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Soil Fertility Network for Maize-Based
Cropping Systems in Malawi and Zimbabwe

Soil Fert Net Annual Report

For the Period 1 October 1998
to 30 September 1999

By

The Network Coordinator



CIMMYT

CIMMYT Maize Program, Natural Resources Group and
Economics Program

Contents

Introduction	3
Elements of the Strategy Employed by Members	3
High Points in Members' Work this Year	4
Soyabeans on the Move in Zimbabwe	4
Starter Packs in Malawi	4
Farmer Participatory Evaluation and Development of Soil Fertility Technologies in Chihota	4
Network Research	6
Participatory Evaluation of Legumes and Green Manures	6
Legume Screening	7
Organic x Inorganic N Equivalency	8
"Best Bet" Technologies Workshop	8
Outputs from the Meeting	10
Update on Best Bet Soil Fertility Technologies	10
Economics and Policy Working Group	12
Working Session and Establishment of the EPWG	13
Role of the EPWG	13
Participating Institutions	14
Platform for Policy Dialogue in Malawi and Zimbabwe	14
Training	15
Grant Making under the Economics and Policy Initiative	15
Research Field Tours in 1999	15
Soil Fertility Research and Extension in Zambia	15
Problem Soils of Northern Malawi	17
Interaction with the Risk Management Project	18
Modelling and Farmer Participatory Work	18
Future Plans	19
Information Exchange	19
Network Publications	19
External Conferences Attended by the Coordinator	20
Network-related Papers with a Contribution from the Coordinator	20
CIMMYT's Soil Fertility Research in Zimbabwe	21
Soil Fert Net Activities for October 1999 to September 2000	21

Introduction

In 1998/99, the Soil Fertility Research Network for Smallholder Maize-Based Cropping Systems in Malawi and Zimbabwe (Soil Fert Net) began a projected second four years of work. We followed the strategy (outlined in our 1997/98 Annual Report) of continuing the important long-term agronomic and soil science research while concentrating more on getting the best soil fertility technologies to the farmers through participatory work and wider partnerships, supported by economics and policy awareness.

Soil Fert Net consolidated its joint research through Network Trials, expanded the testing and dissemination of soil fertility technologies using farmer participatory methods, developed links with colleagues in Zambia, updated our understanding of "Best Bet" soil fertility technologies and laid the groundwork for larger and more widespread impact from those technologies through the launching of our Economics and Policy Working Group (EPWG). Total funding for the year (October 1998 to September 1999) was US\$ 259200. The Rockefeller Foundation agreed to continue funding the Soil Fert Net through September 2000, with an increased allocation to cover coordination of the EPWG.

Table 1 summarizes the major Network events held during the report period.

Elements of the Strategy Employed by Members

- ☞ Farming systems diagnostics to learn about current smallholder maize systems, their problems and opportunities related to soil fertility.
- ☞ Long term studies on productivity trends and sustainability of current cropping systems, to better understand the types and pace of soil degradation, and the urgency for solutions.
- ☞ Relevant process research, such as plant rooting systems and nutrient capture for major crop associations, N losses and fixation under representative biophysical conditions.
- ☞ Networking (peer review of proposals, planning, information exchange, sourcing of funds) to focus a critical mass of research resources on high priority themes, including organic x inorganic input mixes.
- ☞ Multidisciplinary research involving soil scientists, agronomists, geographers, socio-economists, extensionists and policy analysts.
- ☞ On farm research on the productivity and resource efficiency of multiple soil fertility options, leading to the identification of "Best Bet" soil fertility technologies. This work involves multilocational on farm trials, crop modelling, GIS, agronomic and economic (and risk) assessments, and the targeting of technologies by soil type, agroecology, farming system and farmer resources.
- ☞ Widespread testing, feedback on, and integration of "Best Bet" technologies through farmer participation, to ensure farmer compatibility and their effectiveness within farmer resource constraints (cash, labour and land).
- ☞ Information synthesis and provision on the "Best Bets", including in research reports, a newsletter, and management brochures.
- ☞ Scaling up to reach many 1000s of farmers — through partnerships with extension services,

Table 1. Main Soil Fert Net Events, October 1998 to September 1999

Type of Event	Title	Dates	Location
Field Tours:	Soil fertility research and extension in Zambia (with DR&SS, Zambia and TSBF)	20-28 February 1999	East, Central and Southern Zambia
	Soil fertility technologies on problem soils	14-19 March 1999	Northern and Central Malawi
Working Session:	Policy and economics working session	21-23 June 1999	Kadoma, Zimbabwe
Workshops:	Combined use of organic and inorganic nutrient sources (with TSBF/AFNET)	6-8 October 1998	Harare, Zimbabwe
	Best bet soil fertility technologies, revisited (with ICRISAT)	26-28 August 1999	Zomba, Malawi

farmer groups, NGOs and donors. This is done by commodity and food security task forces, e.g. maize in Malawi, soyabean in Zimbabwe.

- ☞ Combination with easily adoptable nutrient use efficient germplasm, e.g. N use efficient and drought tolerant maize.
- ☞ Provision of information on and advocacy for agricultural economics and policy support, especially for external inputs such as fertilizer, lime and seed.

High Points in Members' Work this Year

There were many valuable contributions from Soil Fert Net members in the report period. In this section we highlight three of those that are making a special impact or are using new approaches.

Soyabeans on the Move in Zimbabwe

Over the past three years, the Soyabean Promotion Task Force has taken soyabean from a minor crop for smallholder farmers in Zimbabwe to be probably the most rapidly expanding crop in the communal farming sector. Research has shown that soyabeans can grow and yield well (between 1 and 3 t grain/ha) on communal farms. The original idea was to use 'promiscuous' or naturally nodulating varieties such as Magoye, but various other 'specific' varieties such as Roan have been widely used with farmers, together with rhizobial inoculants from Grasslands Research Station, Marondera because seed of the promiscuously nodulating varieties is in short supply. On-farm research showed major benefits in the yields of maize following soyabean compared with continuous maize, largely due to effects of improved soil fertility. Extension efforts have included training for farmers in processing and preparing several dishes from soyabean and the farmers are retaining substantial amounts of the crop for their families.

The expansion of soyabean has been achieved largely through the efforts of two key members of Soil Fert Net; Sheunesu Mpepereki of the Department of Soil Science and Agricultural Engineering at the University of Zimbabwe and Ishmael Pompi of AGRITEX, and their teams. Now farmer demand is far exceeding what they can deliver in assistance with accessing inputs and with extension training. To ensure continued

help for farmers the group is seeking donor assistance for a major extension effort with soyabean.

In 1999, three agricultural economists, Joseph Rusike and Chris Sukume from the University of Zimbabwe and Andrew Dorward from Wye College, University of London, together with Sheu Mpepereki and Ken Giller of UZ undertook a detailed economic evaluation of soyabean production and markets. It also considered the best ways of assisting farmers to organize themselves to market their crops, and included a stakeholder workshop when donors were brought together with all of the other key players to decide on the best way forward. Soil Fert Net is preparing the report for publication. A large extension activity is being developed ready for the 1999/2000 cropping season.

Starter Packs in Malawi

In our annual report last year, we described a nationwide initiative to supply maize seed + fertilizer starter packs to smallholder farmers in Malawi for the 1998/99 cropping year.

The aim was to raise food security by improving the productivity of maize (the basic food crop) on smallholder farms through more widespread use of proven seed and fertilizer technology from research. Technical input into the content of the starter packs came from members of Soil Fert Net based in Malawi. A 0.1 ha "starter pack" of hybrid maize seed and fertilizer was distributed to each of the 1.8 million farm households in Malawi, along with seed of several grain legumes.

Rainfall was good during 1998/99 and most farmers produced a reasonable crop of maize (better than if they had used no fertilizer), contributing to household food security and self-sufficiency of maize in Malawi.

Farmer Participatory Evaluation and Development of Soil Fertility Technologies in Chihota

This project, which was also described in detail in last year's annual report, began during 1998/99 with the following objectives:

- ☞ Expose about four thousand farmers to a range of "Best Bet" soil fertility technologies from research by mounting a set of on farm demonstrations throughout Chihota during 1998-2000.
- ☞ Bring those farmers, extension and research closer by involving farmers in the assessment of technologies and provide a facility for

feedback on generated technologies to extension and research.

- ☞ Encourage farmer adoption, experimentation and integration of the most acceptable technology into the farming system.

To select fields for the demonstrations, the twenty Agricultural Extension Workers (AEW) in Marondera District collected 50 different soil samples each from their areas for soil analysis at the Soil Productivity Research Laboratory (SPRL) in Marondera. These were analysed in September and October 1998 and the five plots with the lowest pH values in each AEW's area were selected as demonstration and evaluation plots for the 1998/99 season. At each site, an AEW worked with a group of about 15 farmers.

Farmers and extension workers implemented 105 Best Bet soil fertility technology demonstrations throughout Chihota and Svosve Communal Areas in 1998/99. They covered:

- Maize liming and fertilizer
- Herbicide on maize
- Soyabean rotation
- Groundnut rotation
- Bambara nut rotation
- Velvet bean green manure intercrop with maize
- Velvet bean green manure sole crop
- Sunnhemp green manure intercrop with maize
- Sunnhemp green manure sole crop

Most of the demonstrations involved the liming of maize fields.

Mid-season and end of season evaluations provided the farmers, extensionists and researchers with an opportunity to examine the technologies in the demonstrations. Group interviews were conducted during about 30 field days with farmer groups throughout Chihota in February 1999 to get farmers' opinions and feedback on these technologies. An end of season workshop was held for all stakeholders in late June 1999 to discuss the results of the demonstrations, paying particular attention to what the farmers thought about the various technologies, their adoption and modification.

Most farmers appreciated the benefits of applying lime, even when only half the recommended rate had been applied this season. Farmers raised the issue of availability of the lime since few local shops stock it. Farmers were also concerned about how to apply the lime. Small-scale farmers find it difficult to apply lime evenly over their land.

