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Models of Agricultural Land Use Activities
and Rural Livelihoods
Mike de Klerk and Rogier van der Brink

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with
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The models, and even more particular numbers in the models, in this section arevrough and incomplete. They do not imply that most beneficiaries will, or should, use their land in a particular way after the reform. Certainly the State should not pressure them to do so. But the models may be typical of post-reform outcomes-with wide spreads around them, given variations in land, water and farmers'preferences and alternatives.

Out of a wide range of options, described in general terms, four models were selected for quantitative analysis. The four models are derived from empirical data on land use, net farm incomes, household size, and agricultural income shares. The models refer to four agro-ecological zones for which case studies were undertaken. They are: the summer grains area of the southern Transvaal and the northern Orange Free State; the livestock-dominated areas of the Eastern Cape; the vegetables/wine areas of the Western Cape; and the peri-urban vegetable areas around Durban, _ Pietennaritzburg and Cape Town. The case studies cover 28% of agricultural land and 34% of existing farm jobs (excluding the periurban areas).

In view of time constraints, we have excluded several important agro-ecological zones and crops. Some, like the Karoo, are areas of low agricultural potential. Others-the subtropical areas of Natal and the Eastern Transvaal (fruit, sugar and timber) and the irrigated perimetersuhave high agricultural potential. Consequently, the case studies are broadly indicative of areas of medium agricultural potential. Some of the excluded creps, notably sugar and some sub-tropical fruits, are proven by South Afrian and international experience to be especially appropriate for efficient small-scale farming. Overall, the aggregate totals derived from our four models probably reflect approximately average national agricultural potential (and cost of land acquisition per hectare), but somewhat understate average national suitability of land for crops associated with labor-intensive smallholding (and therefore the amount of livelihoods per unit of land and of capital cost).

We have made rather conservative assumptions. Nevertheless, the results are quite encouraging. When land moves from large to small holdings, there is a substantial increase in the number of rural livelihoods. First, this is because farming becomes more labor-intensive. Second, it is because there is stronger linkage to labor-intensive rural or small-town production of non-farm goods and services. These two effects greatly outweigh the loss of jobs on the larger farms as they are restructured. Moreover, the cost-per-job is surprisingly small.

For example, suppose that a land restructuring process acquires 10 per cent of commercial farm areas in the above four zones. This would entail a net gain of 360,000 rural livelihoods, i.e. fully accounting for the loss of farm and nonfarm jobs in the commercial sector. The capital cost to be borne by a combination of own equity and grants (set at 70% of the market value of land, livestock and machinery needed by the farm households established) would amount to roughly R 1.3 billion.

If 50 percent of the selected areas were redistributed, 1.8 million rural livelihoods would be gained at a capital cost of R 6.4 billion. If one takes into account'that in 1991 the commercial sector employed around 1.17 million laborers on the total agricultural area of the RSA, the estimates of net rural livelihoods gained seem quite promising.

The models selected should on no account be used as "target models" that drive the planning’ process of rural restructuring. One of the strongest messages emerging from the case studies was that local control and beneficiary participation in the process of rural restructuring are paramount. All of the case studies placed great emphasis on gaining further insight into potential beneficiaries’ views on future options for rural restructuring and the creation of rural livelihoods.

The organization of this report is as follows. Section 2 spells out the general principles surrounding land use and rural development in the rural restructuring program. Section 3 describes qualitatively the range of models that could be contemplated under such a program. Section 4 reports the assumptions and results of the quantitative analysis that was performed for four selected models- one for each agro-ecological zone. Section 5 summarizes the implications of the modeling excercise for the creation of rural livelihoods and the associated capital costs.

2. General principles and assumptions

Large numbers of poor, but often potentially commercial, farm households can obtain reasonably attractive household and employment levels via fiscally affordable land redistribution. This process can be (moderately) stable, sustainable, consistent with national (rural and urban) and household food security and help to restrain the speed of rural/urban migration. However, the conditions for this are rather tight.

First, beneficiary households are certainly not required to rely wholly on farming, nor should they be expected to generate unduly high agricultural incomes. We envisage:

a. an indicative income of between 5000 and 12,000 for a typical range of postreform households of six persons, including the value of own consumption;

b. between 25 and 75% of this income from agriculture.

