management or even landscape taxes related to cabin development and tourism etc. that may contribute to some type of landscape management may be an option with some positive local effects. However, a large scale cabin development will hardly be sustainable in terms of use of natural resources, energy consumption and biodiversity in these sensitive mountain areas.

7.4. SA of Managed Change for Biodiversity (MCB)

This Section presents the results of the matrix-based assessment done as part of the SA process for BioScene. It also records the most significant aspects raised by the stakeholders in the meetings (on the sustainability objectives and on the SA matrices), and relates the outcome of the matrix assessments with relevant findings from the ecological and socio-economic investigations, including the assessment of visualisations of changes to the landscape resulting from the three scenarios.

7.4.1. Overview

Managed change for Biodiversity		Driver/chain 1 – Agricultural policies given up, replaced by agri-envt payments	Driver/chain 2 – Increased consumer demand for local products and rural tourism	Driver/chain 3 – increased importance of NGOs for landscape management measures	Aggregated results per scenario
Biodiversity	**O1 -** Ensure viable populations of semi-natural habitats sensitive to agricultural decline	+ -	+ -	+ -	+ -
	O2 - Ensure viable populations of other naturally occurring species	0	0	0	0
Sustainable natural resource management	**O3 -** Ensure sustainable use of outfield resources linked to fishing, hunting, grazing, forestry, recreation and tourism	-	+	+	+
	O4 - To reduce pollution and implement pollution prevention techniques. Agriculture has a special responsibility for reducing leakage	+	? +	0	+
	O5 - To encourage harvesting and processing of natural resources is managed at local level to reduce transport	+	+	+?	+
	O6 - Develop alternative energy sources, and better utilisation of local wood	0	+	0	?+
Rural and economic development	**O7 -** Maintain family farming, incl. mountain summer farming and a varied animal husbandry as important economic activities based on local grass resources	-	+	0	0
	O8 - To promote the development of local food brands/niche food products	0	+ +	0 +	+
	O9 - Develop viable business networks for mountain summer farming, local foods and tourism	? +	+	? +	+
	O10 - To upheld forestry activities to maintain forestry as a source of income and for providing timber to local sawmills	0	+	0	+?
	O11 - Develop alternative forest products	0	+	0	+
	O12 - Promote the establishment of service businesses for the private sector, including tourism businesses	0	+	0	+
	O13 - Promote the establishment of tourism based on the natural and cultural resources of the area, incl. mountain summer farms	+	+ +	0	+ +

	O14 - To create jobs for highly educated people so the local community is able to offer locals youth and incomers work after ended education	+	0	0	+
Social development	**O15 -** To encourage all, but especially the young, to actively participate in outdoor activities using the nature	+	+	+	+
	O16 - To ensure that all groups have an influence in decision making processes and a just share in the distribution of access to services and common goods	0	0	+	+
	O17 - To develop cultural qualities as an asset for life quality and attractiveness of the community	+	+	+	+
Institutional capacity for SD	**O18 -** To enhance participation and co-operation of local groups, esp. youths, children and women, organisations and interests	0	0	+	+
	O19 - To strengthen the co-operation between farming/rural communities and public agencies, esp. environmental authorities and organisations	+	0	+	+
	O20 - To make the local authorities capable to take more responsibility concerning the governance of local resources	0	0	+	0

Table 8: Matrix based assessment of the MCB scenario

The main drivers for this scenario were: agricultural policies given up and replaced by agri-environmental payments, increased consumer demand for local products and rural tourism, and increased importance of NGOs for landscape management measures. Their implications for the sustainability themes and objectives can be summarised as follows:

- **Biodiversity:** a balanced contribution overall;
- **Sustainable natural resources:** overall positive effect on the objectives;
- **Rural and economic development:** a generally positive effect on the objectives;
- **Social development:** overall positive effect on the objectives;
- **Institutional capacity:** generally positive impacts with the objectives.