Farmers were very interested in sunnhemp and velvet bean green manures and had many questions about the inputs, management and benefits from these.

Management issues included the method of establishing the sunnhemp (broadcast or seeded in lines), whether to apply fertilizer, and where green manures fit in a crop rotation (with most feeling that maize should follow the green manure). Farmer wanted to know how much N would be left in the soil after incorporating the biomass. There was discussion about farmers spreading their crops and inputs over big areas. Many felt it better to concentrate the inputs on a smaller land area, get a higher yield per unit area, and then use remaining land for green manures. Farmers were interested to use the green manures as intercrops with maize.

Some farmers were interested to know if animals could be grazed on the sunnhemp and how to use velvet bean as human food. If all the sunnhemp and velvet bean were to be incorporated, where would the farmers get seed for next season? Farmers were advised to leave small portions for seed.

Farmers said soyabean was new to them and they needed help on how to use it. It was planned that the AGRITEX nutrition unit will demonstrate how soya can be used to make many types of food during ward and district shows. Next year, soyabean needs to be compared with other leguminous crops like groundnut and bambara nut. Where the seed had been inoculated with rhizobium, the growth looked better than where fertilizers only had been used.

At the farmer feedback and re-planning workshop held in June, farmers were interested to use indigenous legumes for grain and for green manuring. They also brought up the issue of developing ox-drawn equipment to apply lime. Additionally, the meeting identified the need for more help from SPRL, UZ and the Zimbabwe Farmers Union, and more networking among the various stakeholders.

The major concerns from researchers covered the need for more appropriate farmer controls against which the new interventions can be compared and the overly complex and expensive fertilizer inputs given to some of the liming and green manure demos. These are leading to re-designed and simplified demonstrations to be implemented in 1999/2000.

Results from the farmer and soil taxonomies developed during the initial survey in September 1998 were re-worked by Mauricio Bellon and issued as Soil Fert Net Research Results Working Paper 4 in August 1999.

Mauricio Bellon visited Zimbabwe again in August 1999 and with AGRITEX staff from Marondera and Tendai Gatsi of DR&SS, developed and tested a baseline survey questionnaire about farming resources and soil fertility practices for Chihota. This was implemented with about 300 farmers during September by a team of enumerators under supervision from AGRITEX staff. Tendai Gatsi is analyzing the data.

During the season, some members of the project team and farmers had commented that inputs used in some of the demonstrations appeared expensive compared with the likely returns. Because of this, Tendai Gatsi did a preliminary economic analysis on the technologies as implemented in the 1998/99 demonstrations. His findings, given in Target 20, suggested that liming, intercropping of maize with sunnhemp and soyabean are the most economic of the interventions. The sole crop green manure packages (with maize yield foregone for one year) were considered the least economic.

Network Research

Soil Fert Net continued to support mutually agreed and high priority network research through a series of small top-up grants, on request, to implement the work. The main areas in 1998/99 were farmer participatory evaluations of best bet legumes, legume screening and organic x inorganic N equivalency research.

Participatory Evaluation of Legumes and Green Manures

Soil Fert Net supported members in Malawi (Bunda College) and Zimbabwe (DR&SS and CIMMYT) to carry out this work in 1998/99, based on the farmer participatory planning meetings held in 1998.

Green Manures in Mangwende — Farmer participatory green manure trials were undertaken by the Farming Systems Research Unit (FSRU) of DR&SS (Chinaniso Chibudu) at three sites in Musami and Muchinjike wards of Mangwende communal area, Zimbabwe. The objective was to solicit farmer perceptions and evaluation of cowpea, sunnhemp and velvet bean green manures.

During the season, the team undertook various forms of participation with farmers, including a look and learn tour in February where farmers discussed the performance of the green manures in the field, and a farmer feedback workshop in August to synthesize what farmers had observed on the trials and discuss the way forward.

Among the main farmer perceptions:

- ☛ Biomass production is highest with sunnhemp, followed by velvet bean and then cowpea. This agreed well with measured biomass of 4.6 t/ha for sunnhemp, 3.3 t/ha for velvet bean and 1.2 t/ha for cowpea.
- ☛ The ploughing under of sunnhemp was considered difficult by some farmers, but others have developed a method where the sunnhemp plants are knocked to the ground by a stick tied to the plough axle, making them easier to incorporate.
- ☛ Overall, farmers preferred sunnhemp, then velvet bean and lastly cowpea (because it is susceptible to pests and disease).
- ☛ Farmers liked the idea of using green manures to replenish soil fertility in a rotation, believing this to be a better use of land than leaving it fallow.
- ☛ Farmers requested to learn more about decomposition and nutrient release from the green manures.

Eleven farmers asked to work with the FSRU team in 1999/2000. They plan to evaluate the performance of maize crops that follow the green manures and plant further green manures, including the addition of *C. grahamiana*. The economics of green manure crops will be assessed.

Degraded Sites and Green Manures in Chisepo — This work was carried out by Bunda College of Agriculture (Bernard Kamanga) around Chisepo Extension Planning Area, Kasungu ADD in central Malawi.

Objectives of the study were to:

1. Allow farmers to evaluate and give their perceptions of four Best-Bet green manure technologies to rehabilitate poor soils.
2. Compare crop production and soil rehabilitation benefits of the different Best-Bet systems.
3. Determine the effectiveness of the Best-Bet green manure technologies on good versus poor soils, as defined by farmers.

Farmers classified their soils as "good" or "poor"

and a "Best Bet" trial was placed on each type of soil. The Best Bets being compared are pigeon-pea/groundnut rotation with maize, mucuna rotation with maize, maize + *Tephrosia* intercrop, continuous sole maize with fertilizer, sole maize without fertilizer and a farmer best bet. These are being compared over the 1998/99 and 1999/2000 cropping seasons. No extra fertilizer or manure was applied to any treatment, other than what the farmer decided (at own cost) to apply to the farmer best-bet practice. The farmer managed the trials.

Maize grain yields averaged 1.7 t/ha on the "good" fields and 1.1 t/ha on the "poor" fields in the wet 1998/99 cropping season. The differences between the yields on the fields support the farmers' classification of the fields. Preliminary farmer perceptions indicated that mucuna rotations would benefit them because it produces adequate biomass. Residual effects will be tested in 1999/2000.

Farmer Experiments with Velvet Bean in Chiduku — Following from Soil Fert Net trials with several green manures conducted by CIM-MYT in Chiduku communal area, Zimbabwe, farmers there expressed interest to try velvet bean as a potential green manure in their cropping system. In September 1998, we handed out 2-kg bags of velvet bean seed to about 25 members of one farmer group in Mutoko, Chiduku, through the group chairman. He distributed the seed to farmers that were interested, with a request that they experiment with the velvet bean as they saw fit. In mid March and during the 1999 dry season we visited the farmers to discuss their practices, experiences and plans.

None of the farmers in Mutoko had used velvet bean (or any other green manure) before. Most of the farmers that got seed planted it because they said they wanted to see if it would improve their poor soils. Most farmers said they chose an infertile field to plant the sole crop velvet bean and some were surprised about how well it was growing there. Two farmers decided to plant some of their velvet bean as an intercrop with maize, as well as planting a sole crop. The first farmer intercropped to see whether *Striga* would grow less well in the intercrop than in the sole maize planted next to it. The other farmer said she wanted to see if there would be any benefit to the current maize crop from the velvet bean if the two crops grow together.

All farmers planted their velvet bean into ploughed fields. Some dry planted before planting other crops, some after their first planting of

other crops and others planted it last. A range of different planting methods and spatial arrangements were used. Most dropped seed in open furrows spaced 90 cm to 1 m apart with an in-row spacing of 15 cm to 30 cm and used a plough to cover the seed. All the farmers said they had no problem with planting.

No farmers used fertilizer on velvet bean. Many were unsure about whether they needed to weed velvet bean but this year over half of the farmers did actually weed it. One farmer did an experiment by weeding one half of the plot and left the rest unweeded. She noted that the weeded velvet bean was growing best.

Most farmers planned to plough the velvet bean into the soil at the end of the rains in April and May but in reality most left it to be grazed. Two farmers designated small plots where they left the velvet bean to produce seed for them to use in 1999/2000. All except two female farmers expect to plant maize next year after the velvet bean.

In conclusion, the farmers in Chiduku are very interested in velvet bean and are now trying to develop their own methods for growing the crop. We will provide some *C. grahamiana* seed for them to try in 1999/2000 and continue to monitor their velvet bean work.

Legume Screening

Robert Gilbert reported on the legume screening exercise conducted at Chitedze Station near Lilongwe. Using the following criteria for selecting legumes; set large quantities of seed, have a good emergence percentage, high biomass production and high litter quality, the most promising species identified by this screening exercise were:

- *Canavalia ensiformis* (Jackbean)
- *Mucuna pruriens* (Velvetbean)
- *Vigna unguiculata* (Cowpea)
- *Lablab purpureus* (Lablab or Dolichos bean)
- *Crotalaria grahamiana*

Canavalia ensiformis was by far the best performer of the legumes studied. In addition, there was considerable variability in the growth habit of several accessions, implying greater flexibility in targeting this species for different agroecologies or intercropping systems. *Canavalia* is a drought- and shade-tolerant bean that has performed well in maize intercropping systems in Uganda. *Mucuna* has a long history of green manuring in Central

America and West Africa, and these varieties may complement the *Mucuna* work already underway in Malawi and Zimbabwe. Cowpea and lablab have primarily been used as food crops. These CIAT and ILRI varieties will need further testing to see how they perform under the intense pest and disease pressures on-farm in Malawi. *Crotalaria grahamiana* originates from Madagascar, and has the advantage of a slow, bushy growth habit compared to *Crotalaria juncea* (Sunnhemp). This would make it better suited to maize intercropping systems than *C. juncea*, and renders it worth another season of work despite a low seed yield in Malawi.

One aspect that these promising species have in common is that they are generally large-seeded and exhibit robust emergence and early-season growth. Large-seeded species also have the advantage of being easier for farmers to manage.