If much higher levels are set, then the number of beneficiaries will be smaller. Of course, some households will seek much higher incomes (or proportions coming from agriculture) at once, and incomes should grow.

In order to increase net income per hectare and restrain debt burden, post-reform smallholders V should be helped to adopt processes involving increasing levels of skills, rather than to select products or methods that displace labor by purchased inputs (e.g. weedicides, hired combine harvesters). For the sector as a whole this involves:

a. removing existing incentives to increase capital intensity;

b. radical changes in support institutions, including research.

Stability of rural income will be essential if postreform communities are to be reasonably food secure and credit-worthy. Restructuring should in general encourage:

a. multiple income sources (e.g. efficient part-time farming);

b. rotations, crop and/or livestock mixing, and other choices to reduce farm risk.

c. employment in slack seasons and years in rural public works to increase rural infrastructure.

To reduce the fiscal burden, while ensuring’required support services, the conversion of subsidized services from usage by big to small farmer should not induce extra costs to th e state.
Both agro-ecologies and personal and community preferences should lead to different prope rty
rights and relations. The reform process should respect this fact. It may reduce the cost of
implementing particular household models, e.g. by renting instead of purchasing periodic rights or
common grazing, rather than land itself. On the other hand, effective common pasture syst ems will
be essential (see box).
PROPERTY RELATIONS IN RURAL RESTRUCTURING
Under the political and economic policies of apartheid it was important to provide secure economic opportunities for
white settlers in rural areas. Economic policy in general--and property tax policy in par ticularncreated an incentive for
white farmers to hold freehold title in their entire agricultural estate. This often mean t, especially in the more arid
regions of the country, that arable land would comprise a distinct minority of an extensi ve holding devoted to sheep and
cattle grazing. Given that the fixed cost to the farmer of owning extensive freehold land approached zero, there was a
strong incentive to expropriate into the private domain large tracts of land that in othe r similar regions of the world
carries the name "wasteland."
An essential part of the rural restructuring program is to create alternative property re gimes suited to the agro-
eeological conditions of a region.
In Natal, and in the better parts of the Transvaal and the Free State, most farms would l ikely consist of private
property. This private estate could be held by an individual farm family, or by several f arm families who formed an
agricultural "corporation."
In the more arid regions of the western Transvaal and the Karoo, restructured farmswould consist of a range of
property interests. The superior arable lands would surely be held in freehold, again by individual families or by
several families. The extensive rangelands that are necessarily associated with these pri vate holdings could be held
under several forms of common property.
Though ecologically distinct from South Africa, the summer pastures of Switzerland are he ld in common property
and used under a variety of managerial regimes. In South Africa these property regimes wo uld likely bear a strong
resemblance to customary tenures known in southern Africa since time out of mind.
The programmatic burden of the rural restructuring program is to ensure that property reg imes are instituted that fit
the agro-ecology of a particular area, the cultural imperatives of the new occupants, and the economic conditions that
will guarantee sustainability.
Small-scale agriculture and the environment. Rural restructuring in South Africa raises i mportant
questions about the environmental implications of alternative agricultural structures. So me will
contend that large-scale agriculture--with its heavy machinery, its use of chemicals, its monoculturenis
the most destructive of environmental resources. V This view regards small-scale commerci al
agriculture--with its emphasis on family labo’rnas much more environmentally friendly. Ot hers will
point out that serious poverty is very often associated with overexploitation of the envi ronment as
individuals and families resort to a variety. of survival strategies. This view holds tha t poverty
imposes its own time-horizon imperative on farmers and so they cannot afford to worry abo ut the
future. As long as small-scale agriculture keeps families in relative poverty, the enviro nment will
suffer.

Both views carry some truth, and yet both follow from certain unexamined premises. It is impossible to assert, prima facie, that large farms (or small farms) are better (or worse) for the
environment. One must look beyond size-what we call agricultural structureuto understand the
complex issues here.

For instance, different structures are often associated with different sub-sectors of agriculture. It is rare in agro-ecological conditions such as those found in South Africa to find grain grown on one-hectare plots; the technology of grain production rather forces large-scale enterprises where expensive equipment--often used but a few weeks out of the year-can be employed on a large number of hectares. This does not necessarily mean, however, that such farms automatically squander soil and water resources. Likewise, intensive agriculture producing vegetables for urban markets may be "small" in comparison to grain farms, but could use chemicals that harm not only the local environment, but the consumers of those vegetables.

