Forecasts prevent crop damage by migrant pests in southern Africa

RIU

Validated RNRRS Output.

Twelve countries in southern Africa—Angola, Botswana, D.R. Congo, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia, and Zimbabwe—now use a new early warning system to prevent large-scale damage to crops by migrant pests. It's vital to deal with insect and bird pests before they become a serious problem. But they appear suddenly, multiply rapidly and disappear just as quickly. Now, each country sends in regular reports that are fed into a database. This shows what's happening with pests and where. The information helps pest officers forecast imminent outbreaks and issue warnings so that farmers can take preventive action. Active co-operation between countries has been crucial to the system's success, as pests don't respect national borders.

Project Ref: **CPP46:**
Topic: **7. Spreading the Word: Knowledge Management & Dissemination**
Lead Organisation: **Plant Protection Research Institute (PPRI), South Africa**
Source: **Crop Protection Programme**

Document Contents:

Description

Research into Use
NR International
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Geographical regions included:

Angola, Botswana, Congo DR, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia, Zimbabwe,

Target Audiences for this content:

Crop farmers,

CPP46

A. Description of the research output(s)

1. Working title of output or cluster of outputs.

ICOSAMP (Information Core for Southern African Migrant Pests)
"Establishment of a southern African migrant pest reporting network and computerised data capturing systems"

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

Crop Protection Programme

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.

R8315 (ZA0585) AND R7890 (ZA0439)
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*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.*

Outline of problem
Migrant pests annually threaten the agricultural productivity of more than 123 million people in the Southern

African Development Community (**SADC**) region. These pests are highly mobile and are able to freely traverse political boundaries, making active co-operation between neighbouring countries with regard to monitoring, management, and control vitally important.

The main migrant pests which threaten food crops are three species of locusts viz. **brown locust** (*Locustana pardalina*), **African migratory locust** (*Locusta migratoria migratorioides*), and the **red locust** (*Nomadacris septemfasciata*); **Red-billed Quelea** birds (*Quelea quelea*), and the **African armyworm** (*Spodoptera exempta*).

The main management technique of these pests before they become a serious problem is preventive control. It is therefore important to know the current distribution and scale of infestation, especially in the case of armyworm where the sudden appearance, rapid development and disappearance of the insect calls for quick action. Cross-country communication is the key to early warning of impending invasions or outbreaks.

Outputs

The Information Core for Southern African Migrant Pests (**ICOSAMP**) (R7890) addressed this problem by establishing a southern African information **network** specific to these migratory pests. ICOSAMP fostered regional co-operation between national government migrant pest officers in the SADC region, who regularly provide up-to-date migrant pest distribution information to a central desk. A monthly *ICOSAMP News* Bulletin is disseminated to national and regional decision makers, as well as to international organisations. This information enables decision makers to forecast impending invasions or outbreaks, and thus reduce the impact of migrant pests on the food security of this semi-arid region. During this first Phase of the project, a SADC regional migrant pest reporting form was initiated together with set reporting dates, the design and implementation of a computerised data-capturing system, organisation of two training workshops, and the activation of a website.

The ICOSAMP database is the *only* geo-referenced database available for recording the distribution and status of migrant pests of the whole SADC region.

The second Phase of ICOSAMP (R8315) involved the design and installation of 14 ‘satellite’ country-specific systems to assist ICOSAMP collaborators with ‘in-house’ **data collection and mapping**. Training was provided to each country on the use of their own system.

A specialised workshop was held to train all collaborators on safe pesticide use, application methods, and identification of the relevant migratory pests.

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**=Monitoring network for southern Africa

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

The main commodities upon which the output focuses are the migratory pests which threaten agricultural production in southern Africa viz. armyworm, locusts, and RedBilled Quelea birds.

However, with a few minor additions to the database programming and the purchase of GIS software, this software system can easily accommodate data on the distribution and associated environment of the Larger Grain Borer (LGB), a pest which is raising concern in the SADC region with respect to phytosanitary regulations.

In addition, the ICOSAMP system can easily be installed and used by more organisations and smaller out-stations in each country eg. the software could be installed at local community internet stations, for use by agricultural extension officers.