Some varieties which did not perform well in Malawi (e.g. *Stylosanthes guianensis*, *Neonotonia wightii*), as well as some for which a large quantity of seed was available (e.g. *Canavalia ensiformis*), were given to Ken Giller to test with colleagues at Domboshava, Goromonzi and Chihota in Zimbabwe in 1998/99. Many performed very poorly on the sandy soils. A seed increase of *Crotalaria grahamiana* was done by CIMMYT at Domboshava and about 100 kg of this seed was passed to members in DR&SS and AGRITEX for on farm testing in 1999/2000. Screening and seed increase efforts continued at Chitedze in 1998/99, focusing on the promising species identified in year one, and adding new accessions of *Crotalaria ochroleuca*, *Canavalia ensiformis*, *Clitoria ternatea* and *Macroptilium atropurpureum* kindly donated by Joseph Mureithi of KARI, Kenya. For the first time, leaf disease was seen on the velvet bean at Chitedze.

Organic x Inorganic N Equivalency

Work on organic x inorganic combinations continued with TSBF and Soil Fert Net. Patrick Mutuo and Cheryl Palm of the TSBF Programme in Nairobi prepared protocols for these Network Trials in a short booklet called "Combined Inorganic-Organic Nutrient Sources: Experimental Protocols for TSBF-AfNet, Soil Fert Net and SWNM", dated March 1999. Current co-operators were sent copies of the protocols, which have generated a lot of interest.

"Best Bet" Technologies Workshop

Soil Fert Net's workshop on "Best Bet" Soil Fertility Technologies Revisited for Malawi and Zimbabwe took place in Zomba, Malawi from 26 to 28 August 1999. It was co-sponsored by Soil Fert Net-CIMMYT and ICRISAT. Around 42 participants attended (Table 2), mostly from Malawi and Zimbabwe, but also with persons from Zambia, Kenya and England.

The overall objective of the meeting was to allow members to assess where we are with the Best Bet soil fertility technologies that have featured so prominently in the work by Soil Fert Net and ICRISAT over the last two to three years.

Specific objectives included:

- ☞ Re-examine the Best Bet concept and the criteria used in selecting Best Bets
- ☞ Update individual Best Bet technologies for Malawi and Zimbabwe
- ☞ Review initiatives in testing and deploying the Best Bets, including farmer participatory evaluations, modelling, publicity, adoption and impacts
- ☞ Examine how to improve the Best Bets through better linkages between initiatives, risk assessments, farmer and economic assessments and policies
- ☞ Integrate Soil Fert Net technical initiatives with the new Economics and Policy Working Group, and
- ☞ Plan future directions for the Best Bets.

On the first day we began with reviews of the Best Bet concept and criteria used in selecting Best Bets. The following questions were suggested to help guide the workshop.

1. Developing and Testing Best Bets

- How are the "Best Bets" performing, using rigorous biophysical and socio-economic criteria?
- Additional technologies and options that deserve upgrading to Best Bets – what? why?
- What are the biophysical lower limits for the Best Bets? Do they perform in dry areas and on very depleted soils?

Table 2. Participants (and their Affiliated Organizations) that attended the Workshop on Best Bet Soil Fertility Technologies Revisited, Zomba, Malawi, 26 to 28 August, 1999

Participant	Main Discipline	Organization
Malcolm Blackie	Agricultural economics	Rockefeller Foundation, England
Richard Jones	Agronomy/technology diss.	ICRISAT, Kenya
Rob Gilbert	Agronomy/soil fertility	Rockefeller Foundation/Maize Team, DARTS, Malawi
Webster Sakala	Agronomy	Maize Team, DARTS, Malawi
John DT Kumwenda	Agronomy	Maize Team, DARTS, Malawi
Todd Benson	Geography/agric econ	Maize Team, DARTS, Malawi
Geoffery Kananji	Crop breeding	Legumes Team, DARTS, Malawi
Mark Ritchie	Pest management	Farming Systems IPM Project, Bvumbwe, Malawi
Stephen Carr	Agronomy/economics	Zomba, Malawi
Alex BC Mkandawire	Agronomy/soil fertility	Crop Sci., Bunda College, Malawi
George Kanyama-Phiri	Agronomy	Bunda College, Malawi
Alex Phiri	Agricultural economics	Bunda College, Malawi
Christopher Khonje	Agricultural extension	Kasungu ADD, Malawi
Bernard Kamanga	Farmer participatory res	Risk Project-CIMMYT, Malawi
Bharati Patel	Plant protection	Rockefeller Foundation, Malawi
Andreas Böhringer	Technology dissemination	ICRAF, Zomba, Malawi
Rebbie Phiri	Technology dissemination	ICRAF, Zomba, Malawi
Ruben Puentes	Agricultural systems	Rockefeller Foundation, Mexico
Moses Mwale	Soil fertility	Soils Team, DR&SS, Lusaka, Zambia
David Dhlwayo	Soil fertility	SPRL, DR&SS, Marondera, Zim
Linus Mukurumbira	Soil fertility	SPRL, DR&SS, Marondera, Zim
Danisile Hikwa	Agronomy	Agronomy Institute, DR&SS, Zim
Tendai Gatsi	Agricultural economics	Agronomy Institute, DR&SS, Zim
Jean Nzuma	Soil fertility	Chemistry and Soil Res Institute, DR&SS, Zimbabwe
Chinaniso Chibudu	Agronomy	FSRU, DR&SS, Zimbabwe
Ishmael Pompei	Agricultural extension	AGRITEX Head office, Zimbabwe
Peter Gambara	Agricultural extension	AGRITEX, Marondera, Zimbabwe
Phillip Tavuyanango	Agricultural extension	AGRITEX, Marondera, Zimbabwe
Regis Chikowo	Soil fertility	Soil Science Dept., Univ of Zim
Paul Mapfumo	Agronomy	Soil Science Dept., Univ of Zim
Ken Giller	Soil fertility	Soil Science Dept., Univ of Zim
Melvyn Piha	Soil fertility	Soil Science Dept., Univ of Zim
Sheunesu Mpepereki	Soil fertility	Soil Science Dept., Univ of Zim
Akin Adesina	Agricultural economics	Rockefeller Foundation, Zimbabwe
Reneth Mano	Agricultural economics	Agric. Economics Dept., Univ of Zim
Zondai Shamudzarira	Crop models	Risk Project-CIMMYT, Zimbabwe
Sieglinde Snapp	Soil science	ICRISAT, Zimbabwe
Mulugetta Mekuria	Agricultural economics	CIMMYT-Economics, Zimbabwe
Stephen Waddington	Agronomy	CIMMYT-Soil Fert Net, Zimbabwe

2. Broadening the Evaluation Criteria

- Monitoring long-term and sustainability issues, e.g., nutrient cycling efficiency, resource conservation, variability of performance and risk to farmers?
- Evaluating socio-economic performance – factoring in more economic assessments? Are we getting enough farmer feedback on the Best Bets? Are farmers testing them?

3. How to Reach More Farmers

- Is a wider range of Best Bet options and components required, and how can we identify them?
- Should we refine Best Bets, or provide just guidelines?
- Should we target Best Bets? To agroecologies? To farmer types?
- Do we need to develop more effective institutional partnerships to scale up deployment? Which partners?
- What are specific policy support issues related to Best Bet uptake and impact, and how can these be addressed?

Members then followed with a comprehensive series of presentations updating our knowledge on existing individual Best-Bet soil fertility technologies. These had been identified by members over the last 2 to 3 years.

During that session, draft Best Bet leaflets were presented or tabled by Melvyn Piha on “A Fertilizer Management Package for Optimum Maize Yields on Sandy

Soils in Zimbabwe” and *“Soyabeans for Smallholder Farmers in Zimbabwe”* by Sheunesu Mpepereki and Ken Giller. Another brochure, concentrating on Magoye soyabean for Malawi, is under draft by Stephen Carr.

Additionally, Todd Benson showed a series of brochures about fertilizer management with maize in Malawi, produced by the Maize Productivity Task Force and Agricultural Communications Branch of the Malawi Ministry of Agriculture and Irrigation in July 1999. One brochure (updated from 1997) describes the *“Area Specific Fertilizer Recommendations for Hybrid Maize Grown by Smallholder Farmers in Malawi”*. This is accompanied by four new brochures on

- *How to Get the Best Maize Yields*
- *Which Fertilizers to Use on Maize?*
- *When to Apply Fertilizer to Maize, and*
- *Methods of Applying Fertilizer to Maize*

On the second day, a range of presentations covered experiences and programmes involved with testing and deploying the Best Bets, including various extension initiatives that are promoting single or multiple Best Bets through task forces, farmer participatory evaluations and risk assessments.

On day three we conducted a series of plenary panel-led discussions on improving the Best Bets through better linkages between initiatives, and on economic and policy support for Best Bets.

This was the first time that new members involved in the Economics and Policy Initiative had a chance to meet the wider Soil Fert Net group. Presentations and discussions were held about the role and structure of the Economics and Policy Working Group (EPWG), particularly concerning how it will help us to move with the Best Bets.

At various points in the meeting we held discussions to determine which Best Bets are ready for dissemination and publicity, which need further on-farm work and which new research thrusts network members may wish to include in their work that may lead to new Best Bets. These are summarized in the next section in Tables 3 and 4.

For those Best Bets ready for farmers, group discussions were held on publicity requirements, packaging of the Best Bets, exposing farmers to the Best Bets, the role of the EPWG, and

preparing for adoption and impacts. A group discussion was also held on prioritizing and organizing further research on those Best Bets that need further on-farm work and on new technology ideas.

Fringe meetings and evening sessions included planning for the N exploration being led by the Soil Science Department at the University of Zimbabwe and discussions about draft proposals for work under the EPWG.

Outputs from the Meeting

A range of outputs is forthcoming from the meeting. As indicated earlier, several members are in advanced stages of developing Best Bet brochures. These short concise (single A4 sheet of paper) summaries of knowledge on single Best Bet technologies are targeted at farm advisors. They will need some input and review from extension. They will be published by Soil Fert Net from October to December 1999. Other members with special knowledge about technologies ready for dissemination were asked to develop a brochure. Eventually they will all be collected together in an openable ring binder and distributed by Soil Fert Net.

