12	Quality assurance by inspection organizations	2	Quality assurance by inspection organizations would ensure the quality of imported and produced breeding facilities, semen, veterinary medicines and vaccines to increase herders' willingness to apply high quality livestock technology.	Ministry of Environment and Green development; Ministry of Industry and Agriculture; Animal health and Breeding Agency; State Inspection agency;	2-3 years	No additional cost is required.	Success: Service quality by veterinary/breeding units is sufficient at local level.
	International cooperation						
13	Improve international collaboration and coordination between similar organizations and research institutions	2	Experience sharing trips, forums, fair trade and exhibitions play important roles for learning from other countries. Research and study on the topic in educational or research institutions allow accelerating R& D and deployment of the technology.	Ministry of Environment and Green development; Ministry of Industry and Agriculture; Animal health and Breeding Agency; public and private research and educational institutions	4-5 years	The total expense will be about 120 000 USD for 4 years from donor agencies and the government.	Success: Increased number of professionals with improved skills and knowledge;

2.4 Action plan for Sustainable Pasture Management

2.4.1 About SPM

Sustainable Pasture Management is a climate change adaptation technology which aims to sustain healthy soils and restore degraded pasture in the countryside. This will have benefits for livestock raising, alleviating rural poverty and building resilience to major environmental challenges. Pasture degradation has already taken place to various degrees and the objective of SPM should consider restoring degraded land while preventing further degradation of any non-degraded land to ensure continued ecosystem health and functions.

Mongolia has an estimated 40 million livestock in an area of 1.1 million km^2 of rangeland. Pastureland is the backbone of Mongolian agriculture. Pasture degradation and desertification is among the most serious environmental problems in the country. In Mongolia, pasture degradation is widespread and occurs in all natural zones at different intensities. Pasture is the main source of livestock food and herders livelihood in Mongolia. Well managed pasture helps to protect natural resources and sustains ecological functions and services.

Pasture degradation in Mongolia has manifested in several ways: decreased biomass production, soil fertility decline, desertification, fewer and unpalatable plant species and physical damage by human activities. At present, about 70% of pastureland is in some form degraded. Overgrazing, off-road driving, mining, global warming, low precipitation and lack of land management skills are causing more and more problems for the ranges in Mongolia. Thus, it is becoming increasingly difficult for Mongolia to provide the necessary amount of fodder for the existing number of livestock that is the main source of income for more than one third of Mongolia's population.

There are different categories of pastures depending on usage:

- Otor pasture (Otoris reserved pasture where herders move in critical situations all or part of their herd and household in case of changing pasture, or weather conditions. They differ from seasonal moves in that they are not regular and repeated and usually do not include the entire herd and household. This type of pasture also can be classified into smaller types.)
- Transit pasture which used temporarily

while animals are moving to other locations
- Per-urban pasture
- Pasture for intensified livestock which is settled down in same location
- Pasture for nomadic livestock.

Each type of pasture requires different methodologies of pasture management depending on different factors related to local environment, geography and socio-economic context. Therefore, comprehensive SPM will assure conservation of natural resources and thereby increase livestock productivity. All of these directly increase the nation's resilience to withstanding the negative impacts of climate change and benefits will be widespread with producers as well as consumers. Socio-economic benefits and environmental benefits of SPM are shown in Table 49.

Table 49: Benefits of Sustainable Pasture Management

Socio-economic benefits	Environmental benefits
• Increased income of herders • Increased food security • Alleviate rural poverty • Improved livelihoods • Sustaining traditional lifestyles • Improved social sustainability and cooperation of different stakeholders	• Increased biomass and vegetation • Restored biological diversity including plant species • Sustained water sources (open and ground) • Increased soil fertility • Reduced GHG emissions • Reduced risks of natural disasters • Ensured ecological sustainability and ecosystem functions and services

Despite continuing efforts, pasture degradation remains a critical constraint for sustainable development of animal husbandry of the country. This is an indicator that SPM has not been adopted effectively. The reason is the existence of barriers that prevent effective technology transfer and diffusion mechanism for implementing SPM. Therefore, appropriate corrective action should be taken to address issues pertaining to technology transfer and diffusion for SPM. These barriers are often considered complex, and solutions require a systemic approach.