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

Note: Because of the nature of this project to focus on preventing large scale crop devastation through early warning of impending outbreaks of specific cross-border migratory pests, ICOSAMP will have a cross-cutting output on the above production systems in southern Africa. These migratory pests are no respecter of boundaries and due to the range of crops at risk from these pests, most of the production areas indicated above (except for the forest production systems) may be affected.

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***
X	**X**		**X**	**X**	**X**	

Note: ICOSAMP, because of its' focus on preventing large scale crop devastation through early warning of impending outbreaks of specific cross-border migratory pests, will have a cross-cutting output on the above production systems in southern Africa. These migratory pests (armyworm, locusts, and Quelea) affect the following range of crops in both small-scale and commercial farming practices: barley, maize, millet, manna, pastures, rice, sorghum, sugarcane, teff, wheat, and various other crops eg. sunflower.

*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

Due to the unique nature of this project in the CPP cluster, and the fact that it has a cross-cutting output, the computerised system – with minor programming adjustments - can be utilised to record and map the distribution of other pests in the SADC region, as well as disseminate research information via the ICOSAMP website.

One particular pest of concern in the region is the **Larger Grain Borer** (*Prostephanus truncatus*). Small-scale farmers face a particular challenge in maintaining grain stocks free of insect infestation to optimise potential food security, or to retain grain quality long enough to allow marketing later in the storage season when prices are higher. This is potentially exacerbated by the spread of the LGB in the region. The main cereal grain to be considered is maize which is becoming an ever more important crop in sub-Saharan Africa with demand increasing by 93% from 27 million tonnes in 1995 to 52 million tonnes in 2020.

Previous Research Outputs that could possibly be / or are already clustered with ICOSAMP are:

African Armyworm – R8407, R7966, and R6762 where ICOSAMP system could be utilised to record data and map outbreaks. The ICOSAMP system was also installed onto the computer of the Armyworm Forecasting Services in Arusha, Tanzania to assist with recording of data and map creation.

Locusts – R7779. Brown locust data from South Africa, Namibia, and Botswana is entered into the ICOSAMP database during outbreaks.

Quelea – R8426, R7967, R6823, R8314. Quelea distribution data from every country in SADC are regularly added to the ICOSAMP database, and portions of this data were used to validate two of the Quelea projects listed above.

In addition, ICOSAMP could easily be used as a 'template' for the design of a similar system in East Africa for monitoring their regional migrant pests.

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)**.*

Validation of outputs of the ICOSAMP project has been an ongoing process during both phases of the project development (1 January 2000 - 31 March 2003; 1 April 2003 – 31 March 2005).

The outputs, and how and by whom these were validated, are indicated below.

SADC migrant pest communication network established. This communication network was established at the beginning of the project, and regularly utilised by all the SADC collaborators, and other international stakeholders. The regular use of the icosamp@ecoport.org email address by all stakeholders is in itself a validation of this output.

Standardised reporting forms designed and implemented. Beta versions of 3 standardised 'SADC regional' reporting forms (one for armyworm, one for locusts, and one for quelea) were discussed, accepted, and implemented by all collaborators during the first workshop held in 2001. Initially, the reporting forms were planned on a quarterly submission basis, but after discussions at the second workshop in 2002, collaborators agreed to revert to a monthly reporting format, and these forms were adjusted to suit this decision. Minor adjustments were made to these forms during the second phase of the project, to accommodate the design of country-specific software systems. These suggestions were put forward by collaborators and validated.

Workshops and Training. To date 2 annual workshops, 1 training workshop, and 7 personalised training sessions were provided to collaborators. Collaborators were requested to complete a workshop evaluation questionnaire at the closure of each workshop/training session, and these results were recorded in the Final Technical Reports.

Database, GIS, and computer systems designed. All collaborators (= end users) were actively involved during the second workshop, in evaluating the usefulness and ease-of-use of the computerised database system. Even though two of the participants had never been previously exposed to a computer, they were able – with assistance – to navigate the various menus and options. Based on the results of the evaluation, adjustments were made to the system.

Bulletins and Website. Monthly ICOSAMP *News* Bulletins are issued, disseminated via email and fax, and posted on the website. The website (http://icosamp.ecoport.org) is updated on a regular basis.

