New techniques give decision makers an edge

RIU

Validated RNRRS Output.

The Local Application of Remote Sensing Techniques (LARST) project has produced a variety of remote sensing tools to help decision makers plan for and monitor a huge range of environmental problems. They can also be used to provide early warning of threats to food security (like locust outbreaks), human and animal health (by predicting epidemic outbreaks), threats to forestry (like fire) as well as threats to water resources, and fisheries. Remote sensing techniques like these give decision makers the tools they need to properly design, implement and monitor new policies. The techniques are already in use around the world to solve a range of problems, from detecting fire risks in Nicaragua, Mexico and Botswana, to estimating rainfall and avoiding famine in Ethiopia.

Project Ref: **FRP35:**
Topic: **7. Spreading the Word: Knowledge Management & Dissemination**
Lead Organisation: **Flasse Consulting Ltd**
Source: **Forestry Research Programme**

Document Contents:

Description

FRP35

Research into Use
NR International
Park House
Bradbourne Lane
Aylesford
Kent
ME20 6SN
UK

Geographical regions included:

Africa, Central America,

Target Audiences for this content:

Forest-dependent poor,

A. Description of the research output(s)

1. Working title of output or cluster of outputs.
In addition, you are free to suggest a shorter more imaginative working title/acronym of 20 words or less.

Existing title: LARST Forestry Phase II: Operational fire information systems

Suggested title: **Local Applications of Remote Sensing Techniques – LARST Tools**

2. Name of relevant RNRRS Programme(s) commissioning supporting research and also indicate other funding sources, if applicable.

- DFID – LARST Forestry Phase I
- DFID – Environmental Monitoring in Africa: Transfer and Local Application of Remote Sensing Techniques (LARST)
- DFID – Indonesia/UK environmental monitoring project
- DFID – Agro-eco-climate zonation from satellite observation
- DFID – Nicaragua Land Resources (Fire) Monitoring Project
- DFID – Forecasting Outbreaks of the Brown Locust in Southern Africa
- DFID – Range land inventory monitoring project Botswana (BRIMP)
- DFID – Environmental information for malaria control
- EU – Indonesia Forest Sector Support Programme
- EU – JRC - Global Vegetation Fire Monitoring Project
- UK Met Office

3. Provide relevant R numbers (and/or programme development/dissemination reference numbers covering supporting research) along with the institutional partners (with individual contact persons (if appropriate)) involved in the project activities. As with the question above, this is primarily to allow for the legacy of the RNRRS to be acknowledged during the RIUP activities.

R6326 (R5072) – LARST Forestry – Indonesia
R6053 – Agro-eco-climate zonation from satellite observation – Africa Regional
R7779 – Forecasting Outbreaks of the Brown Locust in Southern Africa – S Africa

*4. Describe the RNRRS output or cluster of outputs being proposed and when was it produced? **(max. 400 words)**. This requires a clear and concise description of the output(s) and the problem the output(s) aimed to address. Please incorporate and highlight (in bold) key words that would/could be used to select your output when held in a database.*

Rationale:
In many poor countries; decision makers with responsibility for **natural resources** often do not know what they could do (choices), nor what they should do (inadequate **information**) to improve matters. Shared information on the state of the problem is an essential component of **environmental governance** (i.e. collective management of the **environment** by and for the stakeholders). Consequently there is a need for better (thematic, timeliness and large coverage) **environmental information** to support a) design, implementation and **monitoring** of policies (particularly at regional and national level) and b) to support timely **environmental monitoring** for **early warning** and strategic response (particularly at provincial and local level), in the fields of **food security**, **water resources**, **health**, **conservation**, **fisheries**, **forestry**, etc.

LARST outputs:
LARST outputs were and still are critical for improving natural resources governance, through dissemination of suitable information to stakeholders for ***timely*** management response.

