African Journal of Rural Development, Vol. 1(3): December 2016: pp. 239 - 245 ISSN 2415-2838

Date received: 14 October, 2014 Date accepted: 21 April, 2016

Contributing towards sustainable farming through synergy between student training and action research with emerging farmers

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ABSTRACT
A learning approach has evolved since 1992 at the Namibia University of Science and Technology (formerly the Polytechnic of Namibia) to expose students to hands-on extension work, while encouraging farmers to experiment with sustainable production methods and explore business opportunities. All second and third-year students of the Agriculture programme are taken together on two visits per year to a farming community, often on a resettlement farm. The courses involved are Agricultural Extension, Agribusiness Management, Agricultural Land Management and Agroecology. For each course students undertake particular activities before, during and after the visits. Students are divided into groups, with each group allocated a a broad thematic area of focus to ensure integration. Examples of thematic areas of interest are water; grazing; trees and bushes; livestock; crops; gardening; energy; transport; food storage; value addition; marketing. During the first visit many of the students facilitate the initiation of small-scale trials to be managed by farmers. These trials are then jointly evaluated during the second visit about two months later.

Key words: Agricultural extension, Namibia, participatory approaches, students action research

RÉSUMÉ
Une approche d'apprentissage a évolué depuis 1992 à l'École polytechnique de Namibie et vise à exposer les étudiants aux activités d'extension, tout en encourageant les agriculteurs à expérimenter des méthodes de production durables et à explorer les opportunités d'affaires. Tous les étudiants de deuxième et de troisième année d'Agriculture réunis, sont amenés pour deux visites par an dans une communauté agricole, souvent sur une ferme encours d'installation. Les cours concernés sont : Vulgarisation Agricole, Gestion des Entreprises Agricoles, Gestion des Terres agricoles et Agroécologie. Pour chaque cours, les étudiants entreprennent des activités spécifiques avant, pendant et après les visites. Les étudiants sont répartis en groupe et à chaque groupe est assigné un vaste champ de thématiques d'intérêt pour favoriser l'intégration. Des exemples de thématiques d'intérêt sont : l'eau; le pâturage; les arbres et arbustes; le bétail; les cultures; le jardinage; l'énergie; le transport; le stockage alimentaire; la valeur ajoutée et la commercialisation. Au cours de la première visite, un bon nombre d'étudiants ont facilité l'initiation de petits essais qui ont été suivis par les agriculteurs. Ces essais sont ensuite évalués conjointement au cours de la deuxième visite environ deux mois plus tard.

Mots clés: Vulgarisation agricole, Namibie, les approches participatives, la recherche-action des étudiants

BACKGROUND

In order to empower farmers to apply effective management, the focus of agricultural extension in Namibia has shifted from prescriptive to participatory. Training is needed to prepare current and future extension workers for the participatory approaches, including hands-on practical training. Participatory methodologies, such as those of Participatory Learning and Action (Pretty *et al*., 1995), provide a useful learning tool for both community members and extension workers, if adapted to local conditions and capable of overcoming accustomised expectations (Treurnicht *et al*., 2001). Participatory action research can be usefully applied to promote uptake of innovation in agricultural sector and thereby facilitate participatory experientation and generation of knowledge (Mapfumo *et al*., 2008). This promotes stakeholder engagements in agricultural research for development.

According to the Polytechnic of Namibia Act (No. 33 of 1994), lecturers had been expected to not only train students, but also do applied research and engage in community service. Since training is the primary function of the Namibia University of Science and Technology, lecturers usually have insufficient time to devote to separate research and community service. One way to cope is to combine the functions, by involving the students in research and community service as part of their training. Thereby each of the components can benefit from the other and achieve synergy.

The hands-on exposure started in 1992 with students of the Nature Conservation Diploma to prepare them to promote and facilitate community based natural resource management. Originally there was only one visit for students of only one course (Zimmermann, 1997). Later a second visit was added to allow follow-up (Zimmermann, 1998). Subsequently the approach was applied to four courses (Agricultural Extension, Agribusiness, Agricultural Land Use Management, and Agroecology) of the Agricultural Bachelor programme in the Department of Agriculture as described in this paper. The overall aim of the learning approach is to attain synergy between student training and community action. Specific objectives include:

(i) To empower farmers to evaluate trials and adopt practices which they deem appropriate;
(ii) To provide sustainable farming options for development organisations to pursue with the farming communities they support; and
(iii) To empower agricultural students to facilitate experimentation with farmers through stimulating learning experiences.