Several presentations will be developed for publication in the Soil Fert Net Working Paper series. A summary of our current understanding of the performance and suitability of the Best Bets, selection criteria and identification processes, will appear as a Results Working paper (under the lead of Ken Giller and Rob Gilbert). Several of the papers on strategies to reach clients, including input supply and dissemination in Kenya, various approaches to extending Best Bets in Malawi, and extending soyabean in Zimbabwe are under consideration. The meeting asked for reviews on liming and use of rock P in Zimbabwe (to be developed under the lead of David Dhliwayo and Linus Mukurumbira of SPRL). These would also come out as Soil Fert Net working papers. Several of these aspects are also being worked on by members for the book described by Malcolm Blackie in Target 19. Malcolm agreed to help develop some of these examples with members.

Update on Best Bet Soil Fertility Technologies

In the various discussion groups at the Best Bets Workshop in Zomba, several criteria for ‘Best Bets’ were highlighted. These criteria include:

- ☞ The need to offer farmers choice — Best Bets should include lists of technologies suitable for different ecoregions and socioeconomic groups of farmers.
 - ☞ We need a clear understanding that not all Best Bets are applicable everywhere — a degree of targetting of approaches is essential.
 - ☞ Putting a technology on the Best Bet list does not mean that there are no questions remaining about the technology, but that sufficient interest has been shown by farmers, and sufficiently robust on-farm testing has been conducted to ensure that the technology has promise.
 - ☞ The technology should not expose farmers to new substantial risks.
 - ☞ We are not recommending organic approaches to soil fertility as a substitute for mineral fertilizers, but as a complement.
 - ☞ In our enthusiasm for impact, we should not promote technologies that have not been tested on the ground by farmers over more than one season.
- In the discussion, the need to better link work

Table 3. Summary of Soil Fert Net Best Bet technologies for Malawi, 1999

Technology	Comments	Person responsible for developing leaflets or research
STAGE 1 BEST BETS – “READY TO GO”		
Area-specific fertilizer recommendations for maize	These have already been adopted by the Ministry of Agriculture	Action Group 1 have already developed several leaflets, some with general emphasis, others specific for ADD's. Contact: Rob Gilbert
Pigeonpea/maize intercropping	Questions remain on targetting for different agroecological zones due to problem of seed set and animal grazing	A leaflet was produced in 1997 by Webster Sakala and Ken Giller. Contact: Webster Sakala and Richard Jones
'Magoye' soyabean		Contact: Stephen Carr and Ken Giller
Groundnut in rotation with maize, and Pigeonpea intercropped with other grain legumes		Contact: Sieglinde Snapp and Alex BC Mkandawire
Tephrosia undersowing of maize	Several groups (MAFE/ICRAF/Chitedze) are recommending different management. Not a problem, but needs to be recognised and the advantages of the different approaches explained so that farmers can experiment.	MAFE already have produced a leaflet. Contact: Rob Gilbert
Mucuna/maize rotations	Some targetting needed. Greatest reservation is the potential problem of toxicity of the mucuna seed. Good information on processing required.	Contact: John Kumwenda and Rob Gilbert
<i>Faidherbia albida</i> trees in cropland		Contact: Henry Phombeya
STAGE 2 BEST BETS – “NEED MORE FARMER TESTING AND ADAPTIVE RESEARCH”		
<i>Sesbania</i> undersowing		George Kanyama-Phiri
Optimum combinations of organic and mineral fertilizers		To be determined
Soil fertility x <i>Striga</i> interactions		Vernon Kabambe
STAGE 3 – NEW IDEAS AND TECHNOLOGIES AT THE RESEARCH STAGE		
Screening green manures	Research ongoing	Rob Gilbert
Intercropping green manures with maize	Research ongoing	Rob Gilbert
Rotating manure kholas	Small area targetted Research just started	Webster Sakala
Chickpea on residual moisture		Richard Jones

Table 4. Summary of Soil Fert Net Best Bet technologies for Zimbabwe, 1999 (Note that many of these technologies are Best Bets primarily for sub-humid areas in Zimbabwe. Biological and economic viability will be lower in semi-arid areas)

Technology	Comments	Person responsible for developing leaflets or research
STAGE 1 BEST BETS – “READY TO GO”		
Fertilizer management package for maize and grain legumes		Contact: Melvyn Piha
Soyabean (inoculated and promiscuous) rotations with maize		Contact: Sheunesu Mpepereki
Liming on acid soils	Questions raised over appropriate rates and supply economics	Contact: David Dhillwayo
Other grain legume rotations		Contact: Ken Giller and Sheunesu Mpepereki
Improved cattle manure management	Dissemination already ongoing	Contact: Jean Nzuma and Herbert Murwira
STAGE 2 BEST BETS – “NEED MORE FARMER TESTING AND ADAPTIVE RESEARCH”		
Pigeonpea rotations and intercropping	Work ongoing	Paul Mapfumo and Richard Jones
Optimum combinations of organic and mineral fertilizers		To be determined
Mucuna/maize rotations		Lucia Muza, Chinaniso Chibudu and Danisile Hikwa
STAGE 3 – NEW IDEAS AND TECHNOLOGIES AT THE RESEARCH STAGE		
Screening green manures	Research ongoing	Steve Waddington and Ken Giller
Forage/fodder legumes	Links to ACIAR project?	Grasslands Marondera and UZ Crop Science
Intercropping green manures with maize	Research ongoing	Lucia Muza
Rock phosphate beneficiation	Economic questions	David Dhillwayo
Breeding better promiscuous soyabean		Eastonce Gwata
Fertilizer management questions in dry areas	Research needed	ICRISAT and Risk Project
Bambara groundnut		Agronomy Institute

on soil fertility with that on soil conservation was emphasised.

In our discussions at Zomba on the status of the Best Bet technologies in Malawi and Zimbabwe, we divided the technologies into three categories; those that we are sufficiently confident about (“ready to go”), those that require more farmer testing and adaptive research, and those that are new ideas or are at the research stage. Tables 3 and 4 summarise our findings.

Economics and Policy Working Group

The wider adoption of Best Bet technologies for the improvement of soil fertility in the region, requires that their profitability for smallholder farmers be carefully assessed, institutional arrangements for improving farmers’ access developed, and appropriate policies established to

support an economic environment for farmers to use the technologies. Soil Fert Net to date has only been able to undertake limited analyses of the economic viability of several of the technologies. Communication with policy makers on what types of policies are required for improving soil fertility has been limited. To fill the “policy gap” and to provide economics input into Soil Fert Net, the Rockefeller Foundation suggested the establishment of an Economics and Policy Working Group on Soil Fertility Management in Southern Africa (EPWG).

Substantial interest from agricultural economists, the Rockefeller Foundation and existing Soil Fert Net members meant that we were able to move forward during the report year to fill this “policy gap” and to provide economics input within Soil Fert Net through the establishment of an EPWG.

Working Session and Establishment of the EPWG

The EPWG was launched at our Policy and Economics Working Session held in Kadoma, Zimbabwe from 21 to 23 June 1999. Around 25 agricultural economists, policy analysts and technical members of Soil Fert Net attended (Table 5).

The aims of the meeting were to:

- Take stock of where and how the work of Soil Fert Net members has impacted on agricultural policy
- Expose members to some approaches, terms, methods and requirements for policy analysis
- Map out strategies and alliances that will improve our interaction with, and impact on, policy makers.

We heard recommendations on natural resource economics in relation to soil fertility from consultants commissioned by the Rockefeller Foundation. Participants strongly endorsed the incorporation of an Economics and Policy Working Group (EPWG) into Soil Fert Net. They also agreed to move quickly to help set up an Agricultural Productivity and Food Security Task Force in Zimbabwe and activate Action Group 3 of the Maize Productivity Task Force in Malawi to undertake the broad-based work of linking technical results with economics and policy action. CIMMYT was asked to expand its coordination role for Soil Fert Net through the addition of time and expertise from our agricultural economist in southern Africa (Mulugetta Mekuria).

A concept note for the EPWG initiative was developed early in July for wider circulation within Soil Fert Net. After modification this was published as a brochure and included in Target 20. Follow-up meetings led to the appointment of an EPWG convenor for Malawi (Alex Phiri of Bunda College) and one for Zimbabwe (Reneth

Table 5. Participants that attended the Soil Fert Net Working Session on Economics and Policy, held in Kadoma, Zimbabwe, 21 to 23 June 1999

Name	Discipline	Affiliation
Malcolm Blackie	Agricultural economics	Rockefeller Foundation, England
Alexander Phiri	Agricultural economics	Bunda College, Malawi
Charles Mataya	Agricultural economics	Bunda College, Malawi
Alex BC Makandawire	Soil fertility agronomy	Bunda College, Malawi
Rob Gilbert	Soil fertility agronomy	Maize Team, DARTS, Malawi
Todd Benson	Geography/agric econ	Maize Team, DARTS, Malawi
Anne Conroy	Policy and agric econ	Government of Malawi
Reneth Mano	Agricultural economics	Agric. Economics Dept., Univ of Zim
Joseph Rusike	Agricultural economics	Agric. Economics Dept., Univ of Zim
Melvyn Piha	Soil science	Soil Science Dept., Univ of Zim
Sheunesu Mpepereki	Soil microbiology	Soil Science Dept., Univ of Zim
Ken Giller	Soil science	Soil Science Dept., Univ of Zim
Tendai Gatsi	Agricultural economics	Agronomy Institute, DR&SS, Zim
Danisile Hikwa	Agronomy	Agronomy Institute, DR&SS, Zim
Peter Goko	Policy analysis	Ministry of Lands and Agriculture, Zim
Chris Mushambi	Soil science	Chemistry and Soil Research Institute, DR&SS, Zimbabwe
Linus Mukurumbira	Soil science	Chemistry and Soil Research Institute, DR&SS, Zimbabwe
Anandajayasekeram	Farming systems econ	FARMESA, Zimbabwe
John Dixon	Farmer participatory res	FARMESA, Zimbabwe
Akin Adesina	Agricultural economics	The Rockefeller Foundation, USA
Wilfred Mwangi	Agricultural economics	CIMMYT-Economics, Ethiopia
Kit Vaughan	Farmer participatory res	CIMMYT-NRG, Zimbabwe
Mulugetta Mekuria	Agricultural economics	CIMMYT-Economics, Zimbabwe
Stephen Waddington	Soil fertility agronomy	CIMMYT-Maize/SoilFertNet, Zim
Johannes Karigwindi	Soil fertility agronomy	CIMMYT-Maize/SoilFertNet, Zim

Mano of the University of Zimbabwe) to do national level coordination of the economics and policy work. Each convenor has applied for funds from the Rockefeller Foundation for the coordination work.

