

Chapter 8

DISCUSSION AND GENERAL CONCLUSIONS

8.1 Introduction

The study has raised many questions on: the interpretation of “marginal lands”; the advisability of using very coarse-grained indicators of biophysical capability of land as a basis for programming the agricultural research activities; the credibility of estimates relating to rural population and land types; and, what is meant by poverty eradication with respect to its links to research delivered by the national agricultural research system. In summing up, the study finds that the definition of “marginal” depends on so many qualifiers that it becomes meaningless in an operational sense. This is illustrated by the fact that land can be “marginal” depending on:

- ◆ its use;
- ◆ its natural biophysical characteristics;
- ◆ its location relative to infrastructure such as roads, railroads, harbours, and cities;
- ◆ the institutional and policy context which influences access of inhabitants to land, water, credit, markets, outside inputs;
- ◆ population pressure;
- ◆ technology development;
- ◆ taking advantage of niche opportunities.

Lands move out of and into marginal status depending on which of the above dimensions are applied in the definition. *(It only makes sense to define “marginal land” in terms of a clearly defined, specific situation).*

8.2 **Poverty Process on MA**

The study considered the forces driving the processes, which retain people in poverty on MAs, in terms of the inter-relationships between the resources and knowledge available to these people and their incentive to use them for sustainable enhancement of livelihoods. This relates to the question of constraints of the poor to access knowledge, natural resources, markets and off-farm income opportunities (including the option to migrate). Constraints are generally regarded as rooted in institutions and policies. MA, because of characteristics such as their isolation, perceived low and risky productive potential and the insignificant economic and associated political power of their inhabitants, typically has been neglected by central government. As a result, only limited public investment has been made in education, health, infrastructure, etc. Little interest has been shown in determining the aspirations of marginal people or their knowledge of how to cope with harsh environments as a basis for focusing public action responses to their capabilities and needs. In view of the high costs of providing quality non marginal rural areas, industry, services, it would be sufficient to attract migration on a scale which would increase the resource base (and income) per capita for the residual population.

Populations in many MA are increasing in absolute numbers in spite of migration, and the increase is likely to continue, probably at a decreasing rate, for some decades. Without investment in the "resource base" of these people, with expanding populations the expectation can only be progressive extension of poverty and degradation of the soils and forests on which they depend for a large part of their sustenance. In agriculture, inappropriate research has been blamed for not taking into account indigenous knowledge and the opportunities and constraints, which apply to the site-specific characteristics of MAs. Thus, it is asserted that few research results have led to widespread or significant improvement in the welfare of marginal people. This is undoubtedly true in many instances, but is merely one symptom of the

underlying cause of marginality, i.e. the institutional and policy arrangements. Without any negotiating leverage by marginal communities on the decision-makers responsible for the amount and type of investment in MAs, these investments tend to be small and poorly adapted to the requirements of the people. This applies equally to agricultural and extension investments (and other areas such as education, health or infrastructure) which have been unable to respond to complex diverse requirements for sustainable exploitation of opportunities deriving from natural resources and value adding micro-enterprises. However, the problem is not technology as such. It is rather the institutional arrangements which determine: what and how agricultural research and extension is carried out, together with the whole range of support services (credit, roads, communications, schools, etc.); resource entitlements; the functioning of markets; and local capacity to manage their own affairs (Jodha, 1995).

8.3 Recommendations for Future Research

Although it is clear that by discarding the biophysical criteria for defining ML, it is violating the spirit of the terms of reference. By redefining the issues in terms of MAs which may occur on any combination of FL and ML, the issue of poverty eradication is being placed in a **global** context, rather than being confined to marginal lands and the rural poor who derive a large part of their livelihoods from them, and who *a priori* are believed to have been by-passed by the Green Revolution. Nevertheless, it is sustained that this is merely another way of cutting the pie. The key question is still where are the concentration of poor who have been by-passed and ignored by the previous regime and who were missed by agricultural research and other priorities of the country. The criterion for distinguishing the by-passed from the non-by-passed rural poor is different. One way to reduce the scope of a "marginal lands" study in the initial stages, would be to exclude any consideration of MAs on the vast areas classified as FL. One might justify this on the grounds that these are the areas which most clearly have benefited from the previous

order - if there is residual poverty in this area, this could be addressed as part of a countrywide rural poverty study, however, the conclusion is that because of:

