

**An Overview of the Usangu Catchment, Ihefu
Wetland, & Great Ruaha River Ecosystem
Environmental disaster.**



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The aim of this document is to raise awareness of the issues that surround this environmental disaster and stimulate the political will and donor support to restore perennial flow to the river.

What went wrong when the Ruaha River dried up for the first time in living memory in 1993 with the situation deteriorating annually?

Who is responsible for this?

What should be done about it?

The document is an attempt to answer these questions based on the research reports and published papers to date.

The scientific research has proved that it is possible to restore the perennial flow to the Great Ruaha River without reducing rice production.

THE BACKGROUND

The Great Ruaha River, formerly a perennial river that originates in the highlands that form the Usangu catchment, is the lifeline of Ruaha National Park and its ecosystem. It also drives the Mtera and Kidatu Hydropower stations that currently provide over half the Nation's power supply.

Ruaha National Park, referred to as 'the Garden of Eden' in the late 1880s, is the jewel in the crown for Southern Tanzania and is a vital part of the Tanzanian Government's strategy for encouraging Tourism development in the Southern Circuit as an alternative to the North of Tanzania. This perennial river dried up for the first time in living memory in 1993 and the period of flow through each consecutive year is shrinking as the problem is continually ignored. While in 1993 the river stopped flowing for a couple of weeks, since 1999 the river has been consistently dry for over 100 days, with wet season flows now under threat.

The deteriorating situation is now directly threatening wildlife in Ruaha National Park; is in danger of jeopardizing visitor interest in Ruaha; and is causing great embarrassment to the Tanzanian Government.

THE CURRENT SITUATION

According to the World Wildlife Fund (WWF) this environmental disaster has already damaged the Ruaha ecosystem, disrupting the natural distribution and behaviour of wildlife between food and water which has in turn led to increased conflicts with local people in the unprotected areas outside the Park.

The WWF report an overall biodiversity loss as a result of the river drying up. Amongst the many species affected are the rich populations of freshwater oyster that has disappeared from the Ruaha river along with the clawless otters that lived off them.

The White Crowned Plover (*Vanellus albiceps*) build their nests on raised sand banks in the river protected from access by terrestrial predators. With the drop in flow the Crown Plover has become exposed to predators. Also in decline are the Tiger Fish (*Hydrocynus sp*) which require oxygenated water. The balance has also disrupted birds of prey and for example has put pressure on the African Fish Eagle (*Haliaeetus vocifer*) resulting in an increasing scarcity of this magnificent bird in Ruaha.

According to Friends of Ruaha (FORS), “this dry season (2003) has been the most desperate yet, even elephant could not find water below the dry surface of the Ruaha River bed (as they do below sand rivers in the dry seasons) indicating the extent to which the entire water table has fallen, leading to a dispersal of wildlife and conflicts with the communities surrounding the park”.

Overcrowding of hippo seeking refuge in the last remaining pools has predisposed them to infectious disease where fighting and mixing of different groups, together with the competition for limited resources, has increased their susceptibility to disease. The resulting epidemic of infectious disease is also crossing into other species that come into contact with them. The carcasses have to be burnt on great pyres – this is not what tourists want to witness!

The above are just some of the impacts that could be mentioned here. To those who have known the Great Ruaha River throughout their lifetime it is unbelievable that this could have happened to such a mighty river and in such a short space of time. Measurements since the 1960s at 13 stations in the upper catchment have shown that the water entering the catchment has not significantly changed so where has it all gone?

THE RESEARCH

- A. Sustainable Management of Usangu Wetlands and its Catchment (SMUWC), now ended, funded by Department for International Development, DFID (formally ODA) UK.
- B. Raising Irrigation Productivity and Releasing Water for Intersectional Needs (RIPARWIN), also funded by DFID and is based on the work done by SMUWC.

While SMUWC studied aspects of natural resource use in Usangu, RIPARWIN is looking more closely at water management, specifically irrigation efficiency.

The extensive research carried out by SMUWC and now by RIPARWIN has identified the problems which led to the drying up of the Great Ruaha River, and the most cost effective approaches in tackling them to reverse the effects of this environmental disaster. The issue is now to translate these ideas into ACTION so that we restore a permanent flow to the Great Ruaha River and its environmental dependants, and provide meaning to the effort that has gone into understanding the problems. The RIPARWIN funding is due to be reviewed and it is hoped DFID will continue the project to ensure the effective transition of research into practice.