This scenario has a significantly positive effect overall towards the achievement of the study area sustainability objectives. In fact there are only a few areas where drivers were in conflict with the objectives - O1, O3 and O7, but these are on the other hand very important objectives. There are conflicts in relation to Biodiversity, O1 (To ensure viable populations of semi-natural habitats sensitive to agricultural decline) where both positive and negative effects were identified. The major negative aspect is that management schemes will have to be directed towards certain targeted, designated areas, and will not be able to copy traditional land use over sufficient areas to ensure biodiversity conservation over time over larger areas. Regrowth over larger areas than today is therefore the likely result, also making access more difficult in these areas, and less attractive for recreation and tourism. The sustainability themes which were the positive in this scenario were 'economic development', in particular the establishment of tourism based on the natural and cultural resources of the area (O13), and 'social development', in particular the encouragement of the young to actively participate in outdoor activities (O15) and the development of cultural qualities as an asset for life quality and attractiveness of community (O17). Overall the sustainability implications of this scenario look very promising with a majority of positive effects on most of the objectives.

7.4.2. Stakeholder views

The Managed agro- and non-agro biodiversity scenario was also rejected at the 2nd stakeholder meeting as it was also only seen as a step along the line of liberalisation and close down of agriculture, with negative consequences for livelihoods and cultural

aspects, and also for landscape and biodiversity. To start with the stakeholders were not very eager to discuss it, however, various statements were made that after all, it could be a transition in a "waiting-for-the crisis"-situation (see the Environment and Solidarity scenario that they developed themselves), and seen as a way to maintain farming and land use somehow. In conclusion, at the 3rd stakeholder meeting after having been presented the sustainability analysis, they regarded this scenario 3 the most positive one, mainly due to social and cultural aspects (see below).

The stakeholders, including the farmers, do in general not mind some landscape management, but refuse a total de-linking from food and fibre production. Conservation organisations/NGOs/other than farmers was seen as something only for very small areas, and rejected as an overall solution but it terms of what they see as desirable as well as what is realistic. It must be stressed that there is no traditions for NGOs carrying out landscape management or nature conservation over larger areas in Norway, and the whole NGO sector has a somewhat different character then e.g. in Britain. Norwegian NGOs are mainly more local and voluntarily in their character, they are small in terms of employment, reflecting the well developed public sector in Norway.

During the 3rd stakeholder meeting, when discussing especially the social and cultural consequences of the 4th scenario that they developed themselves during the 2nd meeting, there was a general agreement that scenario 3 was better.

Landscape and biodiversity
Many of the stakeholders would not mind receiving payments for landscape management per se, such as keeping stock along the main tourist roads to keep the land grazed, as long as it was economically viable. However, they pointed out that *"in summer the animals should be grazing in the mountains and around the summer farms!"*, implying that they would not want to give up ordinary farming systems just in order to satisfy tourists, and that they felt it was equally important to keep the mountain summer farm areas grazed and open. In other words, they did not trust that increased payments for landscape and biodiversity would be directed towards what they saw as important.

Livelihood and cultural aspects
Scenario 3 was seen as including a high level of diversification, in which rural tourism and niche food and organic food production will be important. Although there was considerable scepticism towards the economic viability of this – *"not everybody can go into diversification"*, some of them had already started and were hoping that in combination with more or less "ordinary farming" or organic farming they would be able to amke a living. A crucial issue is how much they may maintain of income from ordinary agricultural production, as they see farming as a necessary basis. Further, they did not believe that the subsidies falling out would be fully replaced by biodiversity and landscape payments, and they saw continued abandonment and loss of landscape values and biodiversity as the result, although some areas could be maintained. What became evident at the third stakeholder meeting, was that although they saw that the future was bleak for many within agriculture, and they feared the social and landscape consequences of that, they also saw that some very positive social and cultural aspects of the trends towards diversification, innovation related to not only tourism but also other business ideas, more mobility, and more incomers coming in (there is, however, net out migration although the total population is relatively stable), was leading to a more lively society, and these aspects they perceived as related to Scenario 3.