LARST forestry is one element in a cluster of LARST outputs. The LARST approach (Local Application of **Remote Sensing** Techniques) aimed at:

- Providing technology for timely and direct access to information (near-real time information through low cost receiving station installed right in the department where information will be used)
- Providing software to derive relevant and understandable information (through participatory research and knowledge transfer)
- Providing monitoring techniques for improved decision support tools (through integration into local practices or development of new adapted tools – including integrated **Geographical Information System – GIS**, where appropriate)

We consider here the whole LARST cluster, as it will bring more opportunities for outputs to be used in a wider context. The main LARST tools and applications areas can be summarized as follows:

	Application areas					
LARST tools	Food Security	Agricultural marketing	Malaria (health)	Fishery management	Locust (pests and diseases)	Forest fires
Rainfall estimation	ü	ü	ü		ü	ü
Vegetation status	ü	ü	ü		ü	ü
Temperature			ü	ü	ü	ü

The LARST approach has been implemented in Africa, Central America and South-East Asia, essentially between 1990 and 2000.

Outputs have included:

- **Forestry**: **fire** information and monitoring system (active fire monitoring, **fire risk**, **burned area** assessments), **deforestation** maps
- **Agriculture**: **yield forecasting**, support to **irrigation**, rice crop monitoring, **locust** outbreak prediction/ assessment
- **Food security**: **Rainfall estimates**, Yield forecasting

- **Fisheries**: sea surface temperature
- **Human health**: **Malaria** epidemic prediction
- **Animal health**: Nasal bot fly treatment support (degree-days maps)
- **Protected area and rangeland management**: **Vegetation status**, rainfall estimates

5. What is the type of output(s) being described here?
Please tick one or more of the following options.

Product	***Technology***	***Service***	***Process or Methodology***	***Policy***	***Other*** ***Please specify***
X	*X*	*X*	*X*		

6. What is the main commodity(ies) upon which the output(s) focussed? Could this output be applied to other commodities, if so, please comment

n/a

7. What production system(s) does/could the output(s) focus upon?
Please tick one or more of the following options. Leave blank if not applicable

Semi-Arid	***High potential***	***Hillsides***	***Forest-Agriculture***	***Peri-urban***	***Land water***	***Tropical moist forest***	***Cross-cutting***
							X

8. What farming system(s) does the output(s) focus upon?
Please tick one or more of the following options (see Annex B for definitions).
Leave blank if not applicable

Smallholder rainfed humid	***Irrigated***	***Wetland rice based***	***Smallholder rainfed highland***	***Smallholder rainfed dry/cold***	***Dualistic***	***Coastal artisanal fishing***

*9. How could value be added to the output or additional constraints faced by poor people addressed by clustering this output with research outputs from other sources (RNRRS and non RNRRS)? (**max. 300 words**).*

Please specify what other outputs your output(s) could be clustered. At this point you should make reference to the circulated list of RNRRS outputs for which proformas are currently being prepared.

During the last 20 years, the world has evolved, and constraints have moved. For example:

- Communication technology has evolved with increase worldwide access to internet, mobile technology and new promising satellite transmission such as EUMETCast.
- Technology awareness, acceptance and usage has increased
- Increasing amount of information and data are readily available.

The new challenges still include, for example, for many poor countries, the lack of relevant knowledge to adapt and integrate the information further into local practices, still too slow internet access to allow large data transfer.

LARST outputs would benefit from being clustered/working in synergy with

- New research programmes for the extraction of improved information from high quality new satellite data (e.g. improved rainfall estimation, vegetation status)
- New in-country facilities (e.g. for Africa, EUMETCast receiving stations and SUMO user-friendly software provided by the PUMA/MTAP project)
- Existing and new programmes such as AMESD, FEWS and Climate Change Adaptations in Africa (CCAA).