Round-table meetings took place with technical scientists that are part of Soil Fert Net in Malawi in August and Zimbabwe in September to establish the priority areas for economics and policy research. Outline proposals are under development by the EPWG in both countries.

Role of the EPWG

The task of the EPWG is to strengthen the potential for impact of Soil Fert Net. It will provide:

- ☞ A holistic framework for closer interaction between soil fertility experts, economists, exten-

sionists and policy makers on strategies for solving soil fertility problems of farmers in a manner that involves increased farmer participation and all stakeholders.

- ☞ Objective economic evaluation of the existing best-bet technologies for soil fertility management.
- ☞ Priority setting and targeting of potential best bets for smallholder farmers.
- ☞ Policy research and advocacy to create an enabling policy environment to promote farmers' use of improved soil fertility management technologies.
- ☞ Strategic and relevant partnership for scaling up the work of the Soil Fert Net.

The "transformed" Soil Fert Net is now a network of soil fertility specialists, economists and policy makers (see Figure 1). The new framework allows continued work on soil fertility technology development for smallholders, while ensuring that the developed technologies are profitable enough to warrant policy interventions to promote them widely to farmers. This will make the Soil Fert Net even more farmer-focused and impact-driven.

Participating Institutions

The participating Malawian institutions to which potential grants from the Rockefeller Foundation are expected to be made include Bunda College of Agriculture and Chancellor College of the University of Malawi, the Polytechnic, the Centre for Social Research, the Ministry of Agriculture and Irrigation, and the Policy Analysis Initiative in the Vice President's office. In Zimbabwe, potential grantee institutions include the University of Zimbabwe, Africa University, Ministry of Lands and Agriculture (Economics Division, Department of Research and Specialist Services and AGRITEX). Persons working in other institutions and in the Republic of South Africa are welcome to apply.

Soil Fertility Network

Coordination by CIMMYT-Zimbabwe
Stephen Waddington and Mulugetta Mekuria

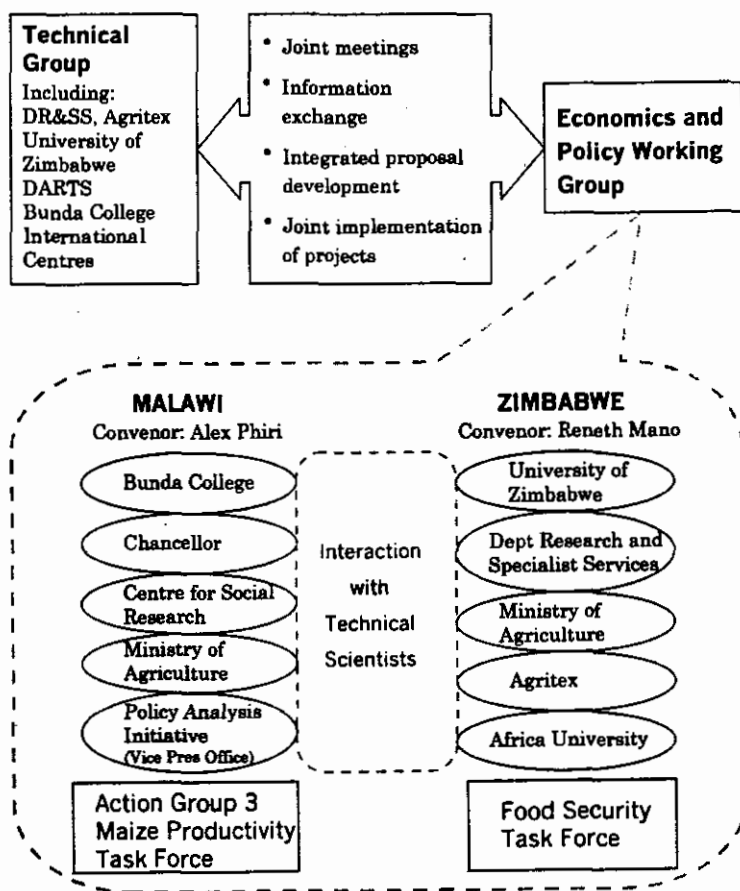


Figure 1. Organizational structure of the Economics and Policy Working Group within the Soil Fert Net

Platform for Policy Dialogue in Malawi and Zimbabwe

For effectiveness of policy dialogue on soil fertility issues for smallholder farmer security in each country, different country-level platforms will be used. In Malawi, Action Group 3 of the Maize Productivity Task Force (under the Ministry of Agriculture and Irrigation) will be activated with support from the Rockefeller Foundation. The Action Group will be expanded to include technical scientists, economists, policy analysts and extension experts and will become the platform for dialogue on appropriate policies for smallholder food security in Malawi. An "Agricultural Productivity and Food Security Task Force" is being established in Zimbabwe (under the Ministry of Lands and Agriculture) as the framework for policy dialogue on issues affecting smallholder farmers' food security in Zimbabwe. The members of the Economics and Policy Working Group of Soil Fert Net will also

become participants in this national Task Force with senior policy makers through a Soil Fertility Action Group.

Training

The EPWG has a central component of building local capacity for economic and policy analysis of natural resource management issues. The University of Pretoria will become a lead centre for capacity building in natural resource economics and policy. The University of Zimbabwe will be the focal point for research on institutional issues for promoting better natural resource management by farmers. Bunda College in Malawi will be the centre for short-term training in microeconomics and policy, through its Agricultural Policy Research Unit.

Two types of training are envisaged under the initiative:

- (a) short term regional training in methods for assessment of soil fertility; and
- (b) MSc training in natural resource economics, in support of technical work on soil fertility.

The Maize and Wheat Improvement Research Network for SADC (MWIRNET) based at CIMMYT-Zimbabwe, plans to conduct regional training sessions for the EPWG, through CIMMYT's Regional Economist for Southern Africa.

Grant Making under the Economics and Policy Initiative

To encourage economists, policy analysts and soil fertility specialists to work together, only proposals that promote such joint work, and which are action-orientated and inform policy decision making on soil fertility will be recommended by Soil Fert Net for support by the Rockefeller Foundation. Proposals can range from microeconomics of soil fertility issues, to broader institutional, micro-policy and sectoral policy issues that affect soil fertility.

Interested individuals in the participating institutions in Malawi and Zimbabwe will submit their proposals to their national convenors. Proposals from South Africa can be submitted directly to the Soil Fert Net coordinators.

Proposals are first reviewed at the national level to ensure relevance and collaboration with soil fertility specialists, and then a further review, focusing on methodology and linkages to Network priorities will be undertaken through the Soil Fert Net coordination office. Approved proposals are then forwarded to The Rockefeller Foundation for final consideration.

As with the rest of Soil Fert Net, grants for approved proposals will be made by the Foundation directly to the applicant institutions. Results of the research activities will be presented at Regional Meetings of the Soil Fert Net, which will now involve the participation of senior policy makers as well as other stakeholders such as NGO's and farmers' groups.

The first project to be reviewed and approved by the EPWG (from August to October 1999) was a proposal to provide extra support to agricultural economics (Tendai Gatsi) in the Agronomy Institute of DR&SS.

Research Field Tours in 1999

This year we held a field tour in Zambia and one in northern Malawi. Additional reports on the tours were included in issue 17 of *Target*. It was with great pleasure that, for the first time, Soil Fert Net was able to visit work by colleagues in the Zambian Government agricultural research and extension services.

Soil Fertility Research and Extension in Zambia

The Zambian tour took place from 20 to 28 February and was jointly sponsored by TSBF/ACFD. Ten members from Zimbabwe joined five from Malawi and around eight colleagues from Zambia (Table 6). The main objective of the visit was to exchange experiences and ideas with their Zambian counterparts carrying out work in soils-related research. Soil Fert Net would like to thank Dr Alfred Mapiki and his colleagues in DR&SS, Zambia for their excellent local organization of this tour.