The interpretation of this is that the post-modern or post-productivist society and economy is giving more space for personal freedom, and less dependence on traditional structures for how to live ones' life and how to do things that have been linked to many rural and farming communities. One must of course not overlook the fact that tourism and international contacts has traditions in the area, but yet several of the farmer stakeholders expressed joy over their experience of that "the world was coming to them" with tourists and other types of international visitors staying at their farms or cabins.

7.4.3. Other evaluations

The key results of the other evaluations used for the sustainability assessment can be summarised as follows (see 7.2.1):

Biodiversity – For biodiversity, this Scenario 3 is no doubt the best of the three presented scenarios – S1, S2 and S3. In the targeted areas there will be an improvement of semi-natural biodiversity, while wild species will not be affected. However, outside the targeted areas there is expected a negative effect of regrowth. It is, however, uncertain to what extent reduced grazing can be balanced through increased pressure through hikers and possibly also more reindeers lead into the area, which is positive for some of the threatened plants.

Socio-economic – The stakeholders were to start with sceptical towards this scenario, seen as only being a somewhat slower path towards liberalisation, like S1 Business as Usual. However, during the 3rd stakeholder meeting, going through the Sustainability Assessment, they discovered that Scenario 3 had what they saw as the most positive social and cultural implications, leading to a more vivid and diverse community, which they saw as more positive than a more traditional agrarian oriented society. They are not negative towards landscape management, but still want to see that linked to food production.

Cost effectiveness – This scenario is intermediate in terms of cost effectiveness, it is estimated to represent about €5,5 mill; half the costs of Scenario 1.

7.4.4. Conclusions

Of the three till now presented scenarios this seems to be the most favourable one both in terms of biodiversity, livelihoods and sustainable development. However, in terms of biodiversity it is not fully sustainable as it leads to a "preserve the best- forget about the rest strategy" in terms of directed schemes towards designated areas, and decline in farming and management practices outside. The effects on family-farm businesses may also be partly negative, although there may be many positive implications in terms of the development of several new farm and other businesses related to niche food, farm and wilderness tourism etc. This scenario seems to lead to the most diverse and modern community in terms of diversification, various type of new competence and people coming into the area. Assuming that there will be sufficient state subsidies for keeping up a number of farm businesses geared towards landscape, management and tourism, this may give sufficient basis for a landscape infrastructure as well as a technical and a social and cultural infrastructure that is necessary for a sustainable development.

7.5. SA of Environment and Solidarity

This Section presents the results of the matrix-based assessment done as part of the SA process for BioScene. It also records the most significant aspects raised by the stakeholders in the meetings (on the sustainability objectives and on the SA matrices).

7.5.1. Overview

Stakeholder scenario		Driver/chain 1 – abandoned farmland, forest and recreation areas (golf) taken into food production	Driver/chain 2 – Stop in further decoupling of agricultural payments	Driver/chain 3 – Strengthened environmental regulation	Aggregated results per scenario
Biodiversity	**O1 -** Ensure viable populations of semi-natural habitats sensitive to agricultural decline	+	+	++	+
	O2 - Ensure viable populations of other naturally occurring species	0	0	0	0
Sustainable natural resource management	**O3 -** Ensure sustainable use of outfield resources linked to fishing, hunting, grazing, forestry, recreation and tourism	+	+	+	+
	O4 - To reduce pollution and implement pollution prevention techniques. Agriculture has a special responsibility for reducing leakage	-	0	+	0
	O5 - To encourage harvesting and processing of natural resources is managed at local level to reduce transport	+	+	+	+
	O6 - Develop alternative energy sources, and better utilisation of local wood	0	0	? +	?+
Rural and economic development	**O7 -** Maintain family farming, incl. mountain summer farming and a varied animal husbandry as important economic activities based on local grass resources	++	+	-	+
	O8 - To promote the development of local food brands/niche food products	-	0	+	0
	O9 - Develop viable business networks for mountain summer farming, local foods and tourism	-	0	0	-
	O10 - To upheld forestry activities to maintain forestry as a source of income and for providing timber to local sawmills	0	0	-?	0
	O11 - Develop alternative forest products	-	0	0-?	-
	O12 - Promote the establishment of service businesses for the private sector, including tourism businesses	0	0	0	0
	O13 - Promote the establishment of tourism based on the natural and cultural resources of the area, incl. mountain summer farms	-	+	+	+
	O14 - To create jobs for highly educated people so the local community is able to offer locals youth and incomers work after ended education	0	0	+	+
Social development	**O15 -** To encourage all, but especially the young, to actively participate in outdoor activities using the nature	+	+	0	+
	O16 - To ensure that all groups have an influence in decision making processes and a just share in the distribution of access to services and common goods	0	0	+?	+?
	O17 - To develop cultural qualities as an asset for life quality and attractiveness of the community	+	+	+	+
Institutional capacity for SD	**O18 -** To enhance participation and co-operation of local groups, esp. youths, children and women, organisations and interests	0	0	+?	0
	O19 - To strengthen the co-operation between farming/rural communities and public agencies, esp. environmental authorities and organisations	-	0	+	+?
	O20 - To make the local authorities capable to take more responsibility concerning the governance of local resources	0	0	+	+

