2.5.5 SUB-MODULE 5: RANGELAND INFRASTRUCTURE DEVELOPMENT

Infrastructure plays an important role in the development of the rangelands for livestock production. These include water infrastructure (boreholes, water pans, subsurface dams and improved shallow wells), Sale and auction yards, holding grounds, dips and spray races, loading ramps and collecting yards, roads and stock routes, among others. One of the most common and important infrastructures for livestock production in the rangelands is water infrastructure.

Water infrastructure:

The biggest need in the rangeland for livestock after feed is water, therefore understanding daily livestock watering needs is key when designing a livestock watering system. Proper planning for the financing and development of water sources, and day to day water service provision (for domestic/livestock) is critical and requires time and effort to make sure that the intervention and support given is appropriate, targeted and demand driven in the long term.

For a rangeland to be self-sustaining, the cost of development of and maintenance of infrastructure must be borne by the users.

Considerations for securing water developments in drylands

When selecting a water infrastructure, greater importance needs to be given to technical, governance and ecological considerations of range management, compared to a focus on the individual water technologies. These are: -

The pasture-water balance

- Understand local dynamics including natural resources and seasonal livestock grazing patterns. The number of water points and their distance from natural pastures will determine the frequency and distance livestock have to trek to reach water and pasture
- Poorly sited infrastructure leads to experimental degradation due to settlements and congregation
- Seasonal water sources are preferable than permanent ones

Technical characteristics of the water point

- Affordability to construct, maintain and sustain
- Depends on whether the water is for domestic or livestock use
- Consider gender dynamics – since women are the ones who collect water most of the time
- Consider factors such as the number and type of livestock, domestic use requirements, livestock grazing patterns, the type and effectiveness of management, and the technical capacity
- Technology should be sustainable
- Should be appropriate such that water point managers can understand and use themselves

Governance system for managing access to water

- There should be control over access by community and visitors to water – this will determine stocking rates on pastures in an area
- Prioritization of water for domestic versus livestock use as the dry season progresses and water becomes increasingly scarce
- Community-managed associations (or WUAs) should be inclusive and representative of different social groups, including women, the poor and marginalized.
- Rules for equitable access to water, for example for women and other vulnerable social groups must be present.
- Visitors seeking water will need to negotiate access, through the principle of reciprocity
- Conflict may arise in the absence of clear governance rules that are followed by all user

Good practice principles for development of water infrastructure

There are four broad principles;

Planning. Water development needs to be part and parcel of natural resource management while recognizing the way that water access and use affects how the broader natural resource base is used and managed. One needs to understand the broader natural resource base and livestock grazing patterns/seasonal movements

Understand local contexts and dynamics, including the social, economic, political, legal and cultural aspects of a given location. Research into the local context should include, but not be limited to: all the potential water resource users (e.g. downstream and upstream users along rivers); water access patterns; water needs/demand; particular concerns relevant to the area—including conflict over resources; customary institutions and their role in water/ resources management; interactions with other governance institutions and stakeholders; and gender considerations. A comprehensive stakeholder analysis should be conducted at the local level to enhance the process. Planners must engage with all the local groups that represent the different resource users in the area, including representatives of customary institutions, women, vulnerable groups and non-local pastoral

Design. Paying attention in the design phase to the rehabilitation of existing systems should be given priority, particularly in the context of emergency interventions when the project lifecycle is limited. During the design phase the following are of importance.

- Identify the existing water points first and explore options for their rehabilitation by upgrading the water supply system before designing new ones.
- Identify why the existing water systems are non-functional or performing poorly as a first step. Improving the performance of what is already there is not only cost effective but researching the existing water supply system can help identify problems and the level of user responsibility. Future operation and maintenance will need to be a continuous process and mainly the responsibility of the users.

