Report on Crawford Fund Master Class

Management of Climate Variability: A participatory approach with researchers, extension officers and smallholder farmers

In collaboration with ACIAR's Sustainable Intensification of Maize-Legume Farming Systems from Southern and Eastern Africa (SIMLESA) Program

Morogoro, Tanzania, 26th November – 2nd December 2011

The University of Queensland (QAAFI-UQ)

Agri-Sciences Queensland (DEEDI)

Australian Government
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Management of Climate Variability: A participatory approach with researchers, extension officers and smallholder farmers

Daniel Rodriguez (QAAFI, The University of Queensland, Australia), John Dimes (Agri-Science Queensland, DEEDI, Australia), and Peter Johnston (Cape Town University, South Africa)

The dependence of farmers on low and or highly variable rainfall across most south eastern Sub-Saharan countries, in combination with depletion of soil fertility, makes the effort of intensifying maize based production systems and lift farmer's livelihoods a rather daunting and complex problem. In general, climate risk acts as a disincentive for farmers to invest in needed technologies and markets, reducing our chances of increasing yields and reducing risks. Across the region, lifting the productivity of crops, i.e. grains and biomass, is paramount to start building more sustainable and profitable cropping systems amid achieving the Millennium Development Goals in Africa.

Across Africa, highly vulnerable risk-averse farmers tend to favour precautionary strategies that buffer against climatic extremes over activities that might be more profitable on average ((Challinor et al., 2007; Hansen et al., 2009; Hansen et al., 2011). One of these precautionary strategies is to sow most of their land to staple crops (i.e. maize), so they assure they are food secured. This means that little resources i.e. land, nutrients, labour, time, would be available to diversify sources of livelihoods, e.g. introducing cash producing enterprises such as legumes or livestock. For example from discussions with a farmer from Mozambique indicated that in 7 out of 10 years he would expected yields of ca. 4t/ha, while in the reminder 3 years yields would be 0.5t/ha or lower. This explained why he allocates most of his land (3ha) to maize every year, so that the only harvest in this uni-modal rainfall environment produces sufficient food to feed his extended family (i.e. requiring ca. 1.5t maize/year).

Farmers' perception of risk and its consequences is paramount here. How farmers' perceptions relate to the actual variability in yields driven by climate variability, and to what extent existing yield gaps driven by poor agronomic practice or lack of use of agricultural inputs are responsible for farmer's risk averse attitudes. For example, the farmer in question did not use chemical fertilisers, applied conventional agricultural practices, and performed limited weeding in his fields only during the wet season. Innovations that could increase productivity are avoided as they are seen as risky. Particularly if farmers have to pay expensive agricultural inputs in advance. Even though climate risk insurance is common product for farmers in most parts of the world it is not common in Africa, where insurance markets are limited and if they exist might not be properly customised for the needs of poor smallholder farmers.

With the support of the Crawford Fund and ACIAR (through the SIMLESA program), we run a participatory training exercise involving 20 small holder farmers from the Mandela Village, in Morogoro, Tanzania; and 20 extension officers, agronomists, and meteorological officers from the National Agricultural Services of Ethiopia, Tanzania, Kenya, Malawi, Mozambique, Botswana and Sudan; with the objective of:

- Train the trainers i.e. NARs researchers and extension officers, on participatory approaches to improve farmer's preparedness and responses to below and above average rainfall seasons.
- Increase farmers' and extension officers' understanding on how year-to-year climate variability impacts agriculture production and decision making, and how existing sources of

climate information could be used to help farmers make better informed decisions and reduce climate associated uncertainties.

- Improve NARs researchers, extension officers and farmers understanding of existing tools, sources of information and products (micro-insurance for smallholder farmers) already available in their region.
- Promote a trans-disciplinary dialog between agronomists, extension officers and meteorological officers.
- Promote the development science and extension networks across the seven participating countries.

Participants

There were 24 participants in the Master Class - having a range of experiences and skills in agronomy, breeding, soil science, systems modelling, meteorology and extension from a wide range of developing countries in Africa: Ethiopia (4), Kenya (4), Tanzania (5), Malawi (4), Mozambique (4), Sudan (1) and Botswana (2) - together with one South African and two Australian trainers (**Annex 1**). Dennis Blight representing the Crawford Fund and Mulugetta Mekuria, SIMLESA Project Manager, CIMMYT, also attended the meeting. Four of the participants were female (1 meteorologist, 3 extension). All the participants were working for National Research agencies, Extension or Meteorology Departments

Co-sponsorship

In addition to the Crawford Fund, co-sponsors of the Master Class were the Australian Centre for International Agricultural Research (ACIAR) through the SIMLESA program, and funding of the participants from Sudan and Botswana.