Clustering with RNRRS: Given its cross-cutting nature, LARST approach could potentially benefit (but not necessarily cluster with) a number of outputs, including:

1. ICOSAMP
2. Forecasting brown locust outbreaks
3. Knowledge management
4. Integrated Floodplain Management
5. Methods of economic and environmental assessment of NRM
6. Decentralised environmental decision making
7. Integrated tsetse control
8. Sustainable management of Miombo woodland by local communities in Malawi
9. Impacts of climate change (predictive models)

Validation

B. Validation of the research output(s)

*10. **How** were the output(s) validated and **who** validated them?*

Please provide brief description of method(s) used and consider application, replication, adaptation and/or adoption in the context of any partner organisation and user groups involved. In addressing the "who" component detail which

group(s) did the validation e.g. end users, intermediary organisation, government department, aid organisation, private company etc... This section should also be used to detail, if applicable, to which social group, gender, income category the validation was applied and any increases in productivity observed during validation ***(max. 500 words)****.*

Scientific/technical validation of algorithms for the extraction of relevant information (fire, vegetation, temperature, …) has taken place in the framework of research, and often published in the scientific literature.

It is important to appreciate that the LARST approach was breaking new grounds 20 years ago, contributing to raising the awareness and knowledge on the potential available through new technologies to support appropriately and cost effectively decision making in country. Although difficult to demonstrate, we believe that LARST activities have been a pillar in the international community in improving near-real time access to useful earth observation information.

While there has been limited systematic validation exercise of the various LARST outputs, according to RIUP validation definition, there is evidence showing the interest in the tools and products developed, as illustrated in the following section.

11. ***Where and when*** *have the output(s) been validated?*
Please indicate the places(s) and country(ies), any particular social group targeted and also indicate in which production system and farming system, using the options provided in questions 7 and 8 respectively, above ***(max 300 words)****.*

Fire Information System – MARENA (Ministry of Environment and Natural Resources – Forestry department) – Managua – Nicaragua: During the first season, 1996, LARST fire information detected many more fires than the forestry department believed possible. While these figures were unwanted (and denied) by the latter, they were welcomed by local ecologists and environmentalists aware of the real situation on the ground. An independent assessment demonstrated that the satellite monitoring information provided the best estimate of fire occurrence nationwide. Since then the system has been used operationally to serve many departments, at local, regional and national levels, both in Nicaragua and in several Central American countries. Information received early in 2006 indicated that the LARST system was still in use, some 9 years after the end of the project [1].

Rainfall Estimation for Malaria prediction– Health Centre – of Niono – Mali: In this semi-endemic region, malaria transmission essentially varies according to the level of temperature and water (mosquito breeding). A system was developed and installed to forecast malaria epidemics, based on the assessment of unusual rainfall events estimated using LARST remote sensing. A participatory evaluation workshop with health stakeholders from local to national level, produced approval and further improvements resulting in an efficient, user-friendly methodology, adapted to the Mali health system [2].

Fire Information System – Indonesia**:** the receiving stations that were positioned in the 1990s were vital in obtaining an overview and understanding of the nature of the fire problem, particularly based on the 1997/98 data. The EU, JICA and GTZ funded projects in Sumatra and Kalimantan, working together with the Indonesian Forestry Department, relied on these data in their recommendations for fire control and suppression.

Overall, there has been in the last 20 years a steady increase in the number of institutions using earth observation data and information, and LARST type outputs, world wide, paying credit to the timeliness,

usefulness and cost effectiveness of this sustainable information.

[1] Bismarck Valdez M. (2006) 'Informe sobre monitoreo de incendios forestales - satellite NOAA 2005', Ministerio del Ambiente y los Recursos Naturales (MARENA) y Sistema Navional de Información Ambiental (SINIA), Managua, Nicaragua, 22p.

[2] Flasse (2002) 'Environmental Information for Malaria Control: Malaria control support system in Mali – participatory workshop' Flasse Consulting, 27p.

Current Situation

C. Current situation

*12. **How and by whom** are the outputs currently being used? Please give a brief description (**max. 250 words**).*

There are many users for LARST type outputs, at all levels, from ministers to local communities.