In summary the findings discovered that:

1. By following the SMUWC recommendations (summarised below) to prevent an expansion in water abstraction from the catchment during the wet season and the unnecessary abstraction of water during the dry season, **it is possible to restore dry season river flow with little impact on rice production.**
2. **There is an undisputed correlation between rice irrigation farming and the recent drying up of the Great Ruaha River and that the main causes behind this were the so called “Small Holder Irrigation Improvement Schemes.”** These were set up by the donors to assist the 20-40,000ha of smallholder rice irrigation in the Usangu catchment to further expand their production with no regard for the environmental consequences or impacts on downstream users.
3. The donor commissioned design engineers for the large and small scale rice irrigation schemes **failed to properly take into consideration the environmental impact of their actions** leading to this environmental disaster. The so-called “improvement/modernisation” of indigenous traditional smallholder schemes has **in fact reduced the efficiency of water use, through unfair distribution of water amongst the rice farmers, resulting in greater conflicts while at the same time failing to improve yields.** The projects failed in all their objectives and created this environmental disaster in the process because they assumed that “traditional” equated to inefficient and “modern” meant efficient in terms of water use, when in fact the reverse was the case.

This doesn't come as any surprise to the large number of people who suspected back in the 1990s that it was no coincidence that the donor supported schemes (listed under Part 1 Environmental Disaster) all occurred during the period when the Ruaha River first dried up!

What IS shocking is that despite the problem becoming apparent in 1993, and SMUWC being commissioned to investigate soon after that, to date nothing has been done to reverse the problem which has, in fact, been exacerbated with some irrigation programs expanding until 2001. (The World Bank funded River Basin Management and Smallholder Irrigation Improvement Project RBMSIIP dramatically increased the abstraction of water with the Igomelo intake in 2001).

It seems incredible that in 1983, the Overseas Development Agency, ODA, commissioned the design consultants, Halcrow GP Ltd of Swindon, UK, to do feasibility studies of both Kapunga and Madibira on behalf of NAFCO, but did not require them to produce a comprehensive environmental impact assessment for these vast schemes. No adequate environmental assessment was produced for the Kapunga project during the feasibility assessment in 1983.

The initial feasibility for Madibira was conducted by ODA and later the project was funded by the African Development Bank. Although some sort of study was conducted at Madibira in 1992, only 6 weeks was given to the environmental impact assessment, which focused on the sociological issues on the Usangu plain itself rather than effects on downstream users. However, it was accepted that the report was not comprehensive, due to the short period of time allotted, and the need to further consider the hydrology and wider impact on the catchment area was stated. This "need for the consideration of the wider impact" was never fulfilled.

The most alarming part is that despite the objections from the Friends of Ruaha Society, and others over the last decade, the need to consider the hydrological impact on the Great Ruaha River being understood in the 1992 feasibility study for Madibira, and the cessation of flow to this river in 1993, the new Madibira scheme was still permitted to be constructed in 1998 on the door step of Ruaha National Park. The African Development Bank should not have funded this without adequate consideration for the environment.

Delay in positive "on the ground" action to reverse the detrimental effects on the environment has served only to exacerbate the problem and make it more difficult to resolve, as huge numbers of migrant people associated with rice farming and cattle herding, have come into the area.

BILATERAL GOVERNMENT COMMITMENT

In March 2001, at the Rio+10 preparatory meeting in London, the Right Honourable Mr. F. Sumaye, the Prime Minister for the United Republic of Tanzania, together with the Right Honourable Mr. A. Blair, the Prime Minister for the United Kingdom, committed Tanzania to restoring year round flows in the Great Ruaha River by 2010. However, three years on, the river, and thus the entire ecosystem, is in an even more critical state.

Although it is widely accepted that it has taken too long for the research to bear fruit, credit must be given to DFID for commissioning the research that has concluded that the environmental disaster was caused by the donor supported schemes. However, for this research to count for anything it must be translated into concrete steps to tackle the problem. Currently there does not seem to be a financial commitment from DFID to convert this valuable research into action. **It is imperative that the donors now support the Tanzanian Government in taking the necessary steps to remove this global embarrassment and prevent these high level dignitaries from having to renege on their responsibilities.**

Part 1 Donor Supported Environmental disaster.

Part 2 SMUWC recommendations and proposed short term strategy.

Part 3 Basis for Action Plan.

Parts 1 & 2 are drawn from the work done by SMUWC and RIPARWIN and papers written by Lankford, B.A. (School of Development Studies, University of East Anglia) et al, including 2001, *Red Routes on Blue Rivers: Strategic Water Management for the Ruaha River Basin, Tanzania. Water Resources Development, Vol 17, No.3:427-444*; and *Irrigation improvement projects in Tanzania; scale impacts and policy implications*; Lankford B.A. accepted by Water Policy in October 2003.

The **latter** scientific paper is highly critical of the donor supported irrigation “improvement” schemes (Part 1 below).

Part 1 Donor Supported Environmental disaster.