Collaborating organizations

Participating African and international organisations include the Ethiopian Institute of Agricultural Research (EIAR) and the National Meteorological Agency; the Kenyan Agricultural Research Institute (KARI), and the National Departments of Meteorology and Agricultural Extension; the Agricultural Research and Technical Services (DARTS), Ministry of Agriaculture and Food Security and the Dept of Climate Chanage and Meteorologoy, Malawi; the Instituto de Investigacao Agraris de Mocambique (IIAM) and the Met Institute, Mozambique; the Ministry of Agriculture and Food Security (DRD) of Tanzania and the Tanzania Meteorology Agency; University of Cape Town, South Africa and the Centre for International Maize and Wheat Breeding (CIMMYT). Australian participating agencies included The Queensland Alliance for Agriculture and Food Innovation (QAAFI) at the University of Queensland (UQ), Agri-Sciences Queensland from the Queensland Department of Employment, Economic Development and Innovation (DEEDI).

Course contents

The topics of the training course included

- Climate information sources for southern and eastern Africa and theory, formulation, interpretation and communication of seasonal climate forecasts
- Engaging farmers in focal group discussion, individual questionnaires and resource allocation mapping on cropping systems, management and climate and yield variability
- Survey results analysis - data entry, comparative yield analysis (RUE) and formulation of management messages under variable rainfall patterns
- Farmer specific modelling applications – model outputs used with farmers in interpretation of yield outcomes under variable rainfall.

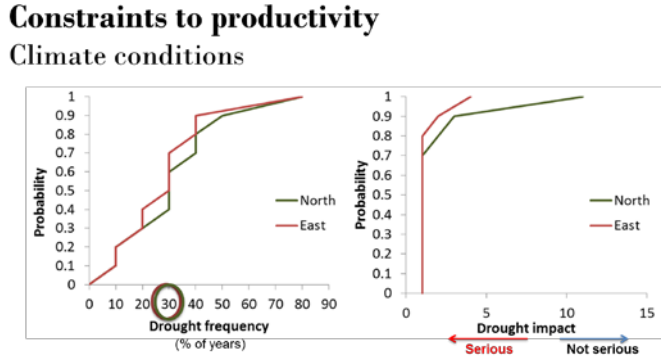
Activities included: (Annex 2)

1. Evaluation of farmer's socio-economic situation (physical, natural, financial, human, social capitals).
    - Presentation by Daniel Rodriguez based on the analysis of SIMLESA's baseline survey data from eastern Tanzania.
2. Existing sources of climate information, risk management tools and products and what would be required to increase their salience, legitimacy, access, understanding and capacity to respond to variability.
    - Presentation on seasonal climate forecasting tools by Peter Johnston Cape Town University.
    - Problems and exercises run and presented by the trainees.
    - Presentation on constraints and opportunities from seasonal climate forecasts and use of climate information to support on farm decision making.
3. Validation of current farmers' practice, performance (expected yields and their variability), and food demand, to understand farmers' perspective in terms of climate variability and how it affects their livelihoods and levels of food security.
    - Farmer's interviews (survey) at Mandela Village run by the trainees on 20 farmers (supervised one to one activity).
4. Increasing trainees understanding of farmers' resource allocation, predominant farming systems, farmers' constraints and opportunities.
    - Trainees and farmers developing resource allocation maps.
5. Workshop activity: evaluating farmers' perception of climate risks and how perceived risk affects their decision making processes, i.e. use of outputs from farmer survey and resource allocation maps collected at Mandela Village and questions to be answered (**Annex 3**).;
    - Desktop work to contrast farmer's perceptions of risk, with observed variability from available climate records, to evaluate whether present farmer's perceptions are justifiable or not;
    - Group work activity and presentations by trainees.
6. Feedback to farmers provided by participating local extension services and the Australian team at Mandela Village based on the conclusions from group work and recommendations.
    - Workshop activity with farmers to discuss results of ex-ante climate analysis and survey results
    - Workshop activity on the relationship between local historical climate variations and simulated outputs from APSIM.
7. Farmer's voice: discussion with the participating farmer's what they would do different next season, and what other training they would require to feel more confident about their on-farm decisions related to managing climate variability.
    - Workshop activity at Mandela Village.