For example, the fire information is used to influence decision-making on crew movement on the ground and for recommendations to political officials, agencies, and institutions as well as specific procedural direction to districts and other land management agencies dealing with fire management and policies.

*13. **Where** are the outputs currently being used? As with Question 11 please indicate place(s) and countries where the outputs are being used **(max. 250 words).***

LARST type tools and information usage has increased over the years, whether used as developed during the 90's, or in derivative form using new satellite data, improved algorithms, and better communication channels. Here are some examples:

Drought assessment – rainfall estimates in Ethiopia: Ethiopia uses the LARST approach to produce timely rainfall estimates in its early warning system, which in 2002-2003 enabled famine mitigation measures to be put in place before drought-related disaster became critical. This resulted in food aid being delivered to communities in the affected area before they abandoned their villages, saving many lives, as well as livelihoods. As a consequence, there is demand to improve the system to cover the whole country sufficient for use in decision making at district level.

Fire information systems are used for example in Nicaragua (see above), in Mexico (Comisión Nacional para el Conocimiento y Uso de la Biodiversidad) [3], in Botswana [4] and in South Africa as near real time fire fighting tools [5].

Vegetation Productivity Indicator: A LARST approach giving important early indications on the type of productivity season compared to the norm is currently being used by various initiatives, such as SADC GeoNetwork [6] and EC crop monitoring bulletins world wide [7].

Locust monitoring using satellites: many locust affected Sahelian countries access this service for vegetation and

rainfall map to assist their routine locust control operations [8].

Locust outbreak prediction in South Africa: LARST vegetation status and rainfall estimation are being used by the South African Agricultural Research Council, Institute for Soil, Climate and Water, working in close collaboration with locust control units, to predict plague outbreaks, one of which has just been predicted in the last months, and recently the number of locusts has been increasing rapidly.

[3] http://www.conabio.gob.mx/conocimiento/puntos_calor/doctos/puntos_calor.html
[4] A. A. Hoffmann, K. Dintwe, B. Phillimon, G. J. Mafoko & S. R. Ngakane (2005) 'An Operational Fire Information System for Botswana' Department of Forestry & Range Resources, Gaborone, Botswana.
[5] AFIS – Advance Fire Information System - http://www.wamis.co.za/eskom/checkboxes/afis.htm
[6] http://www.sadc.int/geonetwork/srv/en/metadata.show?id=124
[7] Example for Sudan: ftp://mars.jrc.it/bulletin/Sudan/2006/Sud060503.pdf
[8] Satellite Information for Locust Forecasting - http://www.fao.org/ag/locusts/en/activ/DLIS/satel/index.html

14. What is the scale of current use? Indicating how quickly use was established and whether usage is still spreading ***(max 250 words).***

Earth observation data, when timely accessed and integrated into decision makers' practices are invaluable. With the awareness of its potential and the increase in thematic products, there is an increasing demand and rare are the countries not relying, in one way or another, on such information. The quality and appropriateness of products vary, and can only be effective when adapted to the needs in synergy with increased knowledge transfer to allow their appropriate usage.

15. In your experience what programmes, platforms, policy, institutional structures exist that have assisted with the promotion and/or adoption of the output(s) proposed here and in terms of capacity strengthening what do you see as the key facts of success? ***(max 350 words).***

See next section.

Current Promotion

D. Current promotion/uptake pathways

16. ***Where*** *is promotion currently taking place? Please indicate for each country specified detail what promotion is taking place, by whom and indicate the scale of current promotion* ***(max 200 words).***

The EC (Development) were very impressed with impact from the LARST approach and (among others) developed a programme to make LARST type techniques available in every country in Africa. Called MTAP/ PUMA this 11M€ programme installed hardware and software in all countries in Africa, but ran out of time before

they could get the LARST applications operational. The follow-on 21M€ AMESD programme will continue some of the dissemination work, but will work mainly at regional and continental level where environmental governance is weakest. These actions, together with the US supported Food Early Warning System (FEWS), play an important role in i) continuous awareness raising on problems arising, and ii) ensuring sustainable access and use of environmental information.