METHODOLOGY

Relevant courses

All four courses provide training opportunities through action research with a rural community that gets visited twice per year by both second and third-year students. The second-year course of Agricultural Extension supports students to empower farmers, through participatory means, to become more self-reliant and improve their standard of living. Another second-year course, Agribusiness Management, supports students to develop a business plan and apply the basics of managing the financial and human resources of an agricultural business. The third-year course of Agricultural Land Management supports students to design appropriate farming systems and manage soil and water. Another third-year course, Agroecology, supports students to evaluate farming systems from an ecological perspective, so that they may minimize harmful impacts of agricultural activities on the environment, while maximizing the benefits of ecological services that support sustainable production.

Staff members who teach these four courses first visit the community without students but with the development organisation that serves the community, to identify appropriate trials wanted by farmers for students to facilitate. The list of trials is then presented to students.

Procedure before visits with students

Students are divided into groups, with each group allocated a topic, such as water, natural vegetation, livestock, crops, gardening, energy, transport, food storage, value adding or marketing. Where possible, students choose their topic and trial of interest, but it is usually necessary to transfer some students to other groups, to ensure a balance in numbers and to have the local language skills available in each group.

Each student is assigned one of the small-scale trials to facilitate, such as implementing a new management intervention on a few animals or on a small plot of land in comparison with the usual management applied by the farmers (e.g. Zimmermann, 2005). As an exmple in 2014, there were 77 students who facilitated 149 trials. Each student is expected to thoroughly research the options for their trial and to write a proposal under prescribed headings. If approved, they obtain the necessary materials and equipment to take along. In addition to facilitating their trials, students are allocated further responsibilities related to their courses.

Each Agricultural Extension student is assigned an exercise of Participatory Rapid Appraisal (PRA), such as landscape transect, seasonality chart, venn diagram, activity clock, matrix ranking, resource mapping, energy flow diagram, money flow diagram, nutrient cycles, pest control web, trend diagram or problem tree. The purpose is to analyse farmers' perceptions of their circumstances and how they make management decisions. Each student also prepares for an energizer exercise, in case they get called upon to facilitate it during the visits.

The Agribusiness students design a questionnaire to determine the resources available to farmers, assess their management practices, marketing situation, record keeping and financial management practices, and to identify problems with a view to seeking solutions.

The Agricultural Land Management students learn how to implement the analysis procedures of Participatory Learning and Action Research (PLAR) for integrated soil fertility management (Defour, 2002).

Each Agroecology student is assigned a permaculture design mapping exercise to analyse farmers' perceptions of the connections between their existing components, such as providing the inputs or serving the needs of other components. This will serve as the basis for later getting the farmers to consider further beneficial connections between components, and with additional potential components suggested by students. The implementation of permaculture design provides a further useful learning experience for all involved (Zimmermann, 2012).

Procedure during first visit over four nights

Upon arrival at the community, the community leaders are greeted and students make contact with the farmers to arrange when to facilitate which trial and learning exercise. Hard cover books and pens are left with the farmers to keep records of their trials, although it is often the children who are then tasked with keeping records due to the superior schooling they received. Students facilitating trials with soil amendments are advised to collect treated and untreated soil to take back to the University for performing a radish bioassay on. This not only provides verification of results obtained by farmers but also serves as back up in case of problems with the trial on the farm. In addition to the trials, students perform different disciplinary specific activities depending on the courses they are taking.

Agricultural Extension students are expected to:

(i) Learn as much as they can about their topic from observations and questioning of community members.

(ii) Perform a "do-it-yourself" exercise, by participating in an activity that the community members are skilled at but the students are not. It not only allows students to appreciate how skilled the community members are, but also allows community members to have a good laugh at the clumsy efforts of the students. In this way the exercise acts as an equalizer, with the students possessing formal knowledge and skills, while the community members possess local knowledge and the skills to apply it.

(iii) Facilitate an energizer exercise, if called upon to do so. Such exercises are normally undertaken during community meetings, when participants become tired and can benefit from some change of activity. They are mostly fun exercises, although some can also be educational. For example, teamwork exercises show how well the community members work together and usually provide opportunities to suggest improvements.

(iv) Facilitate some community members to do their Participatory Rapid Appraisal (PRA) exercise and note their comments, particularly those on key factors that are not evident in the diagram.

(v) Facilitate a report back on the PRA exercise to be performed by one of the community members who was involved in it, and note comments from the audience.

Agribusiness Management students are expected to:

(i) Fill in the questionnaire while interviewing the farmers.

(ii) Keep an eye out for possible business opportunities and obtain farmers' views on them.