A. Small Holder Irrigation Improvement schemes.

According to Dr B. Lankford’s paper “Irrigation improvement projects in Tanzania; scale impacts and policy implications” accepted by Water Policy in October 2003:

The key smallholder irrigation improvement schemes involved are:

1. Usangu Village Irrigation Project 1985-96 funded by FAO to upgrade 6 indigenous channels (3 were completed).
2. Women in Irrigated Agriculture-funded and supported by FAO & Netherlands Government.
3. Kapunga Rice Project 1988-92
 - a) to establish a NAFCO parastatal rice farm.
 - b) to build a smallholder irrigation scheme.
 - c) to improve abstraction from 4 intakes from the Chimala river.
4. Kimani Irrigation Project 1991-1994 funded by the Canadian CIDA.
5. Small Holder Irrigation Improvement Component 1997-2001 that intended to upgrade 6 indigenous furrows, but at the time of writing had completed 2 intakes. World Bank funded River Basin Management and Smallholder Irrigation Improvement Programme (RBMSIIP)

These schemes shared two main aims:

- A. To increase productivity through yields and increase the area under irrigation.
- B. To increase efficiency of water use by the indigenous rice irrigation systems.

According to Dr Lankford’s scientific paper, **neither of these objectives was achieved**. Yields were not increased and efficiency was not improved and **instead these projects have disrupted the flow to the Great Ruaha River and other downstream users**.

This was due to an ill conceived judgment that the “indigenous systems” were less efficient than the “modern improved system”, without analyzing the implications of the improvements.

The indigenous system

The indigenous system is comprised of earth ditches with locally elected irrigation committees to oversee the high maintenance requirements necessary to ensure fair distribution of water. This also ensured common ownership amongst those who depended on the system. Critically, it relied on hand made “inefficient” weirs that were **not watertight and allowed flow to leak back into the river** to become available to more such intakes further down the river. There was always a residual flow that remained in the river for environmental and domestic uses downstream, simply because the crude intakes couldn’t abstract the water.

The “improved” systems

The “improved” intakes that replaced the handmade weirs allowed complete abstraction of the low season flow. Their higher level weirs across the river, and lower base of intake, allowed all the water to be taken no matter what the flow, enabling irrigation even during low flow. This resulted in larger individual irrigation systems that abstracted greater quantities of water throughout the year. Previously, smallholders had to wait until river levels permitted, to be able to draw off water in December and January after the rains.

The consequence of these “improved intakes” was that in addition to being the main contributory factor to the drying up of the Great Ruaha River during the dry season, these schemes disrupted the traditional methods of sharing water between top end and tail end farmers by reducing the number of effective intakes and by placing tail end users further from the intake.

Hand weirs tended to be washed away in floods ensuring excess water was not taken during high flows. During high rainfall and floods, concrete weirs unnecessarily abstracted water since no one bothered to close the intakes. While at low flows, the concrete weir prevents flow down the river because the release gate, for low bypass flow, is controlled by the irrigators who want all the water at this time.

Summary

Unimproved intakes allow water down stream by passive division of flows.

Improved full width weir, closed bypass release gate, intake water abstraction gate with lower base level:

- a) Allows intake to abstract all the water;
- b) Allows late season rice irrigation, dry season cropping and early planting.

Previously, demand for water for rice was between January and May and these schemes have moved this to now allow irrigation between October and June.

The paper concludes that these improved intakes are the main reason for Ruaha River flow problems rather than low irrigation efficiency of water use by the small holders.

1. At the local irrigation level the “improvements” resulted in water inequities between top and tail end users (fewer intakes, drains theoretically returning water to the river, and introduction of canals that didn’t reach tail end users) leading to increased conflicts.
2. Downstream intakes and environmental needs (including the Ruaha ecosystem), domestic users, fisher people, and Hydropower lost out.
3. “Improved” intakes that increased dry season abstraction of water were the main contributory factors that decreased downstream flows to the Usangu wetland and its discharge into the Ruaha River which inevitably disrupted flow in the Great Ruaha River.

Dr Lankford surmised that “improved projects” caused more problems than they solved and resulted in increased top and tail end conflicts and the disrupted flow in the Great Ruaha River.

Modern NAFCO Parastatal Farms

Ironically Dr B. Lankford describes research that has found that the so called modern NAFCO parastatal farms are perhaps 40% efficient in their water use, while traditional small holder farms are 60% efficient in their water use. He suggested that it is possible to achieve 80% efficiency.

There are numerous reasons behind the inefficiency of NAFCO farms, including low fertilizer, weed infestation, poor water level control in the fields (due to large uneven fields and poor water control), wasteful practice of ploughing followed by first irrigation, draining before planting and re-irrigating. This results in very inefficient use of water at a most critical time towards the end of the dry season.

According to Dr B. Lankford's research there are also major irrigation design faults by British engineers in the large scale NAFCO farms that have resulted in one of the main causes for low efficiency of water use on those farms. Water is supplied through sunken channels that feed the fields with little or no head difference. This means water travels over the field slowly with approx. 300mm of water absorbed per irrigation.