8. Improving trainees understanding on sources of climate information, climate services and networking within each participating country.
    - Presentations by each country Meteorological service and representative from the ARC (South Africa).
9. Final reflections by trainees on what they will do different in their work when addressing climate risk management in their respective countries.
    - General discussion and recommendations for further work.

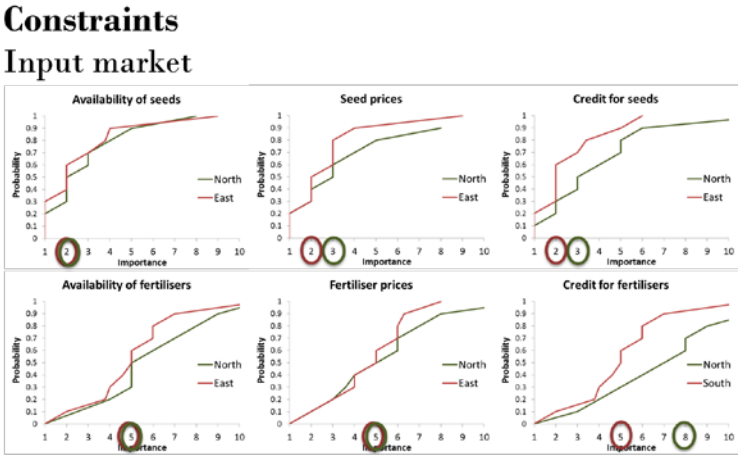
Key Results

- According to farmers, the most likely frequency of droughts, both in Eastern and Northern Tanzanian regions, is 3 out of 10 years. Farmers consider that drought events have very serious implications for them.



Cumulative probability distribution functions for farmers' answers on drought frequency and impact

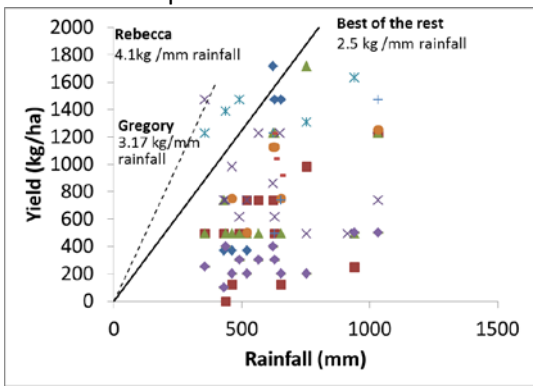
- Input markets constraint farmer's capacity to purchase certified seeds, though access to fertilisers would appear to be less of a problem.



Cumulative probability distribution functions for farmers' answers on market constraints for access to seed and fertiliser

- The agronomic performance of Mandela farmers is highly variable and low in general. Key constraints to rainfall use efficiency appear to be related to:
    - the short window of opportunity between the start of the rainy season and the land preparation activities;
    - sowings occurring outside the recommended sowing window,
    - use of recycled seeds;
    - no use of fertilisers and limited weeding;

- lack of understanding of the benefits of fertilisers and at least two in-crop weeding events.
- lack of cash to purchase fertilisers was also mentioned by several farmers.



Mandela farmers' performance in terms of rainfall use efficiency during the last 10 years. Each symbol represents the response of a farmer. The slope of the lines through the origin indicate the efficiency frontier for rainfall use efficiency.

- Based on the gained understanding the trainees concluded that producing a flyer in the local language, including best local agronomic practices, and discussing it with the Mandela farmers would be the best strategy to reduce the impacts of climate variability and increase farmers' resilience.

Trainees' recommendations to farmers from Mandela Village, Tanzania (Swahili)

Uimarishaji endelevu wa Mfumo wa kilimo mseto cha Mahindi na Mikunde kwa ajili ya Uhakika wa Chakula Mashariki na Kusini mwa Afrika (SIMLESA)