We visited the Zambia/ICRAF Agroforestry Research programme at Msekera Research Station near Chipata in Eastern Province. Participants travelled by road to Chipata in the Eastern Province of Zambia for the start of the tour. The work carried out at Msekera showed how successful *Sesbania sesban* has been as a soil improving agroforestry species in improved fallows. Maize grown after a three-year fallow was shown to perform as well as that which was fertilized at the recommended rate. Another striking trial examined the coppicing ability and management of *Gliricidia sepium*. The coppices are cut over time and applied to the growing maize. The maize response was good. Visits to farmers that have been trying *Sesbania sesban* and *Tephrosia vogelii* improved fallows with maize found them very happy with the large yield increases they get on their following maize

Table 6. List of participants that attended the Joint Soil Fert Net and TSBF Field Tour in Zambia, 20 to 28 February 1999

Person	Affiliation
Rob Gilbert	Maize Team, DARTS, Lilongwe, Malawi
Webster Sakala	Maize Team, DARTS, Lilongwe, Malawi
Rosan Ganunga	Maize Team, DARTS, Lilongwe, Malawi
Vernon Kabambe	Maize Team, DARTS, Lilongwe, Malawi
Jones Thombozi	ICRISAT, Lilongwe, Malawi
Alfred Mapiki	Soil Fertility, DR&SS, Chilanga, Zambia
Moses Mwale	Soil Fertility, DR&SS, Chilanga, Zambia
Smart Lungu	Agroforestry, DR&SS, Chipata, Zambia
Nawa Mukanda	Soil Survey, DR&SS, Chilanga, Zambia
Mlotha Damaseke	Soil Chemistry, DR&SS, Chilanga, Zam
Howard Tembo	Soil Microbiology, DR&SS, Chil, Zam
Prospard Gondwe	Soil Physics, DR&SS, Chilanga, Zambia
Tenford Manda	Maize Breeding, DR&SS, Chil, Zam
Ken Giller	Soil Science Dept., University of Zim
Steve Waddington	CIMMYT/Soil Fert Net, Harare, Zim
Johannes Karigwindi	CIMMYT/Soil Fert Net, Harare, Zim
Herbert Murwira	TSBF/ACFD, Harare, Zimbabwe
Nhamo Nhamo	TSBF/ACFD, Harare, Zimbabwe
Pauline Chiverge	TSBF/ACFD, Harare, Zimbabwe
Justice Nyamangara	ACFD, Harare, Zimbabwe
Jean K. Nzuma	Chemistry and Soil Research Institute, DR&SS, Harare, Zimbabwe
DD Shumba	IFAD/AGRITEX, Shurugwi, Zimbabwe
Regis Chikowo	Africa University, Mutare, Zimbabwe

crops. Interestingly, we met several other farmers that are taking up the technology from the initial adopters (farmer-to-farmer adoption). The improved fallows are now being promoted more widely by NGOs in other parts of Eastern Province. We saw one such project with World Vision International and the Lutheran World Federation in Katete district.

A demonstration on the use of inoculum for soyabean production was visited. Inoculated soyabean is performing as well as soyabean fertilized with 150 kg N/ha. In the past, promiscuous (self-nodulating) varieties of soyabean (Magoye and Hernon 147) were promoted for small-scale farmers. This was because inoculum was reported to be viable only when kept in a refrigerator at 4 °C. However, recent research has shown that inoculum can be kept at room tem-

perature for up to six months and still be viable. Plans are now underway to expand these demonstrations to more areas of Zambia.

After returning to Lusaka, on 24 February we visited the Golden Valley Research Trust to look at their maize breeding programme, with emphasis on the project to develop N-use efficient maize. This work is being carried out in Zambia, Zimbabwe and Malawi as well, as part of a regional project. We then visited Chalimbana Research Station where we saw TSBF/DR&SS (Soil Fert Net) Network trials on organic N x inorganic N substitutions with maize. Here *Sesbania sesban* was combined at different rates with inorganic N for maize production, with a total of 100 kg N/ha in all treatments. The results so far indicate that the combination of inorganic and organic N gives a much better response than the *Sesbania sesban* alone. The other Network trial seen was where the time of application of 50 kg N/ha was varied thus: at planting, seven days after planting (DAP), 14 DAP and 21 DAP. All treatments were top-dressed with 50 kg N/ha. Results indicated very little difference due to time of planting, meaning that where labour is a constraint, farmers may spread labour over a longer time.

At Mount Makulu Central Research Station, we visited the Soil Fertility Laboratory and saw the emission spectrometer used to determine the ¹⁵N used in N use efficiency studies and to quantify biological N fixation in grain legumes. An evaluation of Zimbabwean dwarf maize hybrids for N and water use efficiency was also visited. Some dwarf varieties were seen to be very resistant to grey leaf spot disease that has attacked most maize hybrids in Zambia. A trial on water use efficiency was also visited at Mt. Makulu. Differences in this trial were not pronounced because the season was too wet.

In Southern Province we visited farmers' fields in Choma and Monze districts where the extension service, under the IFAD-funded Soil Conservation, Agroforestry and Extension Programme (SCAFE) project, are extending a range of organic soil fertility interventions, including use of cattle manure, compost, *Sesbania* improved fallows, sunnhemp and velvet bean green manures. Contour ridges were noticed to be very effective in stopping soil erosion on sloping land. Southern Province has many infertile sandy soils and is often quite dry (although this year it was very wet). Farmers are particularly interested to intercrop their green manures rather than plant them as sole crops. Just as we have found in Zimbabwe and Malawi, there is a

gulf between what "front line" extension staff and farmers know about these relatively new organic technologies and what the researchers know. To scale up effectively we will need major investments in the provision of information and training. We also saw more sites of the organic N x inorganic N substitution Network trial. The *Sesbania sesban* was not doing very well there. Soil Fert Net members suggested that alternative legumes be identified for the area. Legumes like sunnhemp, velvet bean and green gram were mentioned to be some of the legumes that could be tried.

The tour concluded on Saturday afternoon at Magoye research station near to Mazabuka where we saw animal-drawn tillage implements, long term trials of maize with several tillage

Table 7. Participants (and their Affiliated Organizations) that attended the Soil Fertility Technologies on Problem Soils Field Tour of Northern and Central Malawi, 14-19 March 1999

Participant	Organization
Malawi	
Alex BC Mkandawire	Bunda College, Lilongwe
A B Chikwati	Bunda College, Lilongwe
U Y K Phiri	Bunda College, Lilongwe
O M M Madzonga	Bunda College, Lilongwe
Ida Mwato	Bunda College, Lilongwe
Kizito Foliás	Bunda College, Lilongwe
Jacob Nyirongo	Bunda College, Lilongwe
Spider Mughogho	Bunda College, Lilongwe
John DT Kumwenda	Maize Team, DARTS, Lilongwe
Webster Sakala	Maize Team, DARTS, Lilongwe
Rosan Ganunga	Maize Team, DARTS, Lilongwe
Noah Nyirenda	DARTS, Lilongwe
Bernard Kamanga	CIMMYT-NRG, Lilongwe
Zimbabwe	
Vusi Manyepe	Agronomy Institute, DR&SS, Harare
Jean Nzuma	Chemistry and Soil Institute, DR&SS, Harare
Peter Gambara	AGRITEX, Marondera
David Dhlwayo	SPRL, DR&SS, Marondera
Paul Mapfumo	Soil Science and Ag. Eng., Univ. of Zim
Regis Chikowo	Soil Science and Ag. Eng., Univ. of Zim
Nhamo Nhamo	TSBF/ACFD, Harare
Stephen Waddington	CIMMYT-Soil Fert Net, Harare

systems, a TSBF/Soil Fert Net network trial on intercropped Best Bet green manures and finally, the "real" Magoye soyabean on Magoye research station.

Problem Soils of Northern Malawi

Our tour of northern Malawi took place from 14 to 19 March and was attended by eight persons from Zimbabwe and around 18 members from Malawi (Table 7). The Network thanks Dr John DT Kumwenda of DARTS for local organization of the tour.

On Monday we visited the truly impressive array of on farm and station soil fertility trials around Chitedze. The on-farm trials included legume green manures, *Tithonia* leaf prunings on maize, Maize Productivity Task Force (MPTF) demonstrations, various forms of legume Best Bets trials, and a Sasakawa Global 2000 demonstration on how to grow high input maize. On the station we saw maize + pigeonpea crop modelling, trials of imazapyr herbicide to control *Striga*, legume crop residues, Network legume green manure screening trials and seed increases, and Risk project crop modelling research.

The following day we visited more on farm trials involving Best-Bet technologies and looked at the agricultural input support the Rockefeller Foundation IDEAA programme is giving to all the farmers in three villages near to Chisepo in Kasungu ADD.

On Wednesday, we saw a further range of MPTF demonstrations, legume green manure residue/maize rotations, *Striga* management and *Tithonia* leaf pruning trials on farm around Mbawa in Mzuzu ADD.

Remaining in Mzuzu ADD, on Thursday at Lunyangwa station and on farm around Zombwe we saw further Best Bet legume trials, work by Bunda College on rock P and compost or manure for maize, a long-term maize/legume trial for modelling and more legume green manure residue/maize rotations.

Performance of the green manure trials was generally impressive, both in term of the biomass produced above ground and effects on following maize crops. At several sites in Kasungu ADD and around Mbawa station in Mzuzu ADD on sandy soils we saw very large grain yield increases with the maize crops that followed, particularly with velvet bean that had been incorporated early. Surprisingly this was

also the case on the P-fixing oxic alfisols around Zombwe where maize after the green manures was far better than with rock P and compost or manure.

Researchers and farmers also report that some of the green manures (velvet bean and jack bean) appear to suppress the effects of *Striga asiatica* on following maize crops. We saw this happening on several farmers' fields.

Round table discussions took place on a range of topics, including:

1. *Tithonia* studies and their feasibility —

It was reported that *Tithonia* could grow in low, mid and high elevation areas of Malawi and on acid soils. Experiences show it is easy to propagate but more labour studies are needed. *Tithonia* biomass yields decline over the years since it relies on deep capture of nutrients. Rotations are needed. It is being adopted in Ntcheu and Dedza. In summary, the group agreed that *Tithonia* is a useful biomass transfer technology and we need to help farmers to use it. Longer-term studies are necessary.

2. Ridge alignment and plant population —

Some observed that in many of the on-farm research experiments seen, ridge spacing was not correctly matched to a particular crop. This could affect their productivity and that of the following crop in cases where the previous crop was for fertility amendment, e.g. groundnut and *Mucuna*. Malawian members responded that ridge spacing in Malawi was recommended to be at 75 and/or 90 cm to allow for intercropping, as this is a common practice in Malawi. For crops like groundnut there is often insufficient seed for the higher densities. The group felt that we should strive for higher plant densities. It was also reported that a single plant per station for maize is advocated and is being demonstrated by Global 2000. Farmers need to see the benefit before they will take it up.

3. *Striga* problem — While the imazapyr herbicide did appear to control *Striga*, some members expressed concern on the use of chemicals, as they may be a threat to the environment. *Mucuna* and *Tephrosia* were observed to reduce *Striga* infestation and it was suggested that more research should be geared towards this, including investigation of mechanisms. Members were pleased to see the synergy between soil fertility legumes and weed control. This will help to make the legumes more adoptable.