- Evaluate the need for and potential impacts of introducing new water points and identify remedial measures to tackle negative impacts. This can be carried out through an Environmental and Social Impact Assessment process.
- Select the water development option based on choice of technology, cost considerations as well as on the expressed needs and capacity of the community. A technical feasibility study and a cost-benefit analysis can identify certain choices, but the community should make the final design decision.
- Planners should explain the technological options available and help communities-through a process of dialogue and knowledge sharing-to select the most suitable technology and design that will satisfy their local needs.
- The use of traditional systems should be encouraged-the designs for which and local materials and construction know-how are already available.
- The technical capacity that will be required to operate and maintain the water points, and as spare parts availability. In remote areas, access to external technical assistance, construction materials and spare parts may be very limited.
- Technologies which do not encourage settlement, and which adequately space water points to alleviate pressure on single water point, must be selected for rangelands.
- Integrate water development design with other pastoral development interventions. Water development should be linked with efforts to improve access to markets, rangeland rehabilitation, etc. to address vulnerability and poverty effectively over the long-term-supporting and improving livelihoods.
- Promote meaningful engagement with communities during the project identification and planning phases. The intervention should promote the use of participatory/consultative methods. Using participatory methods enables planners to understand and benefit from local knowledge systems and allow dialogue between communities and planners on suitable type, placement and size of water points.

Implementation. Ensure constructed water structures are of good quality by focusing on proper design and construction. Community/local capacity should be developed in the construction of the water sources for sustainability.

Promote the contribution of cash and/or labour in-kind in the construction or rehabilitation of water points. This reduces project costs as well as instills a sense of ownership, enhances community commitment to maintaining the water point, and ensures that it is sustained beyond the lifetime of the project. Local contribution is important, should be realistic and should be accompanied by effective community mobilisation.

Strengthen the capacity of water users in management, operation and maintenance. Communities should be assisted in establishing water management committees (or variations thereof), which include representatives of all groups with a stake in the development. The committees that help and manage the water interventions should be built upon existing customary resource management systems. These customary systems often provide a tried and tested context and culturally appropriate approach to water management, which can help diffuse/avoid conflicts over water. Ensuring a combination of formal management committees and customary institutions is recommended.

Provide training to local community members in construction, management and maintenance to embed capacity at the local level. Develop a training curriculum with approaches appropriate to the target community, guided by a training needs assessment. Providing quality training to build community capacity and properly prepare community representatives to manage their system is essential for a sustainable rural water supply.

Sustainability. Continue to assist communities to manage water systems for some time after completion of the project. Adequate follow-up and mentoring may be required for some time. The community may engage private entities like a local entrepreneur, a CBO/NGO, women or youth groups to run the water supply on their behalf to ensure sustainability. However, the plight of the vulnerable groups should also be considered.

Undertake knowledge sharing, exchange and cross learning among implementing partners and relevant government agencies. Exchange visits by communities, to see properly working and successfully managed water supplies, is an important way to demonstrate what is possible, and to raise community expectations. This will enhance the adoption of good practices in the region.

Water sector development actors need to agree on common approaches to development/financing, which avoid undermining good governance. Misguided donations of equipment and spare parts can promote the un-sustainability of community water projects. Often such donations, although well meaning, promote dependency by freely bailing out communities that have failed to manage their water supplies well, thus rewarding mismanagement. Relief should be linked to development i.e. by adopting a long-term livelihoods approach to humanitarian interventions.

Examples of water infrastructure

Boreholes: they are deep, narrow wells that tap into naturally occurring underground water. A high efficiency pump is installed to extract the water from the permeable rock below for use.

Sand Dams/subsurface Dams: Sand dams are reservoirs created when a short wall is constructed across a sand river allowing the storage of both water and sand carried by the flood waters.

Shallow Wells: Less than 20 m deep with low water yields

Water Pans: These are small reservoirs, 1-3 m deep, usually dug off-stream or in open areas, and having raised and compacted banks. They are constructed to collect and store runoff water from various surfaces including from hillsides, roads, rocky areas and open rangeland.

Charco Dams: These are really small excavated pans or ponds, constructed at selected sites on a relatively flat topography for livestock watering. They receive their runoff mostly from open rangeland; thus, contour bunds are constructed to divert runoff into the dam.