- Mbinu nzuri za kupambana na mabadiliko ya tabianchi ni kufuata kanuni bora za kilimo
- Panda bila kulima ndani ya matandazo. Ongea na wakulima walio kwenye mradi wa SIMLESA kuhusu uzoefu wao kuhusu mbinu hiii na matumizi ya viua gugu.
- Unaweza kupanda kwenye vumbi au mara tu baada ya mvua kunyesha kuanzia tarehe 15 Februari mpaka 15 Machi kwenye shimo lenye kina cha sentimita 5.
- Kitaalam mimea ya kujaza shamba sharti upande kwa nafasi ifuatayo: 75 sm (ft 2.5) mstari hadi mstari na 60 sm (2 ft) kati ya mche na mche.
- Kiutalaam panda mbegu bora au mbegu chotara
- Panda punje 3 kwa shimo na punguza zibakie 2 kwa shimo.
- Kama mvua zitachelewa panda aina ya mbegu zinazokomaa mapema au rudia kupanda baada ya ya mazao ya kwanza kukauka.
- Chelewa kupanda kama utabiri wa hali ya hewa unaonyesha kuwa mvua zitachelewa kuanza.
- Kama unalima kilimo mseto cha mahindi na mbaazi, panda mbaazi ya muda mrefu wakati mmoja na mahindi.
- Kwa wazoefu wa kutumia mbolea, tumia TSP kilo 30 kwa ekari kwa ajili ya kupandia. Weka mbolea ya kukuzia (Urea) kwa mafungu. Fungu la kwanza weka kilo 25 kwa ekari wiki 3 baada ya kuota halafu fungu la pili (kilo 25) wiki 7 baada ya kuota (kabla ya mahindi kuchanua). Hakikisha unaweka mbolea baada ya palizi.
- Kama hujawahi kutumia mbolea nunua na kutumia urea kwa majaribio. Tumia mfuko mmoja (Kilo 50) ugawanye mara mbili; kilo 25 weka wiki 3 baada ya kuota na zilizobaki weka wiki 7 baada ya kuota (kabla ya mahindi kuchanua). Hakikisha unaweka mbolea baada ya palizi.
- Weka mbolea wakati udongo una unyevu au baada ya mvua kunyesha katika shimo la kina cha 5sm na ufukie.
- Kila inapowezekana panda mazao mchanganyiko kwa mfano Alizeti, ufuta, mtama, pamba, kunde, choroko na ngwara.
- Fanya kilimo cha mzunguko wa mahindi na mikunde

- Palilia mara angalau mara mbili baada ya kupanda
- Baada ya kuvuna usiondoe masalia yote ya mazao shambani. Hii itasaidia mvua kuingia vizuri ardhini, kutunza unyevu aridhini, kuzuia mmomonyoko wa ardhi, kuzuia uotaji wa magugu.

Trainees' recommendations to farmers from Mandela Village, Tanzania (English)

- The best climate risk management strategy is good agronomic practice
- Direct seed with a hoe under the mulch. Talk to the SIMLESA farmers about their experience with these practices and with the use of herbicides.
- Dry sow or sow after a rainfall between the 15th February and 15th March, at 5cm depth.
- Sowing density: Sow your maize at 75cm (2.5 feet) between rows and at 60cm (2 feet) between hills.
- Preferably sow certified open pollination or hybrid seed.
- Sow 3 seeds and after emergence thin to 2 plants per station.
- With late onset of the rains sow early maturity varieties, or re-sow failed crops.
- Delay sowing if the forecast is for poor early season rains.
- If you are intercropping with pigeonpeas sow a long duration variety at the same time as the maize, at 50cm between hills. Sow one pigeonpea plant per sowing station.
- For the more experienced fertiliser users use triple super phosphate (TSP) 30kg/acr at sowing. Split the Urea fertiliser between 3 weeks after emergence (25kg/acr), and pre flowering (7 weeks) 25kg / acr. Apply the fertiliser after weeding operations.
- If you haven't used fertilisers before buy Urea to experiment. Buy one bag of urea (50kg) and split the bag between knee height (or 3 weeks after emergence) 25kg/acr, and pre flowering (7 weeks) 25kg / acr. Apply the fertiliser after weeding operations.
- Only apply fertilisers if there is soil moisture and you are expecting more rain. Apply the fertiliser after the rain by digging a hole next to the plant (5cm) and bury the fertiliser.
- Whenever possible diversify the number of sown crops, for example: sunflower, simsim, sorghum, cotton, cowpea, greengram, and lablab.
- Preferably rotate the maize fields with the legumes.
- Weed your crops at least twice after sowing.
- After harvesting keep the residues on the surface of the soil to create a mulch. This will help reduce soil erosion, retain soil moisture, improve rainfall infiltration, and control weeds.