(iii) Determine the financial viability of any action deemed by trial to be technically feasible.

Each group of Agricultural Land Management students is expected to:

(i) Facilitate a group of community members to apply its PLAR tool to the local situation.

Agroecology students are expected to:

(i) Look for signs of ecological damage related to their topic.

(ii) Determine the benchmark for environmental sustainability, related to their trial on the community's land. This helps to prevent them from making recommendations that are unrealistic for the area or its current macro-climate.

(iii) Keep an eye out for environmentally sustainable practices related to their topic, which are being practiced by a community member.

(iv) Think about alternative eco-friendly solutions that could improve sustainability.

(v) Facilitate their farmer to draw the first permaculture design map based on perceptions.

(vi) Get relevant parts of the trial implementation filmed.

During the two visits all students are expected to:

(i) Write a report on the first visit and plan for the second visit, under prescribed headings.

(ii) Further research on their trials to address any shortcomings noted during the first visit.

(iii) Obtain further materials or learning tools needed for the second visit.

For the second visit which is usually over four days, all students are expected to:

(i) Jointly evaluate the trial by observing outcomes and analysing the results recorded by the farmer in the record book.

(ii) Facilitate the farmer to demonstrate the trial or perform a roleplay, while ensuring that it gets filmed for showing to the wider community at night.

(iii) Facilitate a discussion on how to achieve collective action, in cases where the suggested activities require it, such as to manage the communal grazing land.

Agricultural Extension students are, in addition, expected to differentiate between their own biases and appropriate neutral advice for the community. On the other hand, Agribusiness Management students are, in addition, expected to present their draft business plan to the farmers to obtain their feedback and decide with the farmers how to address any perceived shortcomings.

Each group of Agricultural Land Management students is, in addition, expected to present the results of its PLAR tool application to the group of community members who participated in it during the first excursion and to note responses of community members and facilitate discussion on appropriate action.

Agroecology students are, in addition, expected to suggest improvements to the permaculture design map to enhance functional linkages between components, while noting the reaction by the farmer(s). Facilitate the farmer to incorporate agreed improvements to the permaculture design map, copy the improved permaculture design map, leaving the original with the community, and facilitate a report back on the improved permaculture design map, to be performed by one of the farmers who was involved in it, and note comments from the audience.

Procedure after the second visit

Each student is expected to write a report, under prescribed headings to ensure that they reflect on the diversity of issues. The senior students are also expected to edit films of their interactions which are later viewed by the external moderators of these courses as quality assurance for confirming assessment marks. Some of the films also get shown to following students when preparing them for these learning experiences.

Follow-up after the visits

Relevant information from the many individual student reports is compiled into one overall reader-friendly report (see Zimmermann *et al*., 2010). Copies of the overall report are then handed over to the development organisation to itself make use of and to distribute to the relevant community leaders. It is then left up to the development organisation to facilitate any follow-up activities as it and the community see fit. The Namibia University of Science and Technology remains available to advise on technical queries that may arise.

After two visits to the same community, the farmers are expected to continue experimenting on their own with new approaches to sustainable farming, and to venture into new business opportunities, through facilitation by the partner development organisation. A different community is then visited the following year, to avoid the same community developing facilitator fatigue if repeating similar interactions with new students in subsequent years.

Findings from trials

There are basically two types of trials. One type is where the student suggests that the farmer make a minor change to his/her management, such as adding a soil amendment or a supplementary feed. In cases where the treated crops or animals greatly outperform the untreated ones, the farmers are usually keen to adopt the treatment if it is affordable. The other type of trial is where the student introduces a new component, such as a species of crop, tree or animal that was not farmed before. When visiting target communities some years later, it is encouraging to often find some of the introduced species spread widely over the farm, from the single household to which it had been introduced.

Sometimes students are disappointed during the second visit to find that their trial had failed, either because the farmer lost interest and no longer applied treatments, or more often because of stresses such as damage to crops by livestock. Nevertheless, such students still learn from the many successful trials of their peers and all students learn more about the realities faced by farmers. Some photos of trials appear in Figures 1-3.