Table 9: Matrix basesd assessment of the stakehodlers' own Environment and Solidarity scenario

The main drivers for this scenario were: global environmental, food and energy crisis will lead to an increased need for utilising local land resources for food production. Abandoned farmland, forest and recreation areas such as golf fields are taken into food

production, a stop in further decoupling of agricultural systems, and strengthened environmental regulation that lead to a low intensive, environmentally friendly food production. Their implications for the sustainability themes and objectives in the study area can be summarised as follows:

- **Biodiversity:** a balance between both positive effects and no significant effects on the objectives;
- **Sustainable natural resources:** a generally positive effect, with some mixed effects in relation to the reduction of pollution;
- **Rural and economic development:** overall mixed effects on the objectives;
- **Social development:** overall a positive effect on the objectives;
- **Institutional capacity:** a generally positive effect, although no significant effect in relation to the enhancement of participation and cooperation of local groups.

This scenario has positive impacts on all sustainability objectives particularly in relation to semi-natural biodiversity (O1), and sustainable natural resources (O3, O5). It is balanced in terms of pollution (O4); in spite of low intensive production, the general need for taking up farming in abandoned areas may lead to a certain increase in leakage in other aspects, It is balanced regarding certain aspects of rural and economic development (O8, O10, O12), but very positive in terms of maintaining family farming, mountain summer farming and varied animal husbandry (O7). The only areas where there is potential for negative effects relate to development of viable business networks (O9), and the development of alternative forest products (O11). Overall the sustainability implications of this scenario look quite promising.

7.5.2. Stakeholder views

It is important to stress that the stakeholders formulated this themselves, and they all seemed to agree on it. The "Environment and solidarity scenario" is based on their wish for a shift in the global situation linked to the WTO negotiations and liberalisation of agricultural trade and policies. They hope that an understanding for the global crisis will develop, as the global grain stores are being reduced, and the desertification, pollution and degradation of farm land in many countries lead to an understanding for the need for a low intensive an environmentally friendly national and local food production in all countries. Further, they pointed out a number of current events, such as bird flue from Asia, the Mad Cow disease in Britain or a new nuclear accident similar to the Chernobyl accident, that will make it necessary to produce more food nationally.

Of course self interest plays an important role for stakeholders taking this position, however, this is actually an issue within the farmers' organisations, especially the Norwegian Farmers and Smallholders' Union, and idealism and international solidarity are central ideas. Norwegian farming organisations are relatively active in the La Via Campesina, the international peasant movement, working with sustainability and the food sovereignty principle – the right to produce food on one's own territory and to consume it, are core ideas.

Landscape and Biodiversity consequences

The environmental aspect of this scenario is related to their wish to keep the land and the landscape open through environmentally friendly farming methods, including grazing in the mountain areas. Then, as a consequence of this, biodiversity will be maintained.