The NAFCO farms typically irrigate twice, requiring 600mm of water before a crop of rice has even been grown. This contrasts to small holders' where the surface channel is 5-15cm above the field level, with water moving over the field quickly so that there is less time for infiltration and the field typically takes 100-130mm before the rice is transplanted after 7 days.

The NAFCO farms typically allow a month to lapse between flooding and transplanting so water is taken earlier, at the end of the dry season and as early as between July and September. The normal growth cycle of rice requires 750-900mm of which needs to be added to these water requirement figures.

So due to the donor supported British engineers design errors, the modern NAFCO farm requires 3 times as much water per irrigation (and are flooded twice) as the traditional small holders. Thereby more than doubling the annual water requirement of the rice crop and adding pressure on water resources at the height of the dry season.

Another SMUWC paper prepared by HTS Water Management Consultants Ltd: Irrigation Management Transfer, sets out a proposal for the two government owned NAFCO systems in the Usangu plains (Mbarali and Kapunga) that are hydrologically important since they are located on perennial rivers and have the ability to abstract a large amount of water throughout the year. SMUWC argue that since yields at these modern farms are 1-3tons/ha compared to traditional small holder farms of 2-5 tons/ha, and that their use of water is relatively inefficient compared to smallholders, the NAFCO farms should be transferred to the smallholders through a variety of options. The paper concludes that not only would this raise efficiency and productivity but would also provide the opportunity to take irrigated farm land out of production.

B. Comments by witnesses recorded in the film "Talking about Usangu":

1. There is no dispute that the Ruaha River dried up for the first time in living memory in 1993 and every year there after, the situation was getting worse, and was directly related to rice irrigation;
2. Mr. K. Bashar of the University of Dar reported that results from the analysis of measurements at 13 water measuring stations in the upper catchment highlands since the 1960s to 1998 had shown no significant change in water supplying the area to correspond with the drop in flow rates down the Ruaha River.
3. Water is not getting into the Usangu swamp (which has shrunk from >1000sqkm to 80sq km).
4. The Managing Director of TANESCO power supply at the time, Mr. B. Luhanga, pointed out that over a decade flow rates of water into Ruaha were decreasing except for the unusual El Nino year where heavy rainfall at the end of 1997 and beginning of 1998 replenished the reservoir levels. Consequently between 1992 and 2000 power had to be rationed 3 times, crippling industry. There are still question marks over the long term effect of reduced flows on the Hydropower stations at Kidatu and Mtera that are currently contributing towards half the national power supply.
5. As one subsistence farmer put it, "prior to rice irrigation improvements there was no competition for water, but now following the rice irrigation improvement schemes there is conflict from every direction".
6. There has been a huge influx of migrant people associated with irrigated rice farming and cattle herding.

Part 2 SMUWC recommendations and proposed Short term strategy.

SMUWC identified the recommendations below to restore dry season flow to the Great Ruaha River with little impact on rice production.

Immediate objectives:

1. Cease irrigation 3-4 weeks before harvest with no 2nd irrigation to prevent the Ratoon (volunteer) rice crop that self germinates after the harvest. This low yielding 2nd crop results in very inefficient use of water.
2. Use of short season rice varieties, without double cropping, to reduce from the current 150-160day varieties to 120-140 day varieties.
3. Shorten the time taken between wetting fields and transplanting rice (small holders take 7 days while NAFCO take over a month during the dry season).
4. Decrease “season creep” by preventing EARLY and LATE transplanting which both result in low yields (early due to pests, and late due to the cold temperatures) and therefore inefficient use of water in the dry season.
5. Except for nurseries, agree a start date for irrigation. Eg. Not before November.
6. Locate nurseries in contiguous blocks in upstream areas to minimize water loss.
7. Agree closure of main intakes for the period during the dry season 1st June to 1st Nov.
8. Installing boreholes to reduce losses via canal distribution of domestic water (also improves quality of drinking water).
9. Reducing intake flows during heavy rainfall periods.
10. Restrict dry season non-rice cropping under irrigation (does not need to be under continuous irrigation like rice & should only use residual water left over from domestic use or late rice).
11. Encourage contiguous cultivation to reduce canal or plot to plot losses.
12. Encourage use of furrows to prevent plot to plot transfer of water resulting in unnecessary irrigation.
13. Utilise small plots where possible.
14. Reduce depth of water in rice fields from 18cm to 12cm (requires smallholder confidence in water security to prevent hording & NAFCO to level fields to reduce water depth). Agronomists say 5cm is sufficient.
15. Zoning priority land for irrigation & identify land not to be cultivated unless very wet.

Longer term objectives:

16. Reduce Peak abstraction flow to reduce area under irrigation.
17. Time based scheduling methods to reduce intake flows.
18. *Proportional division with different intakes.
19. More proportional division with different intakes.
20. More canal distribution, without further improved intakes, to increase:
 - a) efficiency of water use and water provided to tail end users;
 - b) control through smaller groups facilitating agreements;
21. Drainage to return excess water to the river.