- ⇒ heterogeneity of ML and FL in landscapes,
- ⇒ the likely overriding importance of institutions in defining MAs,
- ⇒ the linkages between MAs and non-MAs in poverty eradication within MAs,
- ⇒ the critical importance of income in poverty eradication which dictates a research focus on : food and non-food products (and associated value added); opportunities and constraints to off-farm sources of earnings (not incorporated in the definitions of FL and ML), and
- ⇒ the likelihood that definition of MAs on non-favoured areas will probably spill over into definition of MAs and FALs, again because of country or region specific institutions driving the poverty process, it would be more efficient to specify MAs without regard to an arbitrary distinction between biophysically favoured and marginal lands.

In addition to the role of favoured lands in poverty eradication for present and future rural populations in MAs, there is also the question of research directed to the poor on favoured lands themselves. This is a fundamental strategic question for the South African agricultural research in terms of the balance among research investments, which address a range of rural population target groups from a poverty eradication perspective. There is a continuum from investments designed to: rehabilitate the productive capacity of the resource, i.e. reverse the degradation process; conserve the “state” of resources, and implicitly their yield capacity; and enhance yields. The first two are land improving investments; the third is “technological change” (Scherr and Yadav, 1996).

It is evident that priority of research related to poverty eradication in all areas (favoured and marginal) through changes in the cultivated area, employment and income generated on FAs by reducing shifts to lower productivity,

investment in productivity increase, human capital, physical infrastructure and institutional change, should be judged by the cost-effectiveness of research expected to have poverty eradication impacts for the various target groups. The study has made us to realise that we are a long way from specification of these target groups. Nevertheless, the linkages and dynamics of movement among classes of land and changes in the numbers and location of rural poor, dictate that any strategy of rural poverty eradication on marginal lands take into account the social cost-effectiveness of research favoured lands, and should incorporate the spillovers to other areas. The framework for cost-effectiveness analysis is discussed in *Box 8.1*.

- A_i = size of area that benefits from agricultural research i
- Y_i = average sustainable net income (or net benefit or use value) increase per unit area due to agricultural research i (where "sustainable" incorporates the environmental protection constraint, and "net" income means benefits actually captured by the farmer net of associated costs of achieving the benefits; the benefits can come from policy gains as well as productivity increases, values appropriately adjusted to present value (PV) terms through use of appropriate discount rate).
- I_{poor} = index for number of poor people gaining or benefiting from (A_i × Y_i) weighted for (a) degree of poverty affected (e.g. proportion 'poorest of the poor'), and (b) extent to which those other than the producers of (A_i × Y_i);
- Off_i = measure of net gain from off-farm activity in A due to research i, weighted for the extent to which poor people benefit from the gain (again, in PV terms);
- S_i = spillover impacts, or externality impacts (in PV terms);
- G_i = measure of gain from research in_i (which, given the left side of the equation, is a measure of production increase, or net income increase, due to the research, weighted for a poverty alleviation objective).

As mentioned, this formulation considers poverty eradication impacts with a focus on agricultural, forestry, or fisheries production. If we limit consideration to marginal agricultural lands (MAL), then A of course would reflect the particular MAL area being considered. However, as discussed below, the formulation will be used to look (at least conceptually) at types of land (both FAL and MAL).

In this section we are asking the following question: given the potential area for crop x or

BOX 8.1

Conceptual Framework for Analyzing Research Investments in Poverty Eradication in a Marginal Lands Context

Targeting research investment to a given area of marginal land, A.