PRA, permaculture design maps and roleplays

Most farmers report back on their PRA diagram or permaculture map to the wider community with great enthusiasm and pride, attesting to their success. Roleplays usually start by showing the negative consequences of a problem that the community faces

Figure 1: The goat kid on the left received a supplement of bran fermented with effective microorganisms (EM), while the kid on the right belongs to the untreated control group. Two months earlier, they were the same size

Figure 2: A chicken tractor cage with no floor allows chickens to feed on insect pests and weed seeds while fertilizing the soil and providing a scratching service to enhance the growth of vegetables that follow

Figure 3: A food forest is established at the hostel of Vergenoeg resettlement farm, to receive water in the dry season from rainwater from the hostel roof stored in the white ferro-cement tank and grey water from the hostel shower, while in the wet season rainwater collects in swales dug along contour lines and gets diverted into the hostel grounds from ditches dug at a slight gradient to catch runoff from the sloping sports field

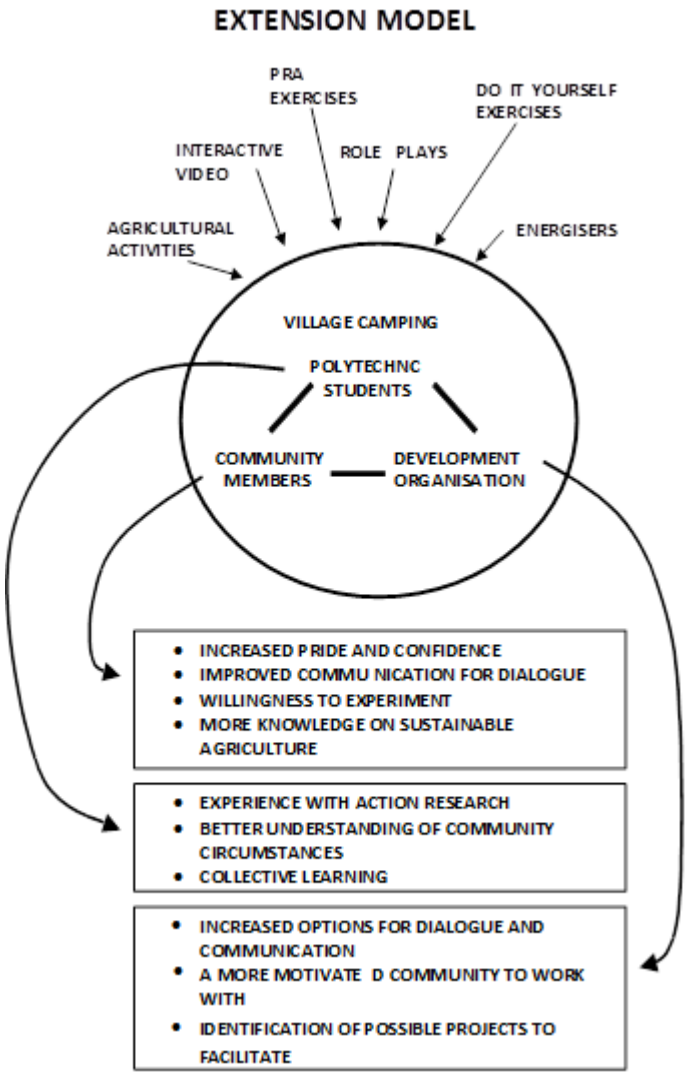

Figure 4: Diagrammatic representation of the conceptual model used for extension work undertaken by agriculture students of the Namibia University of Science and Technology (formerly Polytechnic of Namibia)

and end up with the implementation of an appropriate solution (Zimmermann *et al.*, 1999). Both community members and students usually act in the roleplays amid lots of laughter from spectators and later viewers of the film.

CONCLUSION AND RECOMMENDATIONS

Some continuity is assured by involving both second and third year students, because approximately half of the students have experienced a similar type of visit the year before, even though their roles and responsibilities differ from course to course. The approach used for the learning experience is summarised in Figure 4. The benefit of combining student training, action research and community service, is synergistic, being greater than the sum of their individual benefits, because students learn more effectively through the stimulating experience, the community benefits through the participation of energetic students and the results of the action research are owned and controlled by the community and therefore more likely to be put to good use. Even the lecturing staff benefit from the increased motivation of students and the variation in assessment. Marking of assignments is much more interesting if each assignment is written on a different trial and exercise, compared to those where every student writes the same assignments.

This model of joint learning, with two visits to the same community, should be continued to allow its further evolution and benefit to both students and farmers, as well as the development organisations working with the farmers. One year when funds were in short supply, only a single visit was made, rendering the experience far less effective. The follow-up visits allow joint evaluation of trials initiated during the first visit. The period between the two visits provides students with the opportunity to learn more about their trials based upon experiences gained during the first visit, thus, allowing them to provide feedback to the farmers who sometimes adjust the trials accordingly.

STATEMENT OF NO CONFLICT OF INTEREST

We the authors hereby declare that there are no competing interests in this publication.

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