*Use of Castellated weirs for proportional division of intakes each with the same base level but varying widths determined through local negotiations and users irrigation areas. The advantage of this type of weir is that existing improved intakes can be easily modified to allow a permanent all season maintenance flow down the river through a release (Bypass) flume and a series of divided abstraction intake flumes for use according to varied river flows rather than depending on arbitrary volumetric water control. At high flow rates excess water flows over the weir. At low flow rates water is divided proportionally between the flumes (release & intakes). There is the option of an on-off shutter to reduce intake width at low flows. This type of weir was proposed by Dr Lankford.

The design could be taken a step further to alter the design width of the release or bypass flume during very low flows so that the proportion of water going down the river is greater at extreme low flows. Fewer options leave fewer loopholes to tamper with.

In addition NAFCO large scale farms should be required to:

1. Not use water to soften mud and to germinate weed before drying off. Instead they must shorten the period between wetting and planting to 7 days in the same way as smallholders do;
2. Limit water for nurseries with no dry season irrigation water right.
3. Fill in tertiary canals to increase flow rates across the field, higher density of smaller plots, leveling to reduce water depth.
4. Install transference canals rather than the unnecessarily flooding of intermediate fields.
5. Dry off 3-4wks prior to harvest.
6. Reduce abstraction flow rates and overall right to water to reduce area under irrigation while maintaining rice production through improvements in the efficiency of water use and productivity.
7. Divert the river back into its old river course during dry season to avoid intermediate swamps.
8. Delay start of irrigation until November.

Through these methods it is argued that water abstraction can be drastically cut from 1st June to 1st November with little impact on rice production.

The idea being not to interfere too much with the wet season irrigation requirements, other than to prevent further intake expansion, but in return secure agreement to shut off intakes during the dry season, when the impact on, and value to rice farmers is relatively small, so as to secure water for environmental needs. The flexible seasonal strategy prioritizes rice irrigation during the wet season while domestic and environmental demands take precedence during the dry season. Dr Bruce Lankford's Red Routes on Blue Rivers paper suggests this flexibility could extend to each river to make the strategy appropriate: flexible, situational, prioritized, targeted, zoned & timed water policy using different options according to tributary.

PROPOSED STRATEGY:

1. Wet season: Jan-May:

Rains bring increased river flow and reduced field water demand.

River flow exceeds rice irrigation requirements resulting in a downstream flow. The only intervention necessary is to prevent further expansion of water abstraction (new and improved intakes) that will further jeopardize the Mtera & Kidatu storage reservoirs which depend on this surplus flow. Any conflicts should be alleviated by more equal distribution of water between the rice farmers. In the long term intake abstraction can be gradually restricted in line with water use efficiency improvement programs without affecting reducing rice production.

2. Dry Season: June-End Oct:

River supply exceeds rice nursery requirements and some domestic use while allowing a good flow for environmental needs. Currently, although very little rice irrigation takes place during this period, intakes are left open for the relatively small domestic requirements and intermittent irrigation of non-rice crops. Plot to plot transference rather than canal conveyance to isolated nurseries and non-rice crops result in considerable unnecessary water losses. SMUWC recommend that agreement is obtained to stop dry season abstraction from the river (with perhaps the exception of well located rice nurseries) and instead supply domestic requirements through boreholes or piped clean water.

3. End of Dry Season: Nov-Jan: Rice irrigation demand outstrips supply.

This is the hardest time of the year to ensure flow for environmental and domestic needs since the irrigation demand is so great. However, there may be potential in allowing a small environmental maintenance flow through keeping release gates partially open which will require restricting the amount of water taken at this time. Conflicts to ensure fair distribution will be at their highest. Again long term intake abstraction can be gradually restricted in line with water use efficiency improvement programs.

The greatest concern as to whether river flows in the Great Ruaha River can be restored all year round is at the end of the dry season. Since this coincides with the lowest flow and the highest rice irrigation demand. The objective will be to delay irrigation until November.

There needs to be a tightening of the window of opportunity for rice irrigation from Oct to June (created by the donor supported improved intakes) back to the traditional Jan to May rice irrigation in order to coincide with the wet season and so as to restore the flow of the Great Ruaha River throughout the year.

The proposal is to use a Command & Control combined with a Community based approach (i.e. incentives with enforcement).

The initial objective is to focus on the 15 intakes on the Kimani, Ruaha, Mbarali, & Ndembera perennial rivers. The Ruaha & Mbarali rivers will be most affected by imposing conditions on the Kapunga & Mbarali rice schemes to limit water use both during wet and dry seasons. It's important to ensure that the intake on the Ndebera river remains shut at Madibira between May and November.