Biodiversity was referred to as plants linked to the summer farm landscape, as well as around the main farms and farm inland areas. Even the stakeholder representing the Hunting and Angling Association, with no interest for farming, stressed he wanted to see the landscape open, and that was not due to concern for the farmers, but due to his own interests in access and recreation.

However, at the third stakeholder meeting the attitudes did change when going through the Sustainability analysis for the various scenarios, including their own Environment and Solidarity Scenario. During their discussions on the various consequences, and especially aspects related to rural development and social/cultural qualities of their communities, they discovered effects they disapproved of. The scenario meant that due to a global environmental and food sufficiency crisis, most of the previously farmed areas, and also outfields and the summer farms would be taken into use again. In general, they thought this would be beneficial for landscape and biodiversity as farming methods would be more environmentally friendly, with reduced use of fertilisers and chemicals, however, it may also mean competition about the land in general and the outfields in particular in an other sense than today:

Livelihoods and Cultural Aspects

The negative aspects in the discussions were mainly related to social and cultural factors, way of life, and possibly also increased conflicts between land owners/right holders and non-owners/non right-holders.

Within this scenario the competition for farm land and also the outfields for resource utilisation (farming, harvesting, fishing and hunting) would get harder because the resources actually became more important economically and for the basic need for food and self sufficiency. That could increase conflicts between urban and rural population, in which rural owners would protect their land much harder, and be much less willing to let out fishing and hunting rights, and even try to prevent non-rurals from utilising their *Allemannsrett* (General Right of Access, including berry picking etc.). There are some interesting historical parallels here, which stakeholders indirectly may have been thinking of when they feared increased conflicts: During the economic crisis in the 1930s, there was an increased conflict between farmers/land owners and non-right holders/urban people, as many non right holders tried to fish and hunt (partly illegally) in order to provide their families with food, and were to some extent tried stopped by local right holders. Also berry pickers had been accused of poaching and illegal fishing.

Scenario 4 would mean going back to a more agrarian focused society than today. The diversification of farm income would halt, rural and farm tourism would not be necessary any longer and farmers would have to concentrate on farming again. Although most farmers would prefer to mainly be doing that, two of the farmer stakeholders pointed out that they enjoyed some of the aspects of being within tourism, and they would miss that. The contact with new people, new impulses and the variation that tourism means for their working day, was appreciated, and they would both prefer to keep their tourism businesses. However, they still wanted farming to make out the basis for their activities.

It became obvious through the discussions that stakeholders felt that going back to a society in which rural livelihoods and society was much more agrarian dominated, was not seen as favourable. We have interpreted this as that in spite of the high price the farming and rural community is paying for the restructuring in agriculture, they would not like to loose the increased mobility and freedom in many ways that the present society does offer.

7.5.3. Other evaluations

As this scenario was added by the stakeholders, this scenario has not been undergoing all the assessments as the other scenarios. However, based on discussions between the ecological partner and within the socio-economic group, we suggest these results:

Biodiversity
Positive for semi-natural biodiversity, no changes related to the "wild" biodiversity. General environmental situation will improve.

Socio-economic
Balanced. It will be positive for the agrarian related economy, however, there will be less development within other businesses and tourism.

Cost effectiveness
Balanced. The agricultural payments will be continued (€11 mill), and there will be reduced or no need for rural development measures and payments.

7.5.4. Conclusions

This scenario represents the most sustainable development, both in terms of biodiversity and environment, energy consumption and rural livelihoods. However, it means going back to a more agrarian based society that is perceived as negative in terms of variation in options of choosing ways of life.

8. Overall Sustainability Implications of Scenarios

Comparison of overall implications of scenarios for sustainable development, based on the scenario comparison matrices and 3rd SM discussions - implications on:

- biodiversity
- livelihoods
- sustainable development.

This section is also informed by the results of the other evaluations summarised in section 7 above. Keep the main BioScene objective in mind: enhancement of biodiversity while ensuring the sustainable patterns of development in the areas (policy interventions/management measures).