Key lessons learnt during the Master Class according to the participating trainees

1. Number of seasonal forecasting systems (SCF) available (3, mentioned by participants)
2. Interpretation of SCF outputs (4)
3. The value of long term climate records (2)
4. Work more closely with Met office people (4)
5. Use of weather forecast to adapt practices
6. Developing sustainable support systems for farmers
7. Building more capacity in climate risk management (2)
8. How risk management strategies can be downscaled to farmer level (climate records, modelling, insurance products, SCF)
9. The need of a participatory approach combining modelling, climate records etc (2)
10. Not enough information on SCF -> and that weather and climate information can be useful to farmers
11. How to fill the gap between meteorologists and agronomists
12. Participatory approaches on local climate (3)
13. Providing immediate feedback to farmers
14. Add value to research outputs by using weather and climate data

15. Price risk (at Mandela) is possibly a more important driver of practice change
16. Importance of understanding SCFs
17. Participatory approaches: understanding farmer's situation and perceptions and needs

Lessons Learned in relation to Training Workshop

1. Having access to Mandela village from Morogoro was crucial to the objectives of the workshop. However it resulted in logistical arrangements that were susceptible to flight delays and missed connections. Quite a few participants did not arrive until late on the Tuesday, missing the first farmer interactions. Though more costly, having participants arriving on the Saturday would be a risk management strategy for future training workshops.
2. The workshop had participants from 7 different African countries and this allowed for effective dissemination of the climate subject matter and participatory processes demonstrated at the workshop. However, lack of KiSwahili language skills did present serious limitations for participant's involvement in the farmer interactions. It also meant that the researcher numbers at the farmer meetings swamped the farmer numbers. It would be more efficient if the participatory processes were demonstrated on a country by country basis, with fewer researchers involved and language constraints reduced.
3. The training workshop content proved to be overly ambitious. Insufficient time to complete tasks (eg. SCF exercise, general discussion with farmers, survey analysis) became an issue, despite the dedication of the participants to remain involved late into the day(s). The value of combining survey results and model outputs as part of the farmer feedback process was unable to be tested. Perhaps a two stage training would be preferable – (i) training on climate information, services, seasonal forecasting and insurance schemes implemented on an across country basis to share basic skills, process and information. And (ii) training in engagement with farmers on climate variability and risk using participatory approaches implemented on a site specific basis.

Results of the post- Master Class survey

The results of the survey are shown in Annex 5. Participants were quite positive in their scoring of all aspects of the Master Class. No negative responses were recorded by any of the participants although between one and three participants recorded neutral scores for many of the questions/statements in the survey. The comments made on the survey forms reflect those given in 'Key Lessons Learned section' above.

References

Challinor A, Wheeler T, Garforth C, Craufurd P, Kassam A (2007) Assessing the vulnerability of food crop systems in Africa to climate change. Climatic Change 83, 381-399.

Hansen JW, Mishra A, Rao KPC, Indeje M, Kinthia Ngugi R (2009) Potential value of GCM-based seasonal rainfall forecasts for maize management in semi-arid Kenya. Ag Systems 101, 80-90.

Hansen JW, Mason SJ, Sun L, Tall A (2011) Review of seasonal climate forecasting for agriculture in Sub-Saharan Africa. Expl Agric 47, 205-240.

Meinke H, Howden M, Struik P, Nelson R, Rodriguez D, Chapman S (2009) Adaptation science for agriculture and natural resource management – urgency and theoretical basis. Current Opinion in Environm Sust. 1, 69-76.

Annex 1. Participants and trainers

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South Africa	30	Peter Johnston	Cape Town University	johnston@csag.uct.ac.za	