These rivers contribute to 50% of the rice production but only 25% of the dry season non-rice crop in Usangu. The 15 intakes contribute towards 13% of the total for Usangu and 22 cumecs of abstraction, equivalent to half that of the total for the area. The initial idea is to concentrate on managing 15 intakes for half the year rather than 120 intakes for the whole year.

The 8 perennial streams of the Mkoji catchment will be more challenging since they feed 70 intakes and support extensive dry season irrigation. The Chimala river will present similar challenges.

Part 3 FURTHER SUGGESTIONS TO FORM THE BASIS OF A PROPOSED ACTION PLAN:

Three Pronged Approach:

A. Implementation of the SMUWC recommendations and proposed strategy for smallholder rice irrigation with agreement from all stakeholders to prevent water abstraction during the dry season and to introduce a limit to water use during the wet season; Donor support will be necessary to achieve this.

B. Conditions attached to the Privatisation process of NAFCO farms to prevent water abstraction during the dry season and to reduce intake quota during the remainder of the year. This requires donor assistance to show how efficiency of water use can be achieved to prevent a reduction in production.

C. Medium sized Hydroelectric scheme to be established upstream of Ruaha National Park. This could be funded by commercial investments together with donor assistance.

All three approaches need to be combined if we are to meet the Government commitment for all year round flows to restore the health of the Great Ruaha River by 2010. In fact, if the first decisive steps are taken without delay the benefits from decisive action could be seen 5 years ahead of schedule which would send a clear message to the world about how committed the Tanzanian Government is towards its natural resources.

A. Implementation of SMUWC recommendations.

Steps required to restore flow to the Great Ruaha River while maintaining rice production:

1. Provide tangible benefits to the rice irrigation farmers who follow the recommendations set out by SMUWC through waiving the water rights tax system since it is unpopular, unfair, and assumes an unlimited water supply (and the water rights revenues have been used to build more intakes!-refer to "talking about Usangu"). People must now understand that water is no longer an unlimited resource and that they will have an allocation that they will need to distribute and apply with maximum efficiency if they are to raise their productivity. Boreholes and piped clean water should be provided as an alternative to keeping intakes open for domestic use.

2. In return the Rice Irrigation Farmers (both large and small farms) must:

a) Agree to close the intakes during the dry season when rice production is out of season. Also allow a maintenance flow for the environmental needs of the Ihefu swamp and Ruaha River during low flows through the most critical time in November when flows are limited and demand for irrigation is high. The question will be whether agreement can be reached to allow a sufficient maintenance flow to keep the Ihefu swamp topped up and allow it to spill over into the Ruaha river. Once implementation of the SMUWC & Dr Lankford's recommendations has been achieved, with a ban on irrigation during the dry season, then this flow will keep the swamp topped up so that the November-January requirement will only be to ensure a small maintenance flow that allows the swamp to continue spilling with a very low flow that keeps the Ruaha River healthy. We would hope for some local catchment run off to supplement this flow once the rains arrive.

b) Agree a start date for irrigation in November with transplanting 7 days after flooding. Flooding should not be permitted prior to November. On an annual basis a date must be determined after 1st November dependant on threshold measurements of river flow rates and rainfall. Safeguards have to be built in to close loopholes that may result in season creep.

c) Agree to tighten the transplanting window to prevent season creep through a more uniform use of shorter day rice varieties along with the 3 week drying off prior to harvest. Rice does not need to be grown during the dry season and should be rainfed only.

3. There has to be an immediate cap on further expansion in the capacity to abstract water. Otherwise not only is the likelihood of restoring the Ruaha River flow jeopardized but the wet season flow rates will continue to decline, exacerbating the environmental disaster, endangering tourism to Ruaha National Park, and crippling National Power which now depends on the wet season flow.

4. There needs to be a long term reduction the peak intake abstraction and land area under irrigation particularly during the November and December months if we are to secure perennial all year round flows back in the Ruaha River. This can be achieved through phases with corresponding donor support to enable farmers to compensate production through improved efficiency of water use. However such donor support must go hand in hand with targeted reductions in peak intake abstraction.

5. New Stakeholder Steering Committee.

The Ministry of Natural Resources and Tourism will need to convince the Ministry of Energy and the Ministry of Agriculture as to the urgent need for cross Ministerial support for an action plan to secure permanent flows to the Great Ruaha River with little impact on rice production. The science is there, the problems understood, and solutions obvious: now is the time take action.

Representation: The Central Government needs to appoint a Stakeholder Steering Committee (including representatives from: the Ministry of Natural Resources and Tourism; Ministry of Agriculture and Food; Ministry of Livestock and Water; Regional Administration Secretaries for Mbeya and Iringa; TANAPA; Wildlife Dept.; District Executive Directors for each district affected by the decisions; Natural Resource Officers; Representatives of the District catchment committees; Rufiji Basin Water Office, RBWO; WWF; FORS; TANESCO; NAFCO farm managers; representatives of the Smallholder rice irrigation schemes, etc.) with a high level cross Ministerial mandate to draw up and implement an action plan that will really make a difference for the benefit of all.