Table 10: Scenario comparison matrix

Scenario Comparison Matrix		Scenario 1 - BAU	Scenario 2 – Liberalisation	Scenario 3 - MCB	Scenario 4 – stakeholder scenario
Biodiversity	**O1 -** Ensure viable populations of semi-natural habitats sensitive to agricultural decline	- -	- -	+ / -	+
	O2 - Ensure viable populations of other naturally occurring species	0	0	0	0
Sustainable natural resource management	**O3 -** Ensure sustainable use of outfield resources linked to fishing, hunting, grazing, forestry, recreation and tourism	- / ? +	? / +	+	+
	O4 - To reduce pollution and implement pollution prevention techniques. Agriculture has a special responsibility for reducing leakage	+	-	+	0
	O5 - To encourage harvesting and processing of natural resources is managed at local level to reduce transport	-	- -	+	+

	O6 - Develop alternative energy sources, and better utilisation of local wood	?	0	? +	?+
Rural economic development	**O7 -** Maintain family farming, incl. mountain summer farming and a varied animal husbandry as important economic activities based on local grass resources	- -	- -	0	+
	O8 - To promote the development of local food brands/niche food products	-	-	+	0
	O9 - Develop viable business networks for mountain summer farming, local foods and tourism	?	? +	+	-
	O10 - To upheld forestry activities to maintain forestry as a source of income and for providing timber to local sawmills	?	0	+?	0
	O11 - Develop alternative forest products	+	0	+	-
	O12 - Promote the establishment of service businesses for the private sector, including tourism businesses	+	+	+	0
	O13 - Promote the establishment of tourism based on the natural and cultural resources of the area, incl. mountain summer farms	?	-	+ +	+
	O14 - To create jobs for highly educated people so the local community is able to offer locals youth and incomers work after ended education	+	+	+	+
Social development	**O15 -** To encourage all, but especially the young, to actively participate in outdoor activities using the nature	0	0	+	+
	O16 - To ensure that all groups have an influence in decision making processes and a just share in the distribution of access to services and common goods	0	-	+	+?
	O17 - To develop cultural qualities as an asset for life quality and attractiveness of the community	0	- -	+	+
Institutional capacity for SD	**O18 -** To enhance participation and co-operation of local groups, esp. youths, children and women, organisations and interests	-	-	+	0
	O19 - To strengthen the co-operation between farming/rural communities and public agencies, esp. environmental authorities and organisations	0	-	+	+
	O20 - To make the local authorities capable to take more responsibility concerning the governance of local resources	-	-	0	+

Table 11: Summary Scenario Comparison Matrix

	Scenario 1 BAU		**Scenario 2 LIB**		**Scenario 3 MCB**		**Scenario 4 Environm. & Solidarity**	
Biodiversity	- -	Loss of biodiversity due to reduced grazing and reforestation Green support does not fully compensate for loss of production support	- -	Loss of biodiversity due to reduced grazing and. Remaining farms will increase intensity	- +	In selected areas	+	
Nature resource management	-		-		+		+	
Rural development	?		-		+		-	
Social and cultural development	0		-		+		?	
Institutional capacity	-		-		+		?	

The summary scenario comparison matrix (Table 7) shows that the business as usual and liberalisation scenarios are by far the most negative for the sustainability objectives, particularly in relation to biodiversity. Looking at the biodiversity implications the environment and solidarity scenario is the most positive. In order to mitigate these negative effects for Scenarios 1 and 2, some measures will have to focus on large scale landscape management schemes, bioenergy production, and rural business development schemes. Cabin developments may be positive economically, but may have some

negative biodiversity effects, and possibly also negative social and cultural effects. Most of all it is important to inform people about the ongoing changes and allow them time to adapt their planning of their farms, households and businesses according to that.

Looking at the natural resource implications the MCB and the environment and solidarity scenarios are the most positive, whereas the BAU and liberalisation scenarios are seen as conflicting with the objectives.