In a *sustainable poverty eradication context*, but with a focus on production crops (food, livestock, forest or fish), the contribution of national agricultural research "I" to poverty eradication can be formulated conceptually as follows:

$$\{(A_i) \times (Y_i)\} \times (I_{pop}) + OF_i + S_i = G_i \quad (1)$$

where,

A_i = size of area that benefits from agricultural research i.

Y_i = average *sustainable* net income (or net benefit or use value) increase per unit area due to agricultural research i (where "sustainable" incorporates the environmental protection constraint; and "net" income means benefits actually captured by the farmer net of associated costs of achieving the benefits; the benefits can come from policy gains as well as productivity increases; values appropriately adjusted to present value (PV) terms through use of appropriate discount rate).

I_{pop} = index for number of poor people gaining or benefiting from $(A \times Y_i)$, weighted for: (a) degree of poverty affected (e.g. proportion "poorest of the poor"); and (b) extent to which those other than the producers of $(A \times Y_i)$;

OF_i = measure of net gain from off-farm activity in A due to research i, weighted for the extent to which poor people benefit from the gain (again, in PV terms);

S_i = spillover impacts, or externality impacts (in PV terms);

G_i = measure of gain from research i, (which, given the left side of the equation, is a measure of production increase, or net income increase, due to the research, weighted for a poverty alleviation objective);

As mentioned, this formulation considers poverty eradication impacts with a focus on agricultural, forestry, or fisheries production. If we limit consideration to marginal agricultural lands (MAL), then A of course would reflect the particular MAL area being considered. However, as discussed below, the formulation will be used to look (at least conceptually) at types of land (both FAL and MAL).

In this format, we are asking the following question: given the potential area for crop x or

y, what kind of per hectare income increase could be generated by research related to this crop? (Obviously, in order to identify relevant A, we have to have some particular crop in mind.)

Targeting research investment to a given marginalised population

We can also change the formulation to make the primary objective be poverty eradication. This then would be primary determinant of G_i for a given agricultural research investment, i , in terms of a given target population of poor or marginalised people (some farmers, some perhaps not). If one takes a poor people focus and looks at research investment from that perspective, then the following formulation might be more appropriate:

$$(P_{OPi} \times Y_{pop}) + S_i = G_i \quad (2)$$

where,

P_{OPi} = population of poor people targeted by research i ; population could be associated with any number of characteristics that relate to poverty)

Y_{pop} = average per capita net benefit flow gain for Pop_i due to agricultural research i (such research could be focused on crops and other things that could generate benefits)

S_i and G_i = as before, except G now is expressed in terms of poverty eradication measure;

Given the above formulations, which equally to "marginal" as to "non marginal" lands, there is no necessary reason why, for a given $(A_i \times Y_i)$ or $(P_{OPi} \times Y_{pop})$, the national agricultural research should be interested more in marginal versus non marginal lands, except if the marginal lands (defined by A) have proportionally larger populations of poor people who can gain from changes due to the research^a, i.e. the I_{pop} that applies is higher; or Pop_i for the marginal lands is higher, other things being equal. These I_{pop} and Pop_i conditions define "marginal areas" (MA) used in the study regardless of whether the lands on which this lives is biophysically marginal or favoured.

From a strategic public investment point of view, maximizing returns (G) per unit of scarce research resource ($\$R$) may be regarded as a rational criterion for allocation; (where $\$R$ is amount invested to get the response G). Thus, we have a measure of *research investment efficiency* as follows:

^a Also, aside from question of research efficiency, there is a question of distribution of benefits. This is taken into account by the question above through I_{pop} and the discount rate used.

Research investment efficiency. This could be measured by G_i per \$ of South African government research funds and associated research expenditure, when both are appropriately discounted to the same point in time:

$$(G_i / \$R_i) = \text{research efficiency}; \quad (3)$$

We would want to find that set of research opportunities that maximizes G for the research budget (i.e. we would seek to maximize the net present worth of the research investment).

We can further modify this formulation to look at the *social cost-effectiveness* of research investments - where should be the ultimate objective sought, once we have eliminated all those potential research investments that have $G_i < \$R_i$.