2.4.2 Target for SPM

The technology is expected to target all 320 *soums* of Mongolia and at least 90% of herding families can benefit from it. The diffusion of the technology would enable the herders to manage pasture in better ways and reduce pasture degradation and desertification. The technology transfer and diffusion is intended to be done within 8-10 years and completed by 2022.

2.4.3 Barriers to SPM

In order to identify the barriers, several research methodologies including desk studies through literature surveys, questionnaires, direct interviews with different levels of stakeholders were carried out prior to stakeholder consultations workshop held in September 2012. Through an extensive consultative process, a list of all potential barriers to be faced for technology transfer and diffusion process on SPM technology was prepared and discussed as given in Table 50.

Table 50: Key barriers to technology SPM

Barrier sub/ category	Key barrier	Brief description of barrier
Economic and financial	Lack of financial resources to adopt SPM	Pasture and land management measures and law implementation actions are under-funded from the government. Investment to construct water wells, building winter and spring shelters and other facilities are very limited from government and individual herders. Sufficient funding for training and educating herders and government officials is not allocated into local administration budget.
	Lack of taxation mechanism for pasture usage and management	Animals of herders are private, but pasture and water are common-pool resources. Common-pool resources are often overused - this is true for pasture in Mongolia which is often overgrazed due to lack of regulation and control (Chantsallkham J. and others, 2009).
Non-financial		
Policy, legal, regulatory	Lack of land tenure rights	Whilst full privatisation of the land has proven a successful countermeasure in some countries, it is not feasible in Mongolia, where livestock requires mobility in order to balance the variability of the available fodder. Pasture is common-pool resource in Mongolia and became 'tragedy of the common[31]'. Presently, Pasture Law has been under discussion for many years through frequent meeting of stakeholder. The issue is that there are different views on legality and right holder organizing process.
Institutional, organizational capacity	Lack of regulation authority and mechanism for pasture usage	According to the Land Law, *soum* governments have the power to control and regulate *soum* land, to allocate possession and user rights to citizens and to impose land fees on land possessors and users. But implementation of the Land Law is very weak at local level. The ability of the local governments to fulfill their obligations is limited by lack of manpower and budgetary constraints.
Social, cultural and behavioural	Complexity of pasture system in Mongolia	Socio economic and natural condition in Mongolia is quite unique and complex which makes solutions difficult to find.
	Mobile herding system	When pasture resources become limited and insufficient, social conflicts come up between herders and *soum* governments. In some cases, herders are not able to use traditional seasonal rotations of pasture. Today the total animal number is excessive in comparison with pasture carrying capacity. Therefore, when drought and *zud* happens, overgrazing exacerbate vulnerable herders and increases animal deaths.
	Uncontrolled animal numbers	Pasture land management within mobile herding system is not easy to regulate, and it is difficult to legalize ownership of common–pool resources.

31. The tragedy of the commons is the depletion of a shared resource by individuals, acting independently and rationally according to each one's self-interest, despite their understanding that depleting the common resource is contrary to the group's long-term best interests (Garret Hardin).

Information and awareness	Lack of awareness and knowledge of herders	There is no extension organization to increase herders' knowledge and or make new technological improvements available to them. Only private units of veterinary breeding services at the *soum* level provide some services through state subsidies.
Network failure	Poor collaboration between key actors including local governments, research organizations, civil society institutions and herder groups	Because of incomplete policies, and almost no financial resource, combined with lack of manpower, skills and sharing of some responsibilities with civil society institutions, the implementation of the Land Law is very weak at the local government level.
Other barrier	Frequent drought and harsh winter disasters	Livestock is very vulnerable to natural disasters because individual herders cannot overcome excessive consequences of drought and *zud*. Herders groups are weak in term of finance and human capacity.