Rock Catchments: Rock catchments are suitable in areas with massive unjointed rock outcrops. They are ground catchments with high runoff coefficients as the impervious catchment provided by the rock yields plenty of water from a limited amount of rainfall. They provide relatively cleaner water; they allow gravity flow supplies; and where there are suitable sites for rock catchment dams, they are one of the cheapest and effective means of storing rainwater.

Water trucking

In some situations, the trucking of water may be the only viable approach to ensuring water supply for pastoral livestock during drought and emergencies. The approach is relatively expensive and has limited sustainability.

Any plan for water trucking should be fully costed and matched against the overall benefit expected for livestock owners including the timeframe and eventual exit strategy. Some key issues for consideration are:

Management issues

Staff management and supervision - successful trucking operations require consistent and sustained staff inputs. This includes a need for competent, experienced management and supervision. However, it is also important to ensure that drivers and assistants are kept motivated through proper reimbursement and careful attention to other needs including subsistence allowances and personal security considerations.

Monitoring deliveries - with capable and reliable supervisory staff working in collaboration with community leaders it is possible to ensure the correct number and amount of deliveries. Without careful monitoring it is quick and easy for fraudulent operators to offload supplies along the route and to claim payment for non-delivery unless beneficiaries are made aware of what they are supposed to receive.

Contracts - clearly worded contracts should be written and signed between agencies and trucking contractors, specifying delivery targets and mutually acceptable methods for measuring deliveries. Checks should also be made to ensure that no detrimental effects are felt by existing populations due to the withdrawal of trucking facilities from their usual work.

Design issues

Selection of water sources - use of the selected source/s should be approved by all relevant authorities and user groups. Seek local advice regarding the ownership and rights to any proposed water source. Potential water sources often include urban supplies belonging to private companies, schools, churches etc. Should water be extracted from surface water sources such as rivers and lakes then additional arrangements will be necessary for the loading of trucks.

Trucking routes - should be surveyed and properly assessed to avoid problems with degradation over time and periods of inclement weather. Before entering into trucking agreements, routes should be identified and surveyed including all bridges, fords and other obstacles. The type and suitability of road surfaces should be assessed noting any possible difficulties due to future inclement weather or gradual degradation of surfaces. The cost of, and methods for dealing with these problems and mitigating against future disruption should be considered as early as possible.

Selection and maintenance of fleet and equipment - use only appropriate means of transport, taking into account loading and bearing capacities of trucks and various road surfaces. Major issues to consider are

Cost and availability of fuel - ideally, it should be possible for drivers to refuel without making major detours away from the trucking route. This may require fuel to be brought in separately, adding to the logistical complications of the operation.

Spare parts - should be readily obtainable.

Maintenance **-** may affect the decision regarding the type of transport that will be used by the trucking operation e.g. trucks or tractors and trailers with bowsers or bladder tanks.

Distribution Issues. In addition to the water distribution issues, the effective distribution of water from tankers will require:

- Easy access and turn-around space for vehicles
- Good drainage
- Adequate storage
- Easy offloading into communal facilities (i.e. not into individual containers)

It is important to note that initial deliveries should be extremely well managed and well thought out to ensure the safety of agency staff and beneficiaries alike. There may be a great deal of anxiety present among the beneficiaries whose livestock may already be highly stressed and dehydrating fast. These people/animals will be impatient to receive water. It is important to let people know that additional, regular supplies will be arriving after initial deliveries have been made. If possible, try to build up ad-equate stocks of water quickly.

Relocation of livestock is often implemented as part of the response to an emergency (either as part of the indigenous response or coordinated by external agencies). Where this is occurring, trucking of water may be required to support the migration. This situation will add considerably to the already complex logistics of water trucking.

