DESIGN AND IMPLEMENTATION OF A PROGRAM TO ASSESS THE HEALTH OF AN INTENSIVELY FARMED TROPICAL HIGHLAND AGROECOSYSTEM IN KENYA

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Le bien-être et le développement des communautés rurales dépendent de nombreux facteurs, incluant la santé et les domaines relevant de la recherche en agronomie et écologie. Cependant, une simple prise en compte de ces aspects ne suffit pas. Nous croyons que le processus de recherche doit être catalysé par la communauté, propriétaire de questions de recherche, d'information et de prise de décision. Ainsi, nous avons entamé un processus de recherche, centré sur la méthode participative de la communauté, en complément des efforts de recherche d'appui interdisciplinaire menées par une équipe de chercheurs en santé et en agronomie. La méthodologie « santé des agroécosystèmes » développée par ailleurs a été adaptée ici pour procurer un cadre d'évaluation sanitaire. L'objectif central du programme de recherche est de rendre les fermiers et la communauté capable d'évaluer la santé de leur propre agroécosystème, instituer des actions pour améliorer la perception des problèmes, et contrôler leurs progrès. Le développement d'indicateurs pour l'évaluation de la communauté constitue une part du processus de recherche, et combine la connaissance à la fois des résidents et de la communauté des chercheurs, incluant l'adaptation d'indicateurs déjà initiés au Kenya ou ailleurs. Un total de 14 villages est sélectionné aléatoirement dans chacune des 7 Divisions du district de Kiambu. Dans chaque Division, un village est suivi de façon intensive. Des groupes de travail identifient les buts et les besoins, développent des plans d'action et identifient des indicateurs. Dans l'ensemble des villages, un jeu d'indicateurs standards est recueilli en utilisant des méthodes d'observations régulières. Les indicateurs de santé des agroécosystèmes seront évalués dans chaque village et comparés entre les villages extensifs et intensifs. Dans un dernier temps, les chercheurs accompagnent l'émergence de groupes pilotes pour prendre en considération les ressources et les organisations nécessaires et établir un plan d'action pour amélioration.

INTRODUCTION

Agricultural productivity depends on a multiplicity of social, economic and biophysical factors, all of which are highly interconnected, making simple disciplinary approaches insufficient in stimulating holistic and long-term improvements. The central-highlands agroecosystem in Kenya serves as a good example where such complex interplay of diverse factors impinges strongly on agricultural development. Comprising the country's most agriculturally productive lands, they are the most densely populated in terms of both human and livestock. This has had four major consequences on the nature of agriculture in the region. First, farmland has been subdivided into small units, resulting in the creation of over one million smallholder units. Secondly, attempts to maximize off-take per unit area have led to the integration of livestock and crop enterprises within individual farm units (Delgado, 1989). Two other major consequences are an intensification of agricultural production (Winrock International, 1992) and a decline in fertility due to a severe land degradation. Because of these and other socioeconomic changes, the traditional balance between people, their habitat and socioeconomic systems is fast disappearing (Mohamed-Saleem and Fitzhugh, 1995) and massive ecological damage is likely to occur.

There are many and widely differing suggestions about how the productivity and viability - both economic and technical - of smallholder farms can be improved. Sustainable development, however, will depend on whether the strategy takes a holistic view of the whole farming process and whether it considers all the social, economic and biophysical costs resulting from agricultural production. Based on this, the University of Nairobi in collaboration with the University of Guelph is implementing a research program that aims at a holistic assessment of the central highlands agroecosystem. The core objectives of the research program are to enable farmers and communities to assess the health of their own agroecosystems, develop action-plans to improve perceived problems, and to monitor their progress.

AGROECOSYSTEM HEALTH

Many new ideas have been coming to agriculture that attempt to provide a holistic approach to agricultural development. Among these, agroecosystem health (Waltner-Toews, 1996) has more intuitive appeal as it provides a framework that guides in the selection of appropriate development strategies and provides a systematic approach to implementation, evaluation and remediation.