According to the stakeholders' final results, ten key barriers to technology transfer and diffusion of SPM in the context of climate change were identified and ranked. Among key barriers, economic and financial barriers and policy, legal and regulatory barriers were the most essential.

2.4.4 Proposed action plans for SPM

Stakeholder consultations were carried out to identify measures to overcome barriers (in September 2012). Measures identified in these consultations were validated using results of analysis reported from national and international projects experiences in managing pasture degradation and promoting SPM (Table 51).

Table 51: Key measures identified for SPM, their time scale and roles in innovation stages

No	Key measure	Priority (1– high, 2– med, 3–low)	Accelerating RD&D	Accelerating deployment	Accelerating diffusion
	Financial incentives				
1	Allocate funding for SPM and Pasture Law implementation when it is enforced.	1		Medium	Long
2	Develop subsidy program for pasture usage and management	2	Medium	Medium	Long
	Legislation and regulation				
3	Establish appropriate legal framework for SPM	1	Short	Short	
	Mechanism and institutional arrangement				
4	Strengthen herders groups and organizations	2	Short	Short	
5	Increase capacity of research institutions	2	Medium	Medium	Medium
	Information and awareness raising				

6	Intensify training and education programs for herders and related government officials	3	Short	Short	Short
7	Develop communication strategy for herders	3	Short	Short	
	Support R&D				
8	Support R&D of SPM and pasture monitoring system	1	Medium	Medium	
	International cooperation				
9	Facilitate learning and experience sharing projects and events in countries with similar context	2	Short	Short	

Nine key measures were identified and ranked based on importance in the technology transfer and diffusion. The most important measures were: allocating sufficient fund for enforcement of the Pasture Law, establishment of legal framework for pasture appropriate usage and supporting research and development. Each measure has different roles in the technology innovation stages and time scales to implement (short- 1 to 5 years; medium -up to 10 years; and long – up to 15 to 20 years). Detailed characteristics of measures are provided in Table 52.

Table 52: Detailed action plan of for technology Sustainable Pasture Management

Sector : Animal husbandry / Agriculture							
Technology: Sustainable Pasture Management - large scale and long term Innovation Stage: Deployment – Diffusion							
No	**Key measure/ category**	**Priority (1– high, 2– med, 3–low)**	**Why is it needed?**	**Who?**	**When (0–5 years, 5–10 years, 10–20 years)**	**How much will it cost?**	**Risks and indicators of success**
	Financial incentives						
1	Allocate funding for SPM and Pasture Law implementation when it is enforced.	1	SPM practices including water resource management and establishment of wells and basins, restoration of degraded pasture, pasture and its ecosystems conservation activities, defining boundaries of common properties, animal forage production are generally more expensive. Also, benefits of adopting SPM practices are not immediate and usually spread over several years.	Ministry of Finance; Ministry of Industry and Agriculture; Ministry of Environment and Green Development; Local governments	10-20 years	It will require about 10 million US$ per year from the government and international donors.	Success: Increased funding for pasture management;
2	Develop subsidy program for pasture usage and management	2	Subsidy will support to change unsustainable practices into more managed pasture and other resources. Also animal forage growers and producers should be encouraged with subsidy program. Initiatives and projects for alternative income sources for herders should be supported and funding can be explored from national and international resources.	Ministry of Finance; Ministry of Industry and Agriculture; Ministry of Environment and Green Development; Local governments; Pasture management NGOs; herders organizations	5-7 years	Cost is estimated about 5 million US$ per year from the government and international donors.	Success: Pasture degradation will decrease.