Development of Satellite Country-Specific ICOSAMP systems. At the request of the collaborators, country-specific systems (15) were designed, training provided on these systems, and computer hardware and software provided. Validation of this output has been via the collaborators through the use of their own ICOSAMP systems.

In addition, a request was received from the Armyworm Forecasting Service in Tanzania, for the installation of the Tanzania system and training.

Validation of ICOSAMP. Not only has this network and computerised system assisted SADC national governmental migrant pest officials to add value to their work, but it has fostered cross-border communication, and promoted the re-establishment of migratory pest monitoring in some countries. Examples are:

1. Lesotho: "Not only has ICOSAMP helped us in terms of alerting us of the prospects of having migrant pest outbreaks, but we were also alerted of an outbreak in South Africa in a province bordering Lesotho. That report helped because that part of the country is rarely visited due to its topographic nature."

2. Malawi: “The warning of unconfirmed reports of a locust swarm from Mozambique spurred officials in Malawi to undertake a survey of the areas bordering Mozambique.”
3. Namibia: “We have developed our migrant pest reporting format based on the ICOSAMP reporting forms.”
4. South Africa: South Africa has developed the Quelea database fields for their national AGIS (Agricultural Geo-referenced Information System) to merge with the ICOSAMP database fields.
5. Zimbabwe: “The ICOSAMP network is very useful in issuing warnings of likely outbreaks in other countries, as this information would otherwise be inaccessible and unavailable to member countries operating in isolation.:

*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)**.*

The outputs of ICOSAMP are targeted at 12 countries in the SADC region viz. Angola, Botswana, DRC, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia, and Zimbabwe. In addition, data are also received and Bulletins sent to the International Red Locust Control Organisation for Central and Southern Africa (IRLCO-CSA) based in Zambia, and the Armyworm Forecasting Services in Tanzania. System, reporting forms, and website outputs were all evaluated during 3 workshops.

Monthly reports of migratory pest distribution are received from all SADC governmental officials. This data are collated, analysed, and summarised in the ICOSAMP Bulletins which are then sent to all collaborators and stakeholders.

Due to the nature of this project to focus on preventing large scale crop devastation through early warning of impending outbreaks of specific cross-border migratory pests, ICOSAMP has a cross-cutting output on most of the production systems in southern Africa. Crops most at risk from these pests are barley, maize, millet, manna, pastures, rice, sorghum, sugarcane, teff, wheat, as well as various other crops eg. sunflowers.

Obviously the end goal is to assist decision makers with pre-warning of possible pest invasions into their countries, in the hope that they could mobilise control teams quicker, and thus prevent large-scale devastation of crops, either at small-scale or commercial levels.

Current Situation

C. Current situation

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

As the central ICOSAMP system is now developed and all the country-specific systems have been installed, the main usage of the computerised system is by governmental migrant pest officers.

The distribution list for the Bulletin (email and fax) extends to a wider audience such as research organisations, NGOs, and international organisations. The website, where an archive of Bulletins, maps, and workshop proceedings is maintained, is public domain and is therefore accessible to the general public.

*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).***

The outputs of ICOSAMP are currently being used in 12 countries in the SADC region viz. Angola, Botswana, DRC, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia, and Zimbabwe.

In addition, the International Red Locust Control Organisation for Central and Southern Africa (IRLCO-CSA) based in Zambia, and the Armyworm Forecasting Services in Tanzania also have a system installed.

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

During the past year there has been a definite slowing down in receipt of country migrant pest reports at the central base (Pretoria), which could be as a result of various factors such as:

- Capacity changes at country offices with neglect to inform the ICOSAMP coordinator of these changes;
- A lack of sustainability within these capacity changes, especially with passing on training knowledge of ICOSAMP;
- The capacity of the coordinator being stretched to the limit due to new work commitments, and thus not having time to follow up on non-receipt of reports;
- 'Pirating' of the computer to more senior levels, which means the collaborator does not have access to the ICOSAMP system

The scale of use is however difficult to measure as each country now has its own system and they 'may' be using it for their own in-house reports.