Drawing on recent developments in social, natural and biomedical sciences, agroecosystem health bring together systems concepts with goal-related, measurable criteria to create a process whereby agroecosystems can be systematically and holistically evaluated (Waltner-Toews, 1996). This approach couples conventional research methods which tend to be based on "hard systems" and/or experimental research (Wilson and Morren, 1990) with both participatory (Chambers, 1989) and soft system (Checkland, (1990) methods.

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Soft systems methodology, originally developed to deal with managing complex business organizations, focuses on human activity systems. It is a process whereby a problematic situation is described in "rich" detail and systemic descriptions of that situation are developed based on the various points of view of the participants (e.g. farmers, health care workers, business people, consumers). Based on these systems descriptions, goals are negotiated to accommodate competing or conflicting views, as well as indicators which can be measured to determine if goals are achieved, desirable and feasible changes are introduced, and the indicators are monitored. This may lead back into re-evaluating the situation, developing alternative descriptions and changes, and continuing to monitor. This is both an iterative and intrinsically a collaborative appproach, requiring the participation of all the stakeholders within the ecosystem. Such participation, involving the farming communities, policy makers and researchers can be achieved through the various Participatory Action Research methods.

In human and animal health, diagnosis is done by measuring specific parameters that have known ranges in a healthy individual. Agroecosystem health proposes a similar approach where the spatial and temporal trends of health attributes or their proxies - known as indicators - are assessed (Rapport and Regier, 1980; Rapport, 1992; Odum, 1985; Rapport et al., 1985). Although what constitutes health depends on both objective scientific criteria and value-judgements (Rapport et al, 1985).These health attributes are partly dependent on various social-cultural phenomena (Labonte, 1991) and therefore vary between cultures and over time. However, the degree to which an agroecosystem deviates from a healthy state can be objectively assessed by relying on a suite of indicators - drawing on environmental, socio-economic and community health perspectives of the system with known ranges and/or thresholds in the healthy ecosystem. Since ecosystems are less stable (in a homeostatic sense) than organisms, the health status is indicated not just by the comparison of indicators to thresholds, standards and targets (which can change over time) but also by the direction of change and pattern exhibited by the indicators over time and space and in relation to each other.

Activities in an agroecosystem health are therefore twofold. The first is to define the health attributes based on the goals and objectives expressed by the stakeholders, combined with researchers' best scientific understanding of the constraints and opportunities afforded by the natural "hard" ecosystem, and then using these to develop objective health indicators. The second is an iterative process of health assessment, remediation and reassessment.

RESEARCH PLAN AND STUDY DESIGN

A total of 14 villages were selected at random, two in each of the seven divisions of Kiambu District. In each division one village was selected at random and designated as intensive. The seven intensive villages were involved in the development of health indicators and are being helped to develop their own self-sustaining self-evaluation and action-plan programs. Measurements - using the indicators developed in the intensive villages - are being taken in the other seven villages - designated as extensive - by the research team using regular observational research methods. Agroecosystem health assessments are being carried out at two levels - the farm/household level and the village level.

FARM-LEVEL MEASUREMENT, ASSESSMENT AND IMPLEMENTATION

Participating households are selected at random from a list of all households in the village. Detailed descriptions of selected farms and households are being obtained through farm tours and through structured and semi-structured questionnaires and interviews with farm-family members. Details of animal husbandry, cropping patterns, land use, soil fertility and structure, topography, labour food consumption, debt and credit, income and expenditure are elucidated for each farm using participatory techniques such as seasonal calendars, daily time analysis, livelihood analysis and institutional diagramming. Time lines, trend analysis and change analysis are being used to generate data on farmers' perception of events affecting his life and ecosystem, their chronology, causal structure, direction of change, and future trends.