To date the environmental needs of the Usangu wetlands and Ruaha National Park have not been represented amongst those who have been dividing up this water resource. This new Steering committee is now the opportunity for the Tanzanian National Parks, TANAPA, who have done such an admirable job in protecting wildlife in Ruaha National Park, to take a prominent place in determining the future of the Great Ruaha River catchment on which this park so depends. It will also give TANESCO the opportunity to protect their main resource: water. TANESCO needs to contribute more towards protecting their resources.

a) Project Team-Hands on: The Steering committee needs to direct a Project team to negotiate agreements prior to assistance. The Project team must be hands on with the communities and understand the challenges and potential solutions before they transfer them to the areas concerned in order to avoid exacerbating the problem in the way that previous donor projects have done. The job has to be done properly if the Steering Committee is going to achieve it's aims of all year round flows to the Ruaha river without loss in rice production and retain credibility amongst the communities responsible for abstracting most of the water.

b) Implementation: The steering committee will need to decide on irrigation start dates, final transplant dates, irrigation cut off dates. The primary role of the steering committee is not to further research but to translate the current existing research into a detailed action plan that gains the necessary agreements and By Laws, from village committees & local government, to increase the efficiency of water use while reducing intake capacity and the season for permissible irrigation through the promise of assistance. Legal conditions will need to be imposed by central government on the privatization of the NAFCO farms. The opportunity must not be missed.

c) Cooperation: The steering committee needs to achieve it's aims through Central Government empowerment so that the Project Team can work closely together with the RBWO, local government officials, and other departments, with a common objective and the necessary donor funding.

d) Negotiation with Water User Committees: The measures to waive water rights, and improve efficiency of water use through more effective sharing (Castellated weirs, better canal distribution, reducing plot to plot transfer of water, contiguous blocks of irrigation etc), must go hand in hand with the understanding that there is to be no irrigation during the dry season and that there is now an overall limit to water use in the wet season and particularly at the end of the dry season-start of the rains period. Otherwise more and more rice will be produced from the water saved thereby defeating the object of the exercise.

e) Restricted Intake Abstraction: There is no sense in providing ways of improving the efficiency of water use if it just results in more land area irrigated and water used without restoring flows to the Great Ruaha River. **The water saved must result in flows to the Ruaha River.** It must now be understood that water is no longer an unlimited resource brought by God. Once dry season irrigation is closed, and intakes are capped (with long term phased reductions) then people will have the incentive to improve their efficiency of water use in order to maximise their own productivity.

f) Funding: The cost for these measures needs to be laid at the door of the donors that sponsored the projects that created this problem!

With this central Government support the Steering Committee will be able to give the Project team it directs, the necessary teeth to negotiate agreements with Water User Committees at village level. However the Project Team will need to be:

- very experienced to facilitate decisions within the Steering Committee;
- understand the issues and prime objective of restoring permanent flows to the Great Ruaha River;
- be hands on with the communities;
- have the ability to negotiate agreements with the water users;

It is important to remember that negotiation means that the tangible benefits (boreholes, exemptions in water rights tax, investments in more even distribution of water, inputs eg. New variety seed, etc. are linked directly to concessions in water use ie. No dry season irrigation; peak intake abstraction limits; later irrigation start date; & earlier drying off dates; etc.

Naturally the project team will need donor support to achieve its aims.

While the aim is to meet the Government commitment for permanent year round flow in the Great Ruaha River through the 150km of Ruaha National Park by 2010, the action plan must start taking effect this dry season of 2004 to prevent further environmental damage from irreversibly destroying the Ruaha National Park. If the Government were to act now by approving the ideas for a Steering Committee and Project Team with a cross Ministerial mandate then the Project Team could achieve their aims by the end of 2005.

6. Some further research is needed to:

a) determine the impact of migrant herders and livestock on the Ihefu swamp and Ruaha river flows.

Currently the impact of livestock is still in dispute. There is an undeniable livestock impact on the biodiversity of the wetlands* but it is uncertain as to what the effects are on downstream flows in the Great Ruaha River. Scientific evidence has not yet been presented to show that the impact of livestock is irrelevant or of minor consequence. The possibility exists that livestock have interfered with the sponge effect of the swamp in retaining water and flow for the dry season. This issue still represents a gap in our understanding of the problem and for researchers to disregard the impact it must be based on scientific evidence. No one doubts that the rice irrigation is the main cause behind the disrupted flows in the Ruaha river (this has indeed been what observers have been saying all along), but the relative impact of livestock must be addressed scientifically.