	Legislation and regulation						
3	Establish appropriate legal framework for SPM	1	Whilst full privatisation of the land has proven a successful countermeasure in some countries, it is not feasible in Mongolia, where livestock requires mobility in order to balance the variability of the available fodder. In the Pasture law, Mongolia needs to define the appropriate mechanism, clear rights holders, roles and responsibilities of entities. Experience and lessons learnt from other countries with similar situation, national and international projects and pilots are essential in policy formulation. Results of public survey should be analysed and considered in the law improvements. Mechanism to review and change legal documents based on feedbacks and recommendations need to be considered.	Ministry of Industry and Agriculture; Ministry of Environment and Green Development; Local governments; Pasture management NGOs; herders organizations; research institutions;	2-4 years	No additional cost is required.	Success: Approved Pasture Law and efficient enforcement at all level
	Mechanism and institutional arrangement						
4	Strengthen herders groups and organizations	2	Training package for group formulation and development should be developed and make them available at *soum* level through local government and training centres. Package can include comprehensive guidance for herders about legal framework, business regulations, environmental issues and potential options for income diversification such as ecotourism, and small and medium enterprises using animals raw products etc. Exposure trips and experience sharing forums should be facilitated at provincial, national and international levels.	Ministry of Industry and Agriculture; Ministry of Environment and Green Development; Local governments; Pasture management NGOs; herders organizations; training organizations;	4-5 years	It requires about 50,000 US$ per year for 4 years from the government and international organizations	Risk: Sustainability of herder organizations and groups should be considered. Success: Increased number of herders informal and formal organizations with good capacity;

5	Increase capacity of research institutions	2	Government and non-government research institutions need to be supported to conduct research on pasture, ecosystems, pasture mapping and other related emerging themes and pilot promising practices in small scale. Win –win solutions with social and ecological sustainability should be developed through research and development and successful outcomes of research, tests and demonstration need to be scaled up higher level.	Ministry of Industry and Agriculture; Ministry of Environment and Green Development; Local governments; public and private research institutions;	5-6 years	It requires about 35,000 US$ per year for 5 years from the government and international funding	Risk: Practical application of research results should be ensured. Success: Increased number of research projects and initiatives on Pasture management;
	Information and awareness raising						
6	Intensify training and education programs for herders and related government officials	3	Involvement of related organizations which could provide qualified training, education programs on terms of pasture management and improvement.	Ministry of Industry and Agriculture; Ministry of Environment and Green Development; Local governments; public and private training organizations and national and local media and press;	3-4 years	It will require about 15,000 US$ per year for 3 years from the government and international agencies.	Success: Improved knowledge and skills on sustainable pasture management practices;
7	Develop communication strategy for herders	3	The government needs to develop a communication strategy with key messages along with media and press in order to convince herders and impact their behaviour on about SPM and positive practices.	Ministry of Industry and Agriculture; Ministry of Environment and Green Development; Local governments; public and private training organizations; media and press;	2-3 years	It will require 25,000 US$ to develop and pilot from the government.	Success: Efficient communication strategy about SPM for herders
	Support R&D						

8	Support R&D of SPM and pasture monitoring system	1	SPM Research and Development (R&D) require adequate funding from the government and other donor agencies to study and recommend local context specific solutions to diverse situations. The use of modern technology such as GIS mapping, satellite imaging, mobile communication system, and modeling etc. can be used in pasture monitoring system to provide precise solutions to herders and government officials. As the availability of budgetary resources from the government funding is not sufficient, harnessing donor support should be explored.	Ministry of Industry and Agriculture; Ministry of Environment and Green Development; public and private research organizations herders organizations;	5-6 years	It will cost about 80,000 US$ per year for 5 years from the government and international funding.	Success: Improved pasture monitoring and research on pasture; -decreased pasture degradation
	International cooperation						
9	Facilitate learning and experience sharing projects and events in countries with similar context	2	Learning from other countries will help Mongolia foresee potential issues in future and ensure the technology deployment and diffusion within expected time frame.	Ministry of Industry and Agriculture; Ministry of Environment and Green Development; public and private training organizations and international educational and research institutions;	4-5 years	It will cost about 100,000 USD for 4 years from the government and international funds	Success: Increased number of skilled professionals and specialists;