Annex 2: Program

Master Class Program

Mon 28th	Tues 29th	Wed 30th	Thur 1st	Fri 2nd
9 Arrival and introductions (Mulugetta Mekuria)	8:30 Travel to Mandela village	8:30 Reflection and inputs on the use of climate information and climate risk management tools. (Peter Johnston)	8:30 Travel to Mandela village	9:00 Presentations by the ARC representatives
9:30 Review week program, feedback from participants (John Dimes)	9:30 Farmer group meeting: Description of their cropping systems and management practices	9:15 Summarise response data on household descriptions, food requirements, crop production and management (participants computer work)	9:30 Farmer feedback on survey results. • Explore opportunities for better climate risk management with farmers. • Use of SCF in decision making • Seek inputs on treatments for field experimentation.	(continuation)
10:30 Morning tea	(Skip)	10:30 Morning tea	(Skip)	10:30 Morning tea
11:00 Climate risk, risk management and role within SIMLESA (Daniel Rodriguez).	Group activity with farmers: Discussion of production constraints. Evaluation of local knowledge of climate, seasonal forecasting and decisions affected	11:00 Formulate yield distributions of farmers (rainfall, yields) and compare with meteorological data, and simulation outputs	(continuation)	11:00 Review week activities and plan way forward, including tasks on risk analysis by country
11:30 Climate information and seasonal climate forecasting (Peter Johnston, Cape Town University)	One on one farmer surveys run by participants. Individual Resource Allocation Maps and Questionnaire	12:30 Simulation of crop yields and questions of selected farmers (John Dimes)	(continuation)	What will you be doing different in your R&D plans and farmer interactions, when you go back to your country?
13:00 Lunch	13:00 (Late) Lunch with farmers	13:00 Lunch	(Late) Lunch with farmers	13:00 Lunch
14:00 Climate information and seasonal climate forecasting (Peter Johnston, Cape Town University)	14:30 Return to Workshop venue	14:00 Participants preparing for group presentations	14:00 Return to Workshop venue	Closing ceremony and distribution of Participation Certificates from Crawford Fund
16:30Plan for Day 2 Farmer meeting (John Dimes)	15:30 Afternoon tea	15:30 Afternoon tea	15:30 Afternoon tea	
	16:00 Overview of what we saw and learnt today, and planning of next day's activities (Daniel Rodriguez)	16:00 Group presentations on questions 1-6 below. General discussion and participants preparing their messages to the farmers the next day.	15:00 Presentations by National Met Departments from each country 19:00 Dinner	

Annex 3.

Questions addressed by the group using farmer survey results

Questions answered by the participants on the Wednesday during the group presentations.

1. What is the farmer's perception of climatic conditions for crop production - % of good, average and poor seasons?
2. What aspects of rainfall are associated with good, average and poor seasons?
3. How does farmer's summary description of climatic conditions compare to their recollection of yield of maize in the same seasons
4. How does the farmer's description compare to the meteorological record? (i) rainfall anomalies (ii) adequacy to grow maize (season rain cf. thresholds for good, poor, average (iii) APSIM output
5. What management practices, and how, do farmers change in response to seasonal conditions?
6. How many bags of maize needs to be sold to purchase a bag of fertiliser?

Annex 4:

Newly developed resources and links to downloadable files

- Weeks program by John Dimes
- Introduction to climate risk management by Daniel Rodriguez
- Seasonal climate forecasting by Peter Johnston
- Challenges of using seasonal climate forecasting tools by Peter Johnston
- Exercises by Peter Johnston
- Meeting with farmers by John Dimes
- Excel survey form
- Calculation of rainfall water use efficiency frontier
- Group picture at Mandela Villa
- Group picture with Denis Blight
- Movie with Mandela farmer

Annex 5 POST COURSE SURVEY – MASTER CLASS: MANAGEMENT OF CLIMATE VARIABILITY - RESULTS

A Quality of the Course:	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Not Relevant
(1) The content of the training course was directly related to my field of work at time of completion	13	6	2			
(2) I was provided with adequate supporting material	8	11	1			
(3) The trainers/ mentors were knowledgeable and provided lectures/information of a good quality	15	6				
(4) The content was easy to understand	9	12				
(5) The level of English used was good	13	8	1			
(6) There was sufficient time allowed for the training event to get a good understanding of the content	9	10	3			
(7) The course was well balanced between theory and practice	11	9	1			
(8) Other? Please specify	- Good learning from other SIMLESA partners - Presentations from different countries was a learning tool as well - Full participation of farmers - The significance of the graph on probability (accumulated) against yield needs to be emphasised - the course linked with partners - I would appreciate the approach followed to reach the farmers on the ground and climate change and risk management and recommendations: an applied form of the training - Would like more content on field/ farmers practices					

	- The venue was well chosen

B Knowledge Gained:	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Not Relevant
(1) The training increased my knowledge of international trends/activities	14	8				
(2) I increased my capacity to conduct research	10	9	3			
(3) I better understand issues and principles in my field	8	13	1			
(4) I acquired new technical skills	11	9	2			
(5) I acquired new ways to approach work problems	8	13	1			
(6) I learned techniques for managing and organising people and projects	11	8	3			
(7) I learned new or improved ways to communicate with networks within my field of expertise (eg farmers, donors, research organisations, government)	12	9	1			
(8) Other, please specify	- I gained knowledge how to work with farmers - Interaction of different people with different ideas - I learned the importance of incorporating more people in SIMLESA - I propose that SIMLESA should try to provide the experience from South Africa the next time and organise a meeting to know how we are going - I acquired more training with other countries to exchange views					