4. **Promising technologies** — We learned on this tour that several green manure species appear to be doing well on P fixing soils. *Mucuna* appears to be doing especially well and we need to measure the biomass from late incorporated *Mucuna*. It was noted that technologies are area specific, e.g. *Crotalaria* does not do so well on acid soils. Should we try liming these soils? Members felt that there were many trials underway and that we could get far more value out of most by working together. For example, Bunda College Forum projects could measure the N contribution from green manures in the DARTS trials.

5. **Dissemination of technologies** — It was suggested that farmers must be supported through provision of credit facilities. Participants noted that there are several government agencies and NGOs that provide credit to farmers. Soil Fert Net must have an influence on key government officers that are involved in policy formulation through invitations to annual Soil Fert Net Tours and other events. Network projects need to promote one or a few technologies we know work well, and do that vigorously. This 1998/99 season there were over 2000 Best Bet demos in Malawi, with lots of feedback from farmers and extension. Some participants felt that more work with farmer groups will be worthwhile.

Interaction with the Risk Management Project

The Soil Fert Net coordinator and many of our members have continued to work closely with the project on "Risk Management in Southern African Maize Systems", funded by AusAID/ACIAR and implemented from CIMMYT-Zimbabwe. A major aim of the project is to add value to the work of Soil Fert Net by helping to assess the biophysical risk associated with soil fertility technologies through a combination of cropping systems computer modelling (using the Agricultural Production Systems Simulator - APSIM- Model) and farmer participatory work.

The Soil Fert Net coordinator has provided technical and administrative support to staff on the project this year.

Modelling and Farmer Participatory Work

Data generation to help adjust the APSIM model to local conditions continued during the report period and involved some members of Soil

Fert Net. These included Todd Benson and Webster Sakala in Malawi and Melvyn Piha, James Machikicho, Philip Mushayi and Herbert Murwira in Zimbabwe.

Soil data and long-term climate data were incorporated. The APSIM model appears to better predict maize yields on farm now, although there is still a tendency to over-predict yields at small rates of N, with weeds and under water-logging on shallow sandy soils. Great progress was made in adding grain legume (pigeon pea and Magoye soyabean) and green manure legume (velvet bean) components to the model.

The farmer participatory work concentrated on soil fertility related diagnostic and classification issues around Chisepo in Malawi and in Mhondoro and Chihota, Zimbabwe. FPR tools used included stakeholder analysis, resource flow maps, seasonal crop and labour calendars, transects, farmer typologies of soils and climate and farmers' taxonomies of themselves (wealth ranking). The work in Mhondoro was in close association with the maize fertilizer work by the Soil Science Department at UZ.

Risk Project staff also participated in our Best Bet Soil Fertility Technology Workshop held in Zomba.

Future Plans

Work for 2000 will concentrate on blending the APSIM model work with the FPR to obtain practical outputs. It will also compare the effective-

ness of several methods of exposing farmers to soil fertility technologies (with ICRISAT). Work in Malawi will emphasize legumes. That in Zimbabwe will look at N management with maize and test legumes.

Several members (and the coordinator) attended the Risk Project Results and Planning Workshop held with ICRISAT at Matopos, Zimbabwe in mid September 1999. One especially interesting part of the meeting concerned using the APSIM model to generate outputs for several scenarios about N fertilizer management over four maize crops on a farm. This has developed into a study on the whole farm management of N fertilizer for maize in the semi-arid Zimuto Communal Area of Zimbabwe in 1999/2000. The Risk project will run APSIM modelling scenarios and study farmer decision making for those farms. Several members of Soil Fert Net, including the coordinator, will be involved with this work, particularly the monitoring of N use and maize yields, and farmer experimentation with legumes and fertilizer.

Information Exchange

Network Publications

A summary of new publications from Soil Fert Net is in Table 8.

Workshop proceedings — The proceedings of the Risk Management Project stakeholder meeting, *Risk Management for Maize Farmers in*

Table 8. Publications Produced by the Soil Fertility Network for Maize-Based Farming Systems, October 1998 to September 1999

Series and Number	Title	Author(s)	Date Produced
Newsletter:	Target (Issues 16 to 19)	Open to contributions from all	Oct 1998, January, April and July 1999
Working Paper: Research Results 4	Farmers' taxonomies as a participatory diagnostic tool: Soil fertility management in Chihota, Zimbabwe	Mauricio R Bellon, P. Gambara, T. Gatsi, T.E. Machedmedze, O. Maminimini and S.R. Waddington	August 1999
Workshop Proceedings:	Risk management for maize farmers in drought-prone areas of southern Africa	CIMMYT and ICRISAT (with Risk Management Project)	February 1999
Experimental Protocols:	Combined inorganic-organic nutrient sources: Experimental protocols for TSBF-AfNet, SoilFertNet and SWNM	Patrick Mutuo and Cheryl Palm	March 1999
Information Brochure:	Economics and policy initiative for southern Africa	Soil Fert Net	August 1999

Drought-prone Areas of Southern Africa, was published by CIMMYT in Mexico during February 1999. Many stakeholders are members of Soil Fert Net. The proceedings have been widely distributed in southern Africa.

Target newsletter — Issues 16 to 20 of *Target* were produced and distributed this report period, in October 1998, January, April, July and October 1999. This newsletter continues to be an important way to distribute timely information within Soil Fert Net. During the year we included updates on research and extension being supported by the Network, such as the legume screening and farmer participatory work. We have also invited colleagues who work on topics that interact with soil fertility, such as *Striga* management and abiotic stress tolerant maize, to report their findings.

Network working paper series — Network Results Working Paper 4, *Farmers' Taxonomies as a Participatory Diagnostic Tool: Soil Fertility Management in Chihota, Zimbabwe* by Mauricio R. Bellon, P. Gambara, T. Gatsi, T.E. Machedze, O. Maminimini and S.R. Waddington was produced in August 1999. It details farmer knowledge on soil types, soil management, constraints and opportunities in Chihota Communal Area where AGRITEX is leading a large soil fertility extension project. Several working papers are being prepared. Among these, staff at TSBF in Zimbabwe (Herbert Murwira and Nhamo Nhamo) are developing a results working paper on findings from the organic x inorganic N substitution research. Staff at SPRL, Marondera are reviewing liming and rock P research in Zimbabwe for a possible working paper. Bernard Kamanga and Sieglinde Snapp have drafted a working paper on experiences with farmer participatory methods in Malawi.

External Conferences Attended by the Coordinator

These included:

- The Third Regional Meeting of the Agricultural Resource Husbandry Forum, 12-16 October 1998, Harare, Zimbabwe.
- CGIAR Systemwide Livestock Initiative Workshop on Maize as Food, Forage and Fertilizer for Livestock in the Smallholder Farming Systems of East and Southern Africa, 29-30 October, 1998, Harare, Zimbabwe.
- ECAMAW Working Group Meeting on Soil Fertility Issues in Maize and Wheat Based Systems in Eastern and Central Africa, 15-19 November, 1998, Mombasa, Kenya.

- CIMMYT Project Meetings, 11-16 January, 1999, Texcoco, Mexico.
- IBSRAM workshop on the Sustainable Management of Vertisols in Africa, 10-14 May, 1999, Harare, Zimbabwe.
- Improving Soil Management Options for Women Farmers in Malawi and Zimbabwe, 17-19 May, 1999, Matopos, Zimbabwe.
- Workshop on Improving Crop Management in Drought Prone Environments through Applied Crop Systems Modelling and Participatory Research, 7-15 September, 1999, Matopos, Zimbabwe.

Network-Related Papers with a Contribution from the Coordinator

Bellon, M.R., P. Gambara, T. Gatsi, T.E. Machedze, O. Maminimini and S.R. Waddington (1999). Farmers' taxonomies as a participatory diagnostic tool: Soil fertility management in Chihota, Zimbabwe. Soil Fert Net Research Results Working Paper 4, CIMMYT Maize Programme and Economics Programme, Harare, Zimbabwe. 24 pp.

Giller, K.E., S. Mpeperekwi, P. Mapfumo, P. Kasasa, W. Sakala, H. Phombeya, O. Itimu, G. Cadisch, R.A. Gilbert and S.R. Waddington (1999). Putting legume N₂-fixation to work in cropping systems of southern Africa. Paper presented at the 12th International Congress on Nitrogen Fixation, Foz da Iguacu, Brasil, 12 to 17 September 1999.

Jeranyama, P., O.B. Hesterman, S.R. Waddington and R.R. Harwood. (1999). Relay-intercropping of sunnhemp and cowpea into a smallholder maize system in Zimbabwe. *Agronomy Journal*. In Press.

Shamudzarira, Z., M.J. Robertson, P.T. Mushayi, B.A. Keating, S. Waddington, C. Chiduzo and P. Grace (1999). Simulating N fertiliser response in low-input farming systems 1. Fertiliser recovery and crop response. European Society of Agronomy, Symposium on "Modelling Cropping Systems", Barcelona, Spain. Published on CD-Rom, June 1999.

Snapp, S.S., P.L. Mafongoya and S. Waddington (1998). Organic matter technologies for integrated nutrient management in smallholder cropping systems of southern Africa. *Agriculture, Ecosystems and Environment* 71:185-200.

Waddington, S. (1999). Some promising soil fertility technologies being developed within Soil FertNet. In: *Risk Management for Maize Farmers in Drought-prone Areas of Southern Africa*. Proceedings of a Workshop held at

Kadoma Ranch, Zimbabwe, 1-3 October 1997. CIMMYT, Mexico, D.F., Mexico. pp. 5-11.

Waddington, S.R. (1999). Best bet technologies to manage soil fertility in Zimbabwe's smallholder maize-based systems. SoilFertNet-CIMMYT, Harare, Zimbabwe. Mimeo. 12 pp.

At the request of authors, the coordinator continued to review drafts of many publications by Network members, including conference papers and journal articles.

The coordinator served as one of the editors of the 6th Eastern and Southern Africa Regional Maize Conference Proceedings, Addis Ababa, which includes many papers by members of Soil Fert Net and is due to be published by the end of 1999.