The key to environmentally sustainable agricultural policy is to be sure that the incentives upon which farmers operate do not encourage practices that fail to account for the full social costs of agriculture. That principle is true regardless of whether we focus on small-scale agriculture or large-scale agriculture. For example, subsidized prices of agricultural chemicals encourage over-use by both small and large farmers. Subsidized extraction of scarce groundwater renders agriculture unsustainable over the long run, and often imposes serious losses on other sectors as well. Tax policies often encourage mechanization and the purchase of equipment that may not be suited to local agro-ecological conditions. Here, large farmers may be able to take greater advantage of such incentives than can small farmers.

Agricultural water resources in rural restructuring. Rural restructuring in South Africa will need to be’accompanied by coherent surface water and groundwater legislation and administrative codes. These institutional arrangements will help to assure that surface water is allocated to its best use, and that groundwater resources are not depleted by the inevitable rush for individualized control over water for agriculture. The reliance on groundwater by a large number of individualized pumpers is a sure way to destroy valuable groundwater stocks.

The coordinated use of surface water and groundwater--referred to as the conjunctive use of wate -- is an essential aspect of rural restructuring. Agriculture in many developing countries relies on a mix of these two sources of water. Development assistance has a long history of developing surface water resources. Irrigation dams, distribution networks, ditches and control structures, water-users’ associations are well-known examples of efforts to control the time and space variations in surface water.

Along with this focus on surface water development for agriculture, we see many instances in which individual farmers are encouraged to make use of groundwater resources to augment their access to unreliable surface water supplies. Unfortunately, groundwater resourceSnwhile usually declared to be the "property" of the nation-statenare rarely managed in a coherent fashion and so become open-accgss rgourcg free to be captured by those who can avail themselves of its services. When governments subsidize this capture with artificially cheap tubewells, pumps, and electricity (or diesel fuel) then the fragility of the groundwater resource is heightened. There are many instances of groundwater depletion, and some coastal agricultural areas have been destroyed by the subsequent

intrusion of saline water into aquifers.
3. Qharacteristics of Models and Potential Beneficiaries
The following broad categories of potential beneficiaries emerged from the various case-studies:
(i) itraditional communities’, who could be drawn from farming communities in the

homelands/bantustans, idense settlements’, black spots’, rural towns, mine villages, etc.
(ii) farmworker groups.
(iii) individuals, who could be drawn from any of the above or from urban areas.
For each of the above categories of beneficiaries, the following range of typical farm mo dels was
identified. The list is not exhaustive. Models may adapt to local circumstances.
Traditional communities.
a. Common property model.
-arab1e/pastoral mix as determined by community preferences and natural resource base.
-freehold or lease for the community as a whole
-secure usufruct or freehold rights for individual households for residential and arable land,
and common access to pastoral land.
-variable farm size
-shift towards more labor-intensive technology
-appropriate levels and forms of support services
-espeeially in arid/semiarid areas, communities may develop more flexible grazing
arrangements with other communities, which extend the effective range over larger areas t han
covered by existing individual commercial farms
b. Irrigated garden plot model.
-1arge scale irrigation infrastructure available, but adapted for small-scale use
-group lease or freehold to irrigation scheme
-secure usufruct, freehold or sublease rights for individual households
maximum community size of about 100 households
-garden plot size a little over 0.1 ha, residence on site.
-no mechanized tillage
minimum of irrigation equipment
-labor requirements met by household
Farmwgrker ggoups.
c. Improved conventional employment model.
-continued wage employment
-secure residence rights
inormalized’ industrial relations
-gatden/arable plots and grazing rights allocated to households
-labor participation in management decisions
-improved access to social services
d. common property model (see a.)
e. production cooperative model
-joint management of farm by workers
-joint ownership or lease of land and equipment
-support services focussed particularly on management needs
-shift towards more labor-intensive production, possibly involving downsizing of the farm
f. equity-sharing option