Social cost -effectiveness or "impact". $(G_i/\$R_i)$ only considers the efficiency element, i.e. production of the research results. The real aim is to get research in place in the farmer's fields or in the forest or on the grazing lands. Thus, we need to introduce $\$E_i$ or the extension and transfer costs, to come out with an array of opportunities ordered on the basis of:

$$G_i/(\$R_i + \$E_i) \quad (4)$$

Adding $\$E$ to the equation assumes that the South African agricultural research community is interested in research applied on the ground as an ultimate test of success - the $\$E$ may not come from the South African government, but has to be considered, since it is a necessary cost of getting research in use. This also raises a question on the need for research into institutional determinants of $\$E$.

Finally, we also have the strategic question of equity, or distribution of benefits, as a criterion for allocation. If the calculations of G_i in relation to $\$R$ and $\$E$ do not produce results that are acceptable, then the decision-makers need to go back and discuss and possibly readjust I_{pop} or the discount rate.

(I have decided to put this formulation only as an annex, since it represents only the beginning of thinking for a broader discussion of priority setting. However I feel it worth being included and tried in the study, since it does provide a conceptual perspective on the differences and similarities that exist when one focuses on a land/productivity measure of research return versus a poverty eradication measure).

The dilemma of research on MAs as vis-à-vis FAs has been characterised by de Wit (1990) – “well endowed areas because are able to meet demands at relatively low prices...this marginalises less endowed regions because their

terms of trade are eroding. Scarcity of funds, and lack of political power of (these) areas makes it unlikely that the transfer of money that would be needed to revert such marginalisation processes will occur in the foreseeable future.... Agricultural research which is oriented to improvement of least endowed areas may open up new possibilities in some situations. However, in many cases its results are more readily applied in areas that are better off." Accepting this premise, a key issue is the weighting of poverty in the formula discussed in *Box 8.1*.

With the above in mind, the study comes up with the following first recommendation:

Recommendation 1: The National Department of Agriculture (NDA) and the Agricultural Research Council (ARC) need to sharpen their strategic focus on poverty eradication, particularly in setting priorities for research related to marginal areas. A prerequisite is development of a geo-referenced database linking biophysical land conditions with poverty, and incorporating the processes that produce it (i.e. the dynamics of poverty).

In order to meet this challenge, it would need to develop a database relevant to the design assessment of options that lead to more effective impacts on income of the rural poor in highly diverse marginal areas. Elements of this database will be the soil, climatic and terrain conditions. However, it came out from the study that there are many other elements which are equally or more important - production systems, human capital, market access and infrastructure, institutional and policy constraints and the number and location of the rural poor with respect to some or all above characteristics. A logical place to start this activity, would be the ARC –Institute for Soil, Climate and Water, and the Directorate Land Resource Management (D:LRM) expertise on the geographic areas within which they deal; perhaps initially by developing an intuitive GIS which can be progressively improved by formal and informal methods. The issue of site specificity, diversity and

complexity must be addressed to identify points of entry, which are relevant and consistent with the national agricultural research scale. The question here is the extent to which agricultural research may move towards targeting site-specific (or through a typology, situation-specific) rural poverty through research which meets the “public goods” criterion. Meeting this recommendation is regarded as a prerequisite to action on the three other recommendations prescribed in this study. The study is convinced that the national agricultural research and scientific expertise coupled with their field experience in most, if not all, of the diverse MAs, represent a unique resource in coming to grips with the information/analytical challenge.