17. What are the current barriers preventing or slowing the adoption of the output(s)? Cover here institutional issues, those relating to policy, marketing, infrastructure, social exclusion etc. ***(max 200 words)****.*

All the usual problems that one gets when working with under-resourced government departments, including the brain drain.

18. What changes are needed to remove/reduce these barriers to adoption? This section could be used to identify perceived capacity related issues ***(max 200 words).***

These barriers reduce as countries get wealthier.

19. What lessons have you learnt about the best ways to get the outputs used by the largest number of poor people? ***(max 300 words).***

Keep plugging away especially on knowledge management for decision makers. We worked in Ethiopia in the early 90's. Ten years later they had developed the response capability to be able to make use of the information properly, and consequently saved so many lives and livelihoods. It takes time for institutions to evolve new working practices when faced with completely new kinds of information.

Impacts On Poverty

E. Impacts on poverty to date

20. Where have impact studies on poverty in relation to this output or cluster of outputs taken place? This should include any formal poverty impact studies (and it is appreciated that these will not be commonplace) and any less formal studies including any poverty mapping-type or monitoring work which allow for some analysis on impact on poverty to be made. Details of any cost-benefit analyses may also be detailed at this point. Please list studies here.

Benefits from the use of information from satellites, as in the LARST approach, are usually derived from improved decisions in local/national departments,. These range from improved local irrigation, to prediction of malaria epidemics, via better informed management of the natural resources, all impacting on people's lives and livelihoods. There has not been, to our knowledge, any independent evaluation of the indirect impact on poverty.

21. Based on the evidence in the studies listed above, for each country detail how the poor have benefited from the application and/or adoption of the output(s) ***(max. 500 words):***

- *What positive impacts on livelihoods have been recorded and over what time period have these impacts been observed? These impacts should be recorded against the capital assets (human, social, natural, physical and, financial) of the livelihoods framework;*
- *For whom i.e. which type of person (gender, poverty group (see glossary for definitions) has there been a positive impact;*
- *Indicate the number of people who have realised a positive impact on their livelihood;*
- *Using whatever appropriate indicator was used detail what was the average percentage increase recorded*

n/a

Environmental Impact

H. Environmental impact

24. What are the direct and indirect environmental benefits related to the output(s) and their outcome(s)? ***(max 300 words)***

This could include direct benefits from the application of the technology or policy action with local governments or multinational agencies to create environmentally sound policies or programmes. Any supporting and appropriate evidence can be provided in the form of an annex.

LARST generates information in cost effective ways, using existing satellites. The environmental impact from better environmental governance using LARST type information to improve decision making, is expected to be strongly positive in the short, medium and long term.

25. Are there any adverse environmental impacts related to the output(s) and their outcome(s)? ***(max 100 words)***

No

26. Do the outputs increase the capacity of poor people to cope with the effects of climate change, reduce the risks of natural disasters and increase their resilience? ***(max 200 words)***

Yes, see Sections A and F.

Annex

LARST Forestry / LARST TOOLS

Introduction:

LARST Forestry, and LARST outputs in general, are not *typical* RNRRS research outputs, partly due to their multi-theme applications, i.e. cross-cutting focus, and their technical characteristics and wide geographical applications.

While we have tried to fill the Proforma questionnaire as best as we could, we felt important to extract the *essence* of LARST tools output and potential. Using the general structure of the Proforma, it is presented here, in the next 4 pages.

Summary

A. Description of the research output(s)

Rationale:
In many poor countries, decision makers with responsibility for natural resources often do not know what they could do (choices), nor what they should do (inadequate information) to improve matters. Shared information on the state of the problem is an essential component of environmental governance (i.e. collective management of the environment by and for the stakeholders). Consequently there is a need for better (thematic, timeliness and large coverage) environmental information a) to support design, implementation and monitoring of policies (particularly at regional and national level) and b) to support timely environmental monitoring for early warning and strategic response (particularly at provincial and local level), in the fields of food security, water resources, health, conservation, fisheries, forestry, etc.