-continued wage employment
-continued participation of former sole owner in management and equity
-participation by farmworkers in management decisions is generally a prerequisite for pro fit
sharing
-prof1t sharing
-equity sharing with respect to land and/or operating company
Individuals
g. irrigated market garden model
-probably in periurban areas, in dense rural settlement or on existing irrigation scheme
-individual freehold or lease
-wide range of plot sizes, production technologies, income levels and degrees of commerci al
orientation
h. outgrower model
-pr0bably subdivided or expanded large-scale horticultural or sugar farms
-core farm provides services (e.g. input supply, output marketing, financial management)
-individual freehold or lease
i. commercial smallholder/large scale model
-conventional private freehold or lease
-wide range of plot sizes, production technologies, income levels and degrees of commerci al
orientation
-support service package
4, Major Assumptions and Results of Analyzed Models
Beneficiary households are certainly not required to rely wholly on farming, nor should t hey
be expected to meet unduly high target farm and nonfarm income levels. We have used sever al
illustrative income levels (that include the value of own-consumption) for typical post-r eform
households. They are assumed to derive between a quarter and three quarters of their inco me from
agriculture, depending on local conditions. If higher income levels are set, then the num ber of
beneficiaries will be smaller, or the fiscal burden greater. (In the modeling excercise, sensitivity
analysis was performed by increasing indicative incomes by 20% over the base case.) Of co urse, some
households will seek much higher incomes at once, and incomes should grow.
The indicative income levels for which models have been constructed are the following:
(i) In the Eastern Cape, the income level assumed is R5,000 per household per year-half o f
which is derived from agriculture. Current farmworkers' annual wages appear to be in the order of R3,000.
(ii) In the Western Cape, the income level assumed is R12,000 per household per year-thre e
quarters of which is derived from agriculture. Current semi-skilled farmworkers' annual wages appear to be in the order of R6,000.
(iii) In the summergrain area, the income level assumed is R6,400 per household per year- roughly the current rural household subsistence income level. Half is derived from agricu lture.
(iv) In periurban areas, the income level assumed is R9,000 per household per year-reflec ting

greater income earning opportunities in periurban areas. A quarter is derived from agriculture.
International evidence suggests that farm-nonfarm multiplier vary approximately from 1.3 for typical sub-Saharan subsistence agriculture with low population densities and undeveloped rural infrastructure to 2.2 in modern agricultural regions as can be found in the USA (Hagblade et al., 1991). Given the South African situation, a multiplier of 1.6 was assumed. The multiplier is "real" rather than inflationary, given high levels of unemployment and underemployment in South Africa. It can be shown that a multiplier of 1.6 implies that for every farm livelihood created, 0.26 nonfarm rural livelihoods will also be createdf/
The definition of net farm income used in our models is the following. It consists of gross revenues less purchased inputs, purchased labor, depreciation and capital service charge on machinery, and the rental rate on the portion of capital that is borrowed. Net farm income can thus be interpreted as the economic return to the household’s owned resources (labor and the portion of capital assets unencumbered by debt). This figure is different from farm profits, which would be arrived at by substracting the opportunity costs of owned resources from net farm income.
Farm households’ sustainable debt-burden on assets (land, livestock, and machinery) is assumed not to exceed a 30% debt-asset ratio, indicative of a relatively risky agricultural environment. This is consistent with international and local norms (SAAU, 1984:56). The debt-asset ratio is applied to total asset value of land, capital, and machinery. Given a 30% debt-asset ratio, the remaining 70% of asset value represent the capital cost of the models. It is assumed to come from a combination of own equity or grantsnno assumption on the actual source of capital cost is made in the modeling excercise.
The imputed cost of servicing the 30% of assets that are encumbered by debt are calculated as follows. In the case of machinery, a 15% interest rate is applied. In the case of the remaining assets ,.: (land and livestock), empirically observed rental rates from South Africa are used (Kirsten, 1993, and Nieuwoudt, 1993). They vary between 5 and 7 percent, depending on the region.
Capital cost does not include provisions for the cost of housing and rural infrastructure. Households are assumed to build their own houses or to occupy existing houses. The costs of provision for public rural infrastructure (e.g. water supply and roads) are estimated elsewhere.
The methodology of the modeling excercise is as follows. Empirically estimated values for basic

1 Assume specialized farm households exist and permanent laborers do not exist in our rural economy. We do not take into. account rural-urban linkages. Assume target income for farm and nonfarm households is R5000. Net farm income is R2500, remittances are R1250, giving a total of R3750, to which the multiplier of 