Challenges in water service delivery in pastoral areas

- Inadequate infrastructure, which is often unfairly distributed due to inadequate financing.
- Environmental degradation due to inappropriate placement of permanent water sources, which causes degradation of the fragile rangeland environment and leads to loss of grazing areas, conflicts and increased vulnerability of pastoral communities to drought.
- Inappropriate technology choices, which the community cannot sustainably manage and which encourage environmental degradation.
- Poor design and construction of the water structures, due to limited numbers of skilled persons in pastoral areas.
- Poor capacity of beneficiary communities in management, operation and maintenance, due to poor skills, unwillingness to pay for water, poor accountability/financial mismanagement, gender imbalances in the management of water systems, cultural barriers, political interference etc.
- Development actors (including governments) undermining sustainability attempts through haphazard donations to communities that hamper plans towards self-reliance. This is often due to an incoherent and uncoordinated approach to water

development, which is seen by many water actors as the overall impediment to development of sustainable water supply systems in the pastoral areas.

- Limited capacity of lead agencies, like line government departments, to provide the required technical support to community water supply systems

Daily water requirements for livestock

To estimate the approximate needs of the livestock population in an area, the following figures (Table 2.65) for daily water requirements may serve as a rough guide:

Table 2.65. Approximate water needs for livestock

Type of livestock	Average water requirement (litres)	Frequency of drinking
Camels	60-80	Every 4-5 days or longer
Cattle	30-40	Every 1-3 days
Equines (donkeys, mules, horses)	15-25	1-2 days
Sheep	4-5	1-2 days
Goats	4-5	Preferably once a day
Pigs	0.5-2.5	Preferably once a day
Poultry	0.05-0.15	At least once a day

Livestock health and market infrastructure in the rangelands

For livestock production to be sustainable in the drylands, other supporting infrastructure should be present. At the moment Kenya's infrastructure especially in the drylands (roads, holding grounds, stock routes for livestock, etc.) is in poor state, and hence not conducive to efficient livestock marketing. These include livestock health and market infrastructure.

- **Feeds storage facilities**: Hay barns, these are farm structures used to conserve harvested feed materials for future use. The size of the hay barn depends on the amount of feed materials expected to be stored. These should be located in areas which are easily accessible and should be well ventilated. In wet seasons in the ASALs, primary production normally increases hence the availability of excess feed materials. The conservation of these materials is necessary to alleviate feed scarcity during emergencies. Large scale storage facilities have been initiated by County Governments and NGOs to help in communal feed bulking. Their development together with governance structures for their operation can help minimize the impacts of disasters to livestock keepers.

A communal feed storage facility

- **Holding grounds:** These are demarcated areas where livestock are temporarily held before being transported to the market, slaughter or elsewhere. Some of these have been non-existent in pastoral and agropastoral areas due to factors such as insecurity, lack of water, feed and fences. These need to be established to increase the competitiveness of the livestock sector in these areas.
- **Slaughterhouses:** The capacity for utilization varies considerably in the ASALs. Their management is mainly in the hands of civil servants who are technical staff rather than administrative staff, with sometimes little knowledge. It would be preferable for these units to be managed by professional staff that have good experience in financial and commercial management, and even better if they are managed by the private sector. More financing is required to equip, modernise them and improve quality of livestock and livestock products.
- **Cattle races and crushes**: This is being used for operations such as branding, spraying and giving injections. More specialised work such as ear marking, dehorning, castration, foot trimming, weighing, artificial insemination, pregnancy testing and veterinary operations requires a crush to firmly restrain an animal.
- **Dips and spray races:** These are used for controlling external parasites in livestock. Spray races are mostly good for smaller numbers of livestock but plunge dips can handle thousands of animals. Most of the communal dips collapsed in the ASALs due to different factors including breakdowns, mismanagement and land use factors. There is a need to revive them in order to control tick-borne diseases and outbreaks as well as to minimize pollution brought about by individual spraying.
- **Loading ramps and collecting yards**: Loading ramps are necessary to load stock into lorries for transport to market or transfer to other grazing areas.
- **Roads and stock routes**: Livestock routes are critical infrastructure for facilitating movement of livestock from one region to another. In most cases, most are blocked and are poorly serviced and protected, this has negative impacts on livestock, people and the environment. There is a need to map, service and improve them to ensure livestock reach the market in good health condition.