Through individual and group participatory processes, farmers in the intensive villages will be requested to assess themselves, develop goal, targets, action-plans and schedules of implementation. Based on these, indicators will be developed and baseline data collected. Individuals and groups will be presented with data from other individuals or groups and asked to reassess their goals, targets and action plans to establish a degree of consensus. Follow-up visits will be conducted every two months during which measurements will be taken. Re-assessments will occur at the end of the scheduled time of implementation. Group discussions and other participatory techniques will be used to facilitate this evaluation, analysis and development of an action plan.

VILLAGE-LEVEL MEASUREMENT, ASSESSMENT AND IMPLEMENTATION

In all the villages, natural resource and infrastructure assessment will be conducted using participatory techniques such as mapping and institutional diagramming. Villages in the intensive group will be used in the development of agroecosystem health indicators. Village PAR will be initiated through a public meeting in each village. These will be followed by focus groups, interviews, time-lines and trend and change analysis to generate data on the ecologic history of the area, land use systems, cropping and patterns, customs and practices, population migration, fuel types, education, health and credit. Notes will be made on important events recalled their chronology, magnitude, direction in the past and present, expected future trends, putative causes, the proposed course of action and expected difficulties. Subsequently, well-being, wealth and health grouping and ranking, livelihood analysis and analysis of difference will be used to generate data on the community's current criteria and goals for health, wealth and well-being. Focus groups stratified by age, gender and socioeconomic status will be formed to facilitate these participatory activities. Over time, community leaders will be trained and to carry out these activities to ensure continuation after the project is over. In two-day workshops held annually in

each of the intensive villages, assessments and evaluations will be carried out followed by formulation of action plans and a schedule of implementation.

DATA ANALYSIS

Comparisons between intensive and extensive villages and between farms and households within villages will be carried out using standard statistical and epidemiologic tools. Spatial and temporal trends in key indicators and the relationships between them will also be investigated. Various types of system models will be developed to elucidate the relationships between components and factors in the agroecosystem that influence the sustainability and productivity of agriculture.

REFERENCES

Delgado C.L., 1989. The changing economic context of mixed farming in savana West Africa: A conceptual framework applied to Burkina Faso. Quarterly Journal of International Agriculture, 28: 3-4.

Chambers R., Pacey A., Thrupp L.A., 1989. Farmer First: Farmer Innovation and Agricultural Research. Intermediate Technology Publications, London. 219 pp.

Checkland P., Scholes J., 1990. Soft systems methodology in action. John Wiley & Sons, Chichester.

Labonte R., 1991. Ecology: integrating health and sustainable development. Part One: theory and background. Health Promotion International, 6: 49-65

Mohamed-Saleem M.A., Fitzhugh H.A., 1995. An overview of demographic and environmental issues in sustainable agriculture in sub-saharan Africa. In Livestock and sustainable nutrient cycling in mixed farming systems of sub-saharan Africa. Vol II. Proceedings of an international conference held in Addis Ababa, Ethiopia, 22 - 26 November 1993. International Livestock Centre for Africa. pp 3-20.

Odum E.P., 1985. Trends in stressed ecosystems. Bioscience, 35: 419-422

Rapport D.J., 1992. Evolution of indicators of ecosystem health. In: Ecological indicators, Vol 1. McKenzie, Hyatt and McDonald (eds). Elsevier Applied Science, London, New York. pp 121-134.

Rapport D.J., Regier, H.A., 1980. An ecological approach to environmental information. Ambio, 9: 22-27.

Rapport D.J., Regier H.A., Hutchinson T.C., 1985. Ecosystem behaviour under stress. The American Naturalist, 125: 617-640.

Waltner-Toews D., 1996. Ecosystem health: a framework for implementing sustainability in agriculture. Bioscience, 46: 686-689.

Wilson K., Morren G., 1990. Systems approaches for improvements in agriculture and resource management. Macmillan, London, 361 pp.

Winrock International, 1992. Assessment of animal agriculture in sub-saharan Africa. Winrock International Institute for Agricultural Development. Morrilton, Arkansas. 125 pp.