*The WWF (pers comm.) has confirmed the impacts of massive grazing and livestock activities on the floodplain vegetation are undeniable and downward trends on wildfowl numbers and breeding are clearly evident. The Wattled Crane has reportedly been unable to breed successfully for up to 15 years and now the resident population is ageing.

b) determine what is happening with wet season flows since the observations on the ground are suggesting that this has also become a problem. If so, this may have serious National consequences.

c) examine the proportion of water used and wasted by the large scale NAFCO farms compared to smallholders and determine how far intake capacities can be reduced alongside improved efficiency.

B. Urgent Action to Regulate the NAFCO schemes as part of the Privatisation process.

Events are overtaking the SMUWC recommendations for transferring management of the NAFCO farms since the farms have already begun the process for privatisation. The danger is that privatisation will result in increased water requirement due to the incentives to produce at the lowest cost and the financial ability to pull into irrigated production the full land area.

The best compromise is to use the privatisation as an opportunity to reform existing water rights and attach legal conditions to a reduced and capped quota of water permitted to be abstracted. Donor assistance is required to correct the design faults in the system and encourage efficiency provided saved water reaches the Ruaha river. However given a limited water resource any private farm will have the incentive to improve its efficiency of that water in order to maximise productivity. All that is required is the correct advice on how to achieve this and an organisation to limit the water taken.

Since many of the small holder farms are integrated alongside the NAFCO farms the new owners should be involved in the reform to both modern NAFCO farms and the small holder farms. For example: through multiplication & distribution of improved short season rice varieties.

C. Other measures that can be considered:

a) Hydroelectric power project:

It is entirely possible to establish a medium scale Hydroelectric project with large reservoir on one of the perennial rivers relatively near the Ruaha National Park. Somewhere below Madabira would be ideal. This could be funded partially by the commercial sector but with some supporting grants and/or soft loans from various donors. It may be necessary for some donor grants to cover part of the one off capital investment, since otherwise the commercial sector may prefer to turn to locations that hold more potential for power out of the Ruaha catchment. If this can be achieved, then this will solve the problem at the height of the dry season when, even after implementing the SMUWC recommendations, there is still no guarantee of flow. Water will continue to be released all year round as it does from Mtera & Kidatu power stations thereby supporting a flow through Ruaha at all times.

b) Damming the Usangu swamp outlet?

We need to establish the feasibility of a low cost “leaky dam” on the outlet of the Usangu swamp. A dam construction which aims to be 100% watertight with mechanisms for water release control may prove too costly, and the only financial return from power it may achieve would be if it served as a further storage capacity for dry season release of water to Mtera downstream from Ruaha National Park. However, a cheaper version that allowed some flow through the dry season (ie it leaked) could serve to bridge the gap at the end of the dry season maintaining a reasonable flow all year round. Depending on whether a narrow point in the river valley could be found, the dam would be low cost and perhaps only a few feet high, yet still flooding back for miles since the usangu plains are notoriously flat. It would also restore some of the wetland. The three concerns are a) can it be done? b) at what cost? c) will the increased evaporation rates negate its purpose of maintaining flow at all times?

Once measures are implemented, and successful in restoring flows to the Great Ruaha River, regulations will be necessary to ensure sustainability and that the system is protected from abuse.

Donor Responsibility

Donors involved with the above small holder improvement schemes and also the Modern NAFCO farms have the moral obligation and responsibility to put right the environmental damage that they have imposed on the Great Ruaha River Ecosystem. This is a situation that would not have been tolerated in the respective donor's own countries. It is imperative they:

1. Assist and facilitate the Tanzanian Government at higher and local levels to implement the recommendations and restore an all year round flow to the Great Ruaha River;
2. Provide the necessary funding to achieve this aim so that it does not continue to be a Global embarrassment.

The donors need to unite with the Tanzanian Government to reverse the effects of these badly thought out and poorly designed activities.

It is very fortunate that the World Wildlife Fund WWF have already made the commitment to offer their assistance in a leading capacity, but it is unlikely that they will be able to meet all the funding costs on their own. I understand that their report, with funding proposals, will be complete in a matter of months.

Conclusion

There is an urgent need to redistribute the valuable water resources of the Usangu catchment to prevent further environmental damage to Tanzania's national heritage -the Ruaha National Park. The three pronged approach to:

- implement the SMUWC recommendations to regulate water use in the Usangu catchment;
- attach conditions to the privatization process in order to regulate water used on the NAFCO farms;&
- establish a small-medium sized hydroelectric scheme in the Ruaha River catchment;

will enable the Government to meet it's commitment to restoring permanent year round flows to the Great Ruaha River without reducing rice production. All that is required is the Political Will and Donor Support to achieve this objective.

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Finally, thanks must go to TANAPA and the Friends of Ruaha Society for objecting so strongly over the last decade, that the research was undertaken by SMUWC to discover the causes behind the problem that has ultimately led to this opportunity for a solution. It is essential that the interests of TANAPA and FORs are properly represented and taken into consideration with all future activities within this catchment to prevent such a disaster from happening again.