Considering the human livelihoods related categories of objectives:

- For rural development implications the MCB scenario represents the most positive contribution, with some negative contribution from the Liberalisation and Environment and Solidarity scenarios. The scenario with some uncertainty is BAU.
- For social development implications the Managed Change for Biodiversity (MCB) is the most positive scenario. Some negative contribution from the Liberalisation scenario.

Looking at the implications for institutional capacity for sustainable development the MCB scenario is the most positive, with negative contributions from both the BAU and liberalisation scenarios. There would appear to be some uncertainty regarding the likelihood of impacts under the environment and solidarity scenario, however there are indications that going back to a more agrarian based society will reduce the need for developing the institutional capacity.

From table 7 it would appear that the MCB scenario is the most positive. During the 3rd Stakeholder Meeting the stakeholders through their discussions and elaborations on SA came to the same conclusion. They were especially focussing on
social and cultural factors, way of life and rural development, seeing the MCB scenario as leading to the most diverse and open society. However, they saw it as overall negative for biodiversity and the wider landscape and for family farming businesses.

Table 12: Stakeholder priority objectives

	Scenario 1 – Business as usual	Scenario 2 - Liberalisation	Scenario 3 – Managed change for Biodiversity	Scenario 3 – Environment and Solidarity
O3 – To ensure a sustainable use of outfield resources linked to fishing, hunting, grazing, forestry, recreation and tourism	- ? +	? +	+	+
O7 – To Maintain family farming, including mountain summer farming and a varied animal husbandry as important economic activities based on local grazing resources	- -	- -	0	+
O14 – To create jobs for highly educated people so the local community is able to offer local youth and incomers work after ended education	+	+	+	+

On the basis of the results in Table 9 it appears that the stakeholders preferred scenario would be Environment and Solidarity followed by the MCB scenario. However, when comparing this with the stakeholders actual stated preferences as expressed in the discussion of the SA results at the third stakeholder meeting, scenario 3, MCB, becomes their preferred scenario, focussing on objectives related to rural development and social and cultural objectives, such as O8, O9, and also developments related to forestry, such as O11, developing the tourism , also related to summer farms – O13, and it was also a certain fear related to social development if the community became very agrarian dominated (see O16).

9. Recommendations

- Maintained low intensive agricultural practices are necessary in order to maintain identified biodiversity and landscape values. These are in the current situation and within foreseeable future not economically viable without some type of state support, which should be strengthened.
- Farmers find landscape management an agreeable part of their activities if food production still represents the basis for their activities. It is thus necessary to maintain both 'broad and shallow' and 'deep and narrow' subsidy systems directed towards agricultural land use systems, securing a basis of food production and payments for additional specialized landscape and biodiversity management activities.
- Stimulate niche productions that at the same time have conservation benefits, such as goat milk and goat meat production.
- Improved information - increased knowledge about conservation values increases awareness and pride and interest in maintaining these values. The Norwegian case indicates that the information about landscape and biodiversity values linked to the area during the last 15 years have been of great importance for positive attitudes to conservation values
- Need to include stakeholders in defining objectives, measures and monitoring
- Locals need to see potential for economic benefits – livelihood - linked to conservation values
- Tourism and commercialisation should build on existent natural and cultural values in the area, contributing in upholding them
- To imitate traditional land use systems will require substantial public input unless new economically viable solutions are found.
- Innovations both within business developments as alternative types of landscape management necessary. One possibility in the Norwegian study area is to develop bio-energy utilising scrubs and wood from spontaneously reforested areas, combining bio-energy production and landscape management. Combining the two may require some public incentives and payments, as it will imply more labour demanding wood harvesting. Another is to look into "mobile goats" strategies, moving around efficient grazers such as goats.
- The potential of various species for grazing and preventing forest re-colonisation in valuable landscape types should be further explored, including reindeers.