LARST outputs:
LARST outputs were and still are critical for improving natural resources governance, through dissemination of suitable information to stakeholders for ***timely*** management response.

LARST forestry is one element in a cluster of LARST outputs. The LARST approach (Local Application of Remote Sensing Techniques) aimed at:

- Providing technology for timely and direct access to information (near-real time information through low cost receiving station installed right in the department where information will be used)
- Providing software to derive relevant and understandable information (through participatory research and knowledge transfer)
- Providing monitoring techniques for improved decision support tools (through integration into local practices or development of new adapted tools)

We consider here the whole LARST cluster, as it will bring more opportunities for outputs to be used in a wider context. The main LARST tools and applications areas can be summarized as follows:

LARST tools	Application areas					
	Food security	Agricultural marketing	Malaria (health)	Fishery management	Locust (pests and diseases)	Forest fires
Rainfall estimation	ü	ü	ü		ü	ü
Vegetation status	ü	ü	ü		ü	ü
Temperature			ü	ü	ü	ü

B. Validation (examples) of the research output(s)

Fire Information System – MARENA (Ministry of Environment and Natural Resources – Forestry department) – Managua – Nicaragua: During the first season, 1996, LARST fire information detected many more fires than the forestry department believed possible. While these figures were initially unwanted (and denied) by the latter, they were welcomed by local ecologists and environmentalists aware of the real situation on the ground. An independent assessment demonstrated that the satellite monitoring information provided the best estimate of fire occurrence nationwide. Since then the system has been used operationally to serve many departments, at local, regional and national level, both in Nicaraguan and several Central American countries. Information received early in 2006 indicated that the LARST system was still in use, some 9 years after the end of the project.

Rainfall Estimation for Malaria prediction– Health Centre of Niono – Mali: In this semi-endemic region, malaria transmission essentially varies according to the level of temperature and water (mosquito breeding). A system was developed and installed to forecast malaria epidemics, based on the assessment of unusual rainfall events estimated using LARST remote sensing. A participatory evaluation workshop with health stakeholders from local to national level produced approval and further improvements resulting in an efficient, user-friendly methodology, adapted to the Mali health system.

C. Current situation (examples)

LARST type tools and information usage has increased over the years, whether used as developed during the 90's, or in derivative form using new satellite data, improved algorithms, and better communication channels. Here are some examples:

Drought assessment – rainfall estimates in Ethiopia: The National Meteorological Services use the LARST approach to produce timely rainfall estimates in its early warning system, which in 2002-2003 enabled famine mitigation measures to be put in place before drought-related disaster became critical. This resulted in food aid being delivered to communities in the affected area before they abandoned their villages, saving many lives, as well as livelihoods. As a consequence, there is demand to improve the system to cover the whole country sufficient for use in decision making at district level.

Fire information systems are used for example in Nicaragua (see above), in Mexico (Comisión Nacional para el Conocimiento y Uso de la Biodiversidad), in Botswana and in South Africa as near real time fire fighting tools.

Vegetation Productivity Indicator: A LARST approach giving important early indications on the type of productivity

season compared to the norm is currently being used by various initiatives, such as SADC GeoNetwork and EC crop monitoring bulletins world wide.

Locust monitoring using satellites: many locust affected Sahelian countries access this service for vegetation and rainfall map to assist their routine locust control operations.

D. Current promotion/uptake pathways

The EC (Development) were very impressed with impact from the LARST approach and (among others) developed a programme to make LARST type techniques available in every country in Africa. Called MTAP/ PUMA this 11M€ programme installed hardware and software in all countries in Africa, but ran out of time before they could get the LARST applications operational. The follow-on 21M€ AMESD programme will continue some of the dissemination work, but will work mainly at regional and continental level where environmental governance is weakest. These actions, together with the US supported Food Early Warning System (FEWS), play an important role in i) continuous awareness raising on problems arising, and ii) ensuring sustainable access and use of environmental information.