- **Transport infrastructure**: In Kenya, the transport of livestock and livestock products is directly related to other freight traffic, and cattle transport is usually subsidiary to the main freight. Most livestock trucks in developing countries are not specially adapted for cattle transport and although specialised livestock trucks could transport more livestock, they are more expensive and may not find a return load. Trucks are held mainly in the private sector making transport of livestock and products expensive. Formation of associations of transporters and some credit for truckers can be recommended.
- **Livestock market, Sale and auction yards:** These form the backbone to livestock marketing in the arid and semi-arid areas. These are mostly located in trading Centres where stakeholders including brokers, livestock keepers, traders among others meet to participate in livestock marketing.
- **Firebreaks:** These are tracks of about 4 m wide (and can be of any length) which are cleared of all vegetation**.** They are usually constructed in large scale ranches and are essential because they help prevent the spread of dry season fire wild grass fires which destroy grazing pastures and cause tremendous reduction in livestock production
- **Livestock improvement centres (LICs):** These play an important role in improving local herds through training and availing of improved breeding stock either through improved stock either through bulls
- **Livestock development centres (LDCs):** This is an institution provided with staff offices and houses, training venues and animal health laboratories. The main objective is to bring veterinary services closer to pastoralists, provide a base for mobile extension teams and also act as venues for training staff and stock owners.
- **Quarantine stations:** These are intended to quarantine animals and prevent them from contracting communicable diseases. They also provide spaces to treat animals that might have been exposed to diseases and certify that animals in these zones are disease free. They are needed to facilitate access of livestock and livestock products into the high-value markets which has been lost to other producers in the world due to the failure of the country to implement effective disease control measures as required by the prospective importing countries.

The national livestock policy emphasises on the Government to develop and rehabilitate livestock marketing infrastructure in collaboration with the relevant stakeholders. In particular, the local county councils to plough back some of the cess revenue towards the development of livestock marketing infrastructure in order to improve local livestock market. It will also protect the existing holding grounds and other infrastructure from acquisition by private developers or any other entity.

Challenges in rangelands infrastructure – Water service delivery as an example

- Inadequate infrastructure, which is often unfairly distributed due to inadequate financing.
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sources, which causes degradation of the fragile rangeland environment and leads to loss of grazing areas, conflicts and increased vulnerability of pastoral communities to drought.

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- Limited capacity of lead agencies, like line government departments, to provide the required technical support to community water supply systems

Policies and strategies for rangelands infrastructure

1. **Sessional Paper No. 1 of 1999, on National Water Policy on Water Resources Management and Development** sets out a framework intended to bring about a culture that promotes comprehensive water resource management and development with the private sector, with community participation as the prime movers in the process to guarantee sustainability. The government's role would be largely to provide policy guidelines, an enabling environment and to regulate the sector

2. **The Water Act, 2002** provides for the management, conservation, use and control of water resources, and for the acquisition and regulation of rights to use water; as well as providing for the regulation and management of water supplies and sewerage services.

3. **The Draft National Policy for the Sustainable Development of Arid and Semi-Arid Lands of Kenya focuses on the revitalization of the Arid and Semi-Arid Lands (ASALs) -** One of the priority areas for development in this policy document is water resource management and development to improve livestock productivity. Water availability, its appropriate development, and its use, are key to the development of the ASALs. The development of surface water through appropriate community-owned water harvesting structures, such as pans and dams, will be emphasized, while groundwater will be developed based on social and environmental sustainability criteria

4. **The National Water Resources Management Strategy (NWRMS) (2007-2009**) -The strategy provides a guide for assessing, maintaining, enhancing, developing and managing the limited available, renewable, freshwater resources, using an integrated approach and promoting its use on a sustainable basis

5. **EMCA) 1999, (Wetlands, River Banks, Lake Shores and Sea Shore Management) Regulation, 2009 (Cap. 387) –**These Regulations, made under the Environmental Management and Co-ordination Act, 1999, make provision for the management, conservation and sustainable use of wetlands and wetland resources and the sustainable utilization and conservation of (resources on) river banks, lake shores, and the seashore. The Regulations, among other things, set out general conservation and management principles, define duties of the Standards and Enforcement Review Committee and District Environment Committees.

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