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11. Glossary

Assessment Matrices	Are the matrix formats used to record and present the results of the Sustainability Assessment of each of the Scenarios against the Study Area Objectives
Drivers	Any phenomenon that may *change the state* of the land use in the Study Areas e.g. agricultural or biodiversity policy interventions, changing agricultural practices.
Flowcharts	Are the flowcharts produced for each Scenario which set out a *causal chain analysis* showing the relationship between drivers, impacts and land use consequences.
Impacts/effects	Are the impacts which result from the drivers. These may be economic, social or environmental eg physical effects. In some cases drivers will give rise to a chain of impacts eg primary, secondary, tertiary, etc.
Indicator	Measure of variables over time, often used to measure achievement of objectives or targets. An indicator is something that helps you understand where you are, which way you are going and how far you are from where you want to be. A good indicator alerts you to a problem before it gets too bad

	and helps you recognize what needs to be done to fix the problem. Indicators of a sustainable community point to areas where the links between the economy, environment and society are weak. They allow you to see where the problem areas are and help show the way to fix those problems.
Land-use consequences	Are the resulting changes to land use brought about by the drivers, management activities and their impacts/effects
Management activities	Are the activities which are carried out on the ground as a result of drivers, policy interventions and land-use changes. For example, these might be substitution of cattle for sheep, reduced stocking rates on marginal land, reduced grazing & hay cut, cutting shrubs and mowing meadows.
Mitigation	The purposeful implementation of decisions or activities that are designed to reduce the undesirable impacts of a proposed action on the affected environment.
Objectives	A statement of what is intended, specifying the desired direction of change in trends. BioScene considers six categories of objectives (biodiversity, sustainable resource management, rural development, social development, economic development, and institutional capacity for sustainable development) and distinguishes between: – Overall Sustainability Objectives: broad sustainability objectives established for the Bioscene project taking into account European and international policies – Country-Specific Objectives: elaborating on and focusing the Overall Sustainability Objectives for each country, anchoring these in national policy where available – Study Area Objectives: specific objectives for each study area against which the Scenarios will be assessed. These will be derived from the Country-Specific Objectives with input from the Stakeholders
Policy interventions	Are policies that are put in place to produce different land use / agricultural & biodiversity outcomes than would otherwise be the case in the absence of intervention
Scenario	In environmental studies, scenarios can be defined for example as 'images of the future, or alternative futures' that are neither predictions nor forecasts , but an alternative image of how the future might unfold (EEA, 2001). In BioScene three exploratory scenarios are being developed for each study area extending over a 25-year period, to 2030: A 'business-as-usual' forecast (scenario 1) and two alternative policy cases described as 'agricultural liberalisation' (scenario 2) and 'managed change for biodiversity' (scenario 3).
Significance	Is the importance of an Impact or Trade off as identified and assessed during the Sustainability Assessment

Stakeholder	is a member of the stakeholder panel established for BioScene in each study area
Sustainability Assessment	Is a process which can help inform and improve strategic decision-making. More specifically it is a systematic process for the assessment of the likely economic, social and environmental consequences of each of BioScene's scenarios and the combinations of management activities contained in them. The aim of the assessment is to understand the potential impacts of each of the scenarios on wider sustainability objectives and identify changes that will increase desirable and reduce undesirable consequences. For example, enhancing positive effects, mitigating negative effects and avoiding the transfer of negative impacts to future generations. In other words identifying the most sustainable policy interventions and management activities.
Sustainable development	is development that meets the needs of the present without compromising the ability of future generations to meet their own needs (Brundtland Report, World Commission on Environment & Development, 1987). In a biodiversity perspective sustainability refers to the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding (UN Convention on Biological Diversity, 1992). In BioScene these two interpretations are combined and sustainability is fundamentally grounded in the environment, led by the aim of conserving biodiversity.
Trade-offs	Are the possible trade offs which may be made between one set of consequences and another when assessing the general acceptability of particular scenarios during the SA process. One approach is to define a set of trade off rules to guide these trade off decisions eg based on the expectations and expectations of stakeholders. The SA Team will provide Partners with more detailed advice on this issue in advance of the January 2005 project meeting

Provided by Sheate, Dagg and Byron, Imperial College, University of London