Early in 1999 the coordinator completed the "Inventory of Smallholder Green Manure cover Crop Systems in the Tropics" for green manure work in Zimbabwe and returned it to CIDICCO.

CIMMYT's Soil Fertility Research in Zimbabwe

As a contribution to the research within Soil Fert Net, CIMMYT-Zimbabwe continued to work on the AGRITEX Training Centre at Domboshava, in Chinyika resettlement area and in Chiduku communal area. We continued the long-term maize + groundnut rotations at six on farm sites and on station in Domboshava. These trials were in their sixth year on the same fields with our cooperating smallholder farmers. Our other long-term trials on maize + grain legume intercrops and cheaper sources of basal fertilizer for maize continued at Domboshava. In cooperation with the Southern African Drought and Low Soil Fertility (SADLF) maize breeding project, we conducted four on farm trials of promising maize hybrids with and without fertilizer (two in Chinyika and two in Chiduku).

We also produced several hundred kg of velvet bean, *C. grahamiana* and Magoye soyabean from our Soil Fert Net seed increases at Domboshava. This seed is provided to members for their research with farmers.

The following CIMMYT-Zimbabwe staff are supported under the Rockefeller Foundation Soil Fertility Network grant:
Stephen R Waddington, Maize Agronomist

Johannes Karigwindi, Research Assistant
John Chifamba, Recorder/Field Assistant
Rudo Shongedza, Secretary (50% time)

Soil Fert Net Activities for October 1999 to September 2000

The following section lists major events and new activities for the next twelve months. We will develop details about the activities as we move into the New Year. Other activities may be added as we go through 2000, depending on interest and opportunities.

Farmer Assessment of Best Bets

Case studies on the farmer assessment of Best Bet technologies and the value of farmer participatory tools in soil fertility work are continuing, particularly with AGRITEX in Chihota, Zimbabwe. These were established in 1998 after a series of Soil Fert Net farmer participatory workshops.

Combined Mini-Workshops with Field Tours

Because of experience with the power and cost effectiveness of combined field tours and workshops, we are planning two of these for 2000.

Soil pH and Liming in Zimbabwe — We are developing a combined field tour and mini workshop on soil pH and liming in Zimbabwe. This will occur from 6 to 9 March 2000.

Much of the work on liming in Zimbabwe has been conducted by the Chemistry and Soil Research Institute of DR&SS who, as partners in Soil Fert Net, will be closely involved with helping to organize and conduct the event. Among others, farmers, extensionists, researchers, policy makers, and lime suppliers will be involved. The mini workshop will review existing research on liming requirements and yield advantages, liming effects of manure and identify any knowledge gaps. It will also look at the economics, policy and supply side of liming with a view to formulating strategies that will allow smallholder farmers access to lime. This will be combined with visits to on-farm sites where farmers, extension and researchers are working with lime. We expect to hold an initial planning meeting at the end of November 1999.

As indicated in the section on the Zomba meeting, staff at SPRL are conducting a review of liming in Zimbabwe. Additionally, discussions are underway within the EPWG about some policy-related work on liming. These will form

part of the planning on how to move ahead with lime in Zimbabwe.

Integrated Testing of Maize Varieties and Soil Fertility Techniques with Farmers — Maize germplasm that is more tolerant of water deficits and N deficient soils is entering its second year of on farm testing in Zimbabwe. Similar materials are being deployed in Malawi. These materials are being developed and tested through the SADLF project. A few members of Soil Fert Net were involved in the on farm testing during 1998/99 and have attended SADLF planning meetings.

Soil Fert Net is planning to co-sponsor with SADLF, a combined field tour and mini workshop on the Integrated Testing of Maize Varieties and Soil Fertility Techniques. The event will take place from 10 to 20 April 2000 and concentrate on work in semi-arid and sub-humid parts of eastern and northeastern Zimbabwe. Some participants will also travel to Manica Province of Mozambique.

A major aim will be to view the performance of the new maize hybrids and OPVs with farmers on their fields and develop plans for more widespread further testing of the varieties in combination with soil fertility and water management technologies.

Field Tours

We also expect to conduct a field tour in Malawi, perhaps jointly with the Risk Management Project, covering some of the green manure and grain legume work there.

Agricultural Resource Husbandry Forum Regional Workshop

We plan to sponsor several Soil Fert Net members from government agricultural research institutes to attend the next Forum regional workshop, to be held in 2000. This is part of our goal to better integrate Soil Fert Net and Forum. Members that already have, or are planning work with Forum grantees will be given preference.

Agroforestry Conference

SADC/ICRAF is planning an agroforestry conference for countries of southern Africa, to be held in Zimbabwe during the second week of June 2000. Soil Fert Net has been asked to participate in the meeting. We expect to sponsor several members working on soil fertility aspects of agroforestry to attend and present their work.

Soil Fert Net Economics and Policy Working Groups (EPWG)

As described earlier, the Soil Fert Net EPWG-Malawi and EPWG-Zimbabwe will become fully active during late 1999. Proposals will be jointly developed by soil scientists, agronomists, agricultural economists and policy analysts to conduct jointly agreed and high priority economic and policy work related to soil fertility during 2000.

The EPWG will operate through Action Group 3 of the Maize Productivity Task Force in Malawi and the Soil Fertility Action Group within the Agricultural Productivity and Food Security Task Force in Zimbabwe.

A range of work is under development for likely implementation in 2000. In Malawi, this includes socio-economic factors affecting the adoption of soil fertility technologies, the economics of inorganic fertilizer use and the economic potential of soyabean and pigeonpea. In Zimbabwe, this includes the economics and policy implications of a wide range of inorganic and organic soil fertility technologies, and some special emphasis on liming and rock P.

Various meetings are planned during the year in both Malawi and Zimbabwe to bring together the disciplines. These include about six proposal review meetings, four consultative meetings to present and discuss results from the activities, and two meetings with Malawi MPTF Action Group 3 and the Soil Fertility Action Group in Zimbabwe. Most of these will be supported out of funds provided directly to the convenors of the EPWG in Malawi and Zimbabwe. The main Soil Fert Net networking grant will provide some additional support, especially for links across the countries.

Network Trials

The Soil Fert Net grant will continue to support the farmer participatory work on Best Bet technology assessments began during 1998/99. These include a range of technologies in "mother + baby" trials around Chisepo in Malawi (Bunda College of Agriculture) and participatory testing of green manures in Mangwende, Zimbabwe (Farming Systems Research Unit of DR&SS). The Soil Fert Net grant is also supporting a study on the labour needed to incorporate mucuna residues into the soil in Malawi.

Help will also be provided on a range of initiatives linked to Soil Fert Net, including the N exploration "Closing the Loop: Identifying N

Sources and Minimising N Losses in Leguminous Cropping Systems" being managed by the Soil Science Department of the University of Zimbabwe, and the organic N x inorganic N substitution work jointly with TSBF.

The N exploration is making measurements of inputs from nitrogen fixation and losses due to leaching, denitrification and volatilization in various experiments of Soil Fert Net members in Malawi and Zimbabwe. Parallel measurements are also being made in East Africa through partners of TSBF. As part of this project a review of methods and literature will be published as a Soil Fert Net working paper and a workshop will be held in August to share experiences, communicate findings from the project and plan follow up activities.

Best Bets Technology Workshop Report

A report was compiled of outputs from the Best Bet Soil Fertility Workshop held in Zomba, Malawi in August 1999. This has been distributed to participants and other interested members during October 1999.

Best Bets Leaflets

Following from the Zomba workshop, we are developing a series of leaflets or brochures on Best Bet soil fertility technologies. The first ones, separate leaflets on soyabean in Zimbabwe and in Malawi, and fertilizer management for maize on sandy soils in Zimbabwe, are due out by December 1999. These are primarily for extension staff, NGOs, research and training organizations and farmer organizations. We expect to produce 2000 to 3000 copies of each leaflet.

Other Publications

In addition to our regular newsletter, Target, we expect to produce at least four Working Papers during the year. These include a Results paper that will summarize our current understanding of the performance and suitability of the Best Bets, selection criteria and identification processes. Several papers on strategies to reach clients, including input supply and dissemination in Kenya, various farmer participatory approaches to extending Best Bets in Malawi, and on the economics of soyabean in Zimbabwe are under consideration. Reviews on liming and use of rock P in Zimbabwe are under development. By the end of 1999 we expect to produce and distribute a general brochure about Soil Fert Net.

Links with Risk Management Project

During the 1999/2000 cropping season, the Risk Management Project will conduct farmer participatory and crop modelling work in Zimbabwe and Malawi in close association with some members of Soil Fert Net.

Agricultural Production Systems Simulator (APSIM) modelling work will concentrate on the whole farm management of N fertilizer in space and time, particularly in the semi-arid Zimuto communal area of Zimbabwe. In Malawi, the modelling will focus on legume rotations and green manuring with maize. Farmer participatory work will be concentrated around Chisepo in Malawi and in Zimuto, Mhondoro and Chihota in Zimbabwe. A new focus of some of the FPR is to compare several methods of exposing farmers to soil fertility technologies, including farmer experimentation and "mother + baby" trials. It will be done in close cooperation with ICRISAT-Zimbabwe.

Reviews of Soil Fert Net and Partner Projects

Soil Fert Net has completed five years of work. In that time, we have achieved a lot together. However, needs and opportunities change. One clear example of this has been the major initiative on economics and policy that we have incorporated into Soil Fert Net in 1999. The Rockefeller Foundation has requested to review Soil Fert Net in the first half of 2000. The major aim of the review will be to develop an even more effective Soil Fert Net for the future.

The Rockefeller Foundation is also expecting to review the work of some of the soil fertility projects that it funds in Malawi and Zimbabwe. Notable among these is the project within DR&SS in Zimbabwe.

We hope that through these reviews we can develop new partnerships and build for the future.

Acknowledgement — The coordinator would like to thank the many members of Soil Fert Net that have contributed most of the information used in this report.

SRW, Harare, 18 November 1999