8.4 The Role of NDA in Removing Constraints

It is now clear that the nature and causes of the poverty found on MAs vary widely with the type of conditions, which determine marginality of the rural population. Thus, there are significant differences between the poor farmer on the mountainous hillsides of the Drakensberg, the farmer surviving on the fringes of the Kruger National Park or in the Limpopo Basin, and the farmer on the drylands of the Transkei woodlands. The solutions to eradicate poverty for the inhabitants of these diverse lands are as varied as the situations encountered. However, there are some common threads – some common requirements and opportunities – that relate to most of the diverse rural poverty situations encountered. These involve the actions that are necessary to deal with the resource, knowledge, and incentive constraints that are the fundamental barriers to poverty eradication. Thus, the study has identified three types of requirements that all situations have in common:

- **Reforming policies and institutions.** This involves improving the social, institutional, and physical infrastructure (access to markets and market information; price policies; access to credit and essential purchased inputs establishment and strengthening of markets; improved property rights; improved roads, communications, transportation, and so forth);

(b) It can continue with its mainstream work with community improvement

- **Generating and diffusing new improved technologies.** This applies to crop, livestock, forestry, agroforestry, and fisheries. The new technologies need to fit the various biophysical and institutional characteristics and constraints of the diverse agricultural and associated lands; and other more environment friendly approaches to agricultural intensification
- **Diversifying land use systems and income opportunities.** This includes increasing access to off-farm employment (e.g. through forestry, fisheries, and agro-industrial opportunities associated with improved postharvest technologies, small-scale enterprise development, etc.).

It is emphasized that it generally takes integrated action in all three areas to break the 'vicious circle' of poverty and to move a marginal population along the development path. Because these three basic requirements are common in principle and concept (although not in operational detail) for nearly all marginal land-poverty types, they provide promising areas in which to search for the public goods research opportunities, which are the focus of the agricultural research supported by the government.

8.5 The way ahead for the NARS

The road to poverty eradication for the poor living on MAs is a rocky and twisting one. Negotiating it would require concerted effort by many parties, hopefully working in concert and in a coordinated and effective way together. The role of NARS will be a major and crucial one. What it can do, is essential to the process. Basically, the study sees the NARS as being able to move further in three main directions:

- (a) It can provide support to policy and institutional reform, through its work on the identification of poverty processes and constraints to its eradication; work in the area of identifying, locating, and classifying the areas and types of poverty for which it is best equipped to address; and work in the area of policy and institutional strengthening.

- (b) It can continue with its mainstream work with commodity improvement in agriculture, forestry, agroforestry, and fisheries, but with added emphasis on breeding and agronomic work related to the needs of MAs conditions, e.g. drought tolerant varieties, work on integrated soil nutrient and water balances and utilization, work on IPM and other more environment friendly approaches to agricultural intensification and improvement (e.g. organic production practices).
- (c) It can continue on the path of increased support to natural resources management research, and research related to land use diversification and land use systems approaches to the problems of MAs.

It became clear that a focus on poverty eradication brings with it a number of challenges related to the identification, development and organization of research. Poverty eradication as an over-arching objective, implies a set of actors and a set of actions that go far beyond the areas in which the government has strengths. The key to success is the establishment of the right kinds of partnerships. Its focus on systematic accumulation and dissemination of information and on methodology for addressing complex site-specific rural poverty situations should provide the necessary legitimacy to attract other actors. Thus, the study recommends that:

Recommendation 2: The agricultural role players should establish new forms of partnerships in order to effectively address their roles in a broader poverty eradication strategy related to those who live in marginal areas.

The study convinces that the poverty eradication focus can help provide impetus for development of innovative and effective approaches to partnerships. Such partnerships will depend on finding complementary sources of funding for all partners involved. It would also imply development of incentives for long-term collaboration and cooperation, since poverty eradication is an evolutionary process.

There is considerable pressure to expand research designed to reduce the rate of resource degradation, which has led to encroachment on forests, salinisation, loss of wetland and erosion. Results are manifested in severe shortages of fuelwood, the drying up of springs and streams, loss of valuable and relatively unique sources of genetic diversity. For example, some of the richest areas of biodiversity in the St Lucia area, in KwaZulu Natal, are under threat of disappearing due to changes in land use management. Better information is needed on degradation processes, couched in the context of issues related to fragility and resilience, and to consideration of issues related to pollution, biodiversity loss and loss of other environmental services. Thus, the study puts forth the following two recommendations:

Recommendation 3: The cluster departments (NDA, DWAF, DEAT) should develop improved mechanisms by which it can be involved with other partners in generating and interpreting improved scientific evidence on: (i) the extent and magnitude of the impacts of agriculture, forestry and fisheries on the degradation or enhancement of natural resources and consequences for production and food security; and (ii) the linkage between poverty and observed resource degradation.