E. Impacts on poverty to date

Benefits from the use of information from satellites, as in the LARST approach, are usually derived from improved decisions in local/national departments. These range from improved local irrigation to prediction of malaria epidemics, via better informed management of the natural resources, all impacting on people's lives and livelihoods. There has not been, to our knowledge, any independent evaluation of the indirect impact on poverty.

F. Potential poverty impact

Extreme poverty is often associated with 'marginal' environments, where livelihoods are strongly dependent on climate variability. Climate variability is expected to increase with climate change. There is therefore great need to improve climate risk management in such countries. LARST provides tools for tracking many seasonal resource changes, providing good early warning for preparedness and response, so reducing impact from (e.g.) droughts or floods.

In addition, there is a rapidly growing need to cope with climate change and its impact on natural resource based livelihoods. Managing climate variability will become even more important under a changing climate. It is imperative that we make best use of the tools that we already possess, to improve food security for the remote rural poor especially in the poorest countries.

In relation to Africa, other actions have gone some way to take LARST approach further.

- PUMA has replaced the technology through EUMETCast so data is now available in all weather services in Africa;
- PUMA has also replaced some of the software with standard routines to process necessary data;
- AMESD will, to some extent, re-institute the monitoring techniques for the new satellites which are much more powerful, but with a more regional emphasis, like FEWS;

An example of how LARST tools contribute to environmental governance: Contribution to Forestry Governance using LARST Fire information tools.

At National Scale: LARST shows the extent of the overall forest fire problem (where, when and how much is burned each year): useful information for developing policy on forest fire reduction/prevention, where required.

At Provincial or district scale: LARST helps planning by prioritising problem fire areas for response and then provides early warning with seasonal risk for preparedness and actions to prevent/control fires and protect important resources.

At local scale: LARST shows fire risk and where fires are burning now for appropriate response.

M&E: trends in fires and burned area (as above) shows where policies, plans and practices have been effective, and where not.

As an indicator**,** detected fires indicate the presence of people, and can be used in protected area management to show where protection is needed now/ soon/working well, etc. Similarly, it can help identify logging concessionaires using fire to drive away the poor denizens of the forest.

G. Potential poverty impact assumptions

While in any LARST type project there is a large component of knowledge transfer and capacity building, the main unknown is the exact way in which stakeholders will choose to use the new information. Where environmental governance is well developed, the information is extremely useful for identifying problem areas in real time. Where environmental governance is immature, LARST type techniques provide information indicating the scale and nature of problems and the need for governance structures to be developed.

H. Environmental impact

LARST generates information in cost effective ways, using existing satellites. The environmental impact from better environmental governance using LARST type information to improve decision making, is expected to be strongly positive in the short, medium and long term.

Annex 1. Acronyms

AMESD	African Monitoring of Environment for Sustainable Development
BRIMP	Botswana Rangeland Inventory Monitoring Project
CCAA	Climate Change Adaptation in Africa
DFID	Department for International Development

EC	European Commission
EU	European Union
EUMETCast	EUMETSAT's Broadcast Service for Environmental Data
FAO	Food and Agriculture Organisation of the United Nations
FEWS	Famine Early Warning System
GIS	Geographical Information System
GTZ	German International Cooperation for Sustainable Development
ICOSAMP	Information Core for Southern African Migrant Pests
JICA	Japan International Cooperation Agency
JRC	Joint Research Centre
LARST	Local Applications of Remote Sensing Techniques
MARENA	Ministerio del Ambiente y Recursos Naturales
MTAP	Meteorological Transition in Africa Project
PUMA	Preparation for the Use of MSG in Africa
RNRRS	Renewable Natural Resources Research Strategy
SADC	Southern Africa Development Community