ICOSAMP has however certainly assisted with capacity building in 12 countries and 2 organisations through provision of the system.

*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).***

From the start of the project there was a very positive response from national stakeholders. This fostered communication between countries eg. between South Africa and Botswana with respect to Quelea on their respective country borders, as well as between research organisations and control organisations. The SADC Secretariat was instrumental in ensuring that ICOSAMP reports were presented at their annual crop protection

meetings.

Unfortunately, due to the re-re-restructuring of the SADC and its' centralisation to Botswana, many issues have been dropped off the agenda – migrant pests being one of them!

When SADC is able to build up their capacity again, and is encouraged to promote cooperation with ICOSAMP, this network will play a vital role in the region.

ICOSAMP is a southern African initiative which can provide lessons on regional research co-ordination, communication and policy advocacy to policy makers as well as information on regional co-operation and best practice in the management of migrant pests.

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.*

1. Promotion of ICOSAMP is currently taking place in South Africa, where the National Department of Agriculture has given permission to load the software system onto their computers based at 2 of the locust control depots. This has still to take place, and training to be provided to the users. This will assist the SA government to more accurately record and map the distribution of brown locust outbreaks, and to formulate in-season forecasts.

2. Two projects were recently awarded by the SADC ICART funding mechanism to NRI (UK) and CABI (UK) for the 'promotion of community armyworm monitoring', and the 'assessment of the impact of Quelea bird control'. Both of these projects will be making use of the ICOSAMP website to disseminate research results and pest distribution data.

*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)**.*

Based on personal experience gained over the last 4-5 years of working on this project, I perceive the constraints to slowing down the adoption of the outputs as largely politically based. Communication in this network is predominantly with national migrant pest officers, many of whom do not have the authority to make decisions. Higher-up decision makers are often unaware of the implications of not responding to alerts sent by ICOSAMP as they are not always *au faire* with the operations of the network.

Also, I have experienced a **large** turnover of country collaborators in this network, due to various reasons such as resignation from their job, retirement, promotions, and even death. This creates a weak 'link' in our network chain as the new incumbents will require training on the ICOSAMP system and introduction to our modus operandi. While there is a friendly agreement between myself and each collaborator, that the person 'leaving' must train the

person ‘entering’, this often does not happen.

Another more recent problem that has surfaced is that the computers I provided were ‘snatched up’ by more senior officials on arrival via the couriers, and the person I had spent a week training on the use of the system, no longer has access to the computer!

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).***

As mentioned in 17 above, solving a political problem is certainly not an easy one, and ICOSAMP is at the mercy of national politicians. Perhaps a solution would be to get NEPAD or SADC to take this network seriously i.e as an insurance policy against a potentially devastating regional outbreak of a pest.

Unfortunately crisis management seems to be the order of the day, as opposed to being well prepared. The capacity structures at SADC are also currently unable to take on the task of running ICOSAMP, and the coordination therefore still resides under the wing of the ARC.

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).***

Although the ultimate goal of ICOSAMP is to reduce the devastation of crops as a result of pests, the current end users of this system are national decision makers. Active participation and endorsement of ICOSAMP at political level will assist in promotion of all the outputs.

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.

Due to the nature of the outputs of this project, no impact studies on poverty could be undertaken.

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*

Due to the nature of the outputs of this project, no impact studies on poverty could be undertaken.

Environmental Impact

H. Environmental impact

24. The direct and indirect environmental benefits related to the output(s) and their outcome(s) are:

ICOSAMP could have an indirect benefit on the environment IF the early warning/alerts are taken notice of when sent. These alerts are meant to assist migrant pest control operators to control potential invasions or outbreaks at an early stage of their development, thereby getting rid of the problem before it gets out of control. The quantity of pesticide applied to the environment during these control operations will likewise be reduced.

25. Adverse environmental impacts related to the output(s) and their outcome(s)?

None.

26. How the outputs could increase the capacity of poor people to cope with the effects of climate change, reduce the risks of natural disasters and increase their resilience?

If the outputs i.e. alerts, are taken seriously by national migratory pest control organisations, the impact on the devastation to crops – especially to the small-scale farmers – will be minimal, thus enhancing the food security of families.