Recommendation 4: Expanded collaborative mechanisms and activities should be developed among the cluster departments and their partners to help focus research and institutional strengthening on issues related to adoption, adaptation, and utilisation of research results that so far have remained unused.

The main concern is that recommendations related to expansion of research particularly on technologies, should be realistic and should take into account the problems in dissemination and adoption of such research. In a poverty eradication context, the poor would not benefit from more research if the results merely sit on the shelves of the scientists and their agencies. This recommendation links closely to the discussion in the following section related to developing a better understanding of the aspirations and incentives of the poor from MAs.

8.6 ANALYSIS OF GENERAL CONCLUSION

Finally the study confirmed three of the four tenets of conventional wisdom, of which the first is: marginal lands are defined in biophysical terms which establish them as having low inherent productivity for agriculture; being susceptible to degradation; and involving high risks for agricultural production. The study raises four key issues, which will guide future research and resource allocation, decisions for reducing poverty in these marginal lands:

- *Potential of biotechnology and agroforestry for the marginal lands*

One of the defining features of the Green Revolution was that the new seeds fared better with complementary input packages including water, fertilisers, and chemicals for crop protection. Hence, there was complementarity between the new technologies and quality of the resource endowment. For this reason, Green Revolution innovations were better suited for favoured agricultural lands, and research for marginal lands appeared to offer a lower rate of return. Subsequent innovations, with a perspective on the poor and marginal lands, sought to help substitute for resources rather than pursuing complementarities. These innovations can, for example, complement pesticide use (genetic resistance), fertilisers (nitrogen fixation), tillage practices, and water (drought resistance). Biotechnology, e.g., genetic maps and markers, possibly GMOs, now offers the promise of making it faster and less costly to achieve these goals. Following this logic, technological innovations derived via biotechnology and applied to particular contexts through GIS mapping, may promise higher rates of return for marginal areas than earlier technology did. How this potential will materialise, thus deserves significant attention.

- *Determinants of poverty*

Poverty in marginal lands is a complex phenomenon, where access to productive assets, public goods investments, institutional arrangements, and cultural and social factors are all-important determinants. Hence, a cautious

analysis of the determinants of rural poverty in marginal areas needs to be made, with a full accounting of the role of different factors including the biophysical context and the technological practices used. Caution, however, must be exercised, as a technological solution may not be the most cost-effective. It is quite possible that other constraints are more limiting on welfare than productivity in resource use as determined by technology. Hence, a comprehensive effort needs to be made to identify the specific determinants of poverty in marginal lands as well as the return from investing in agricultural research compared to other types of interventions such as infrastructure, improved control over assets (human capital in particular), and designing the institutional framework. Understanding the potential of agricultural technology for the MAs consequently deserves a broad interdisciplinary effort before resources are committed to research on technological innovations specialised to these areas. Given the large degree of heterogeneity of situations, this research needs to be done at the local level, followed by comparative analysis to seek broader generalisations.

- *Locus and mapping of the poor*

Having access to reliable and well-documented data on the number and location of the poor is essential in identifying viable strategies to eradicate poverty. Several institutions are already engaged in activities to identify specific areas of poverty concentration and to map their agroecological characteristics.

- *Marginal Lands and Water*

Again the government is well positioned to address water/land/poverty linkages beyond irrigation. Water insecurity appears to be a main poverty feature in marginal lands of arid areas and hillsides. Improvement efforts for marginal lands should continue to recognise explicitly the scope for supply and demand of water, the management of its use, and access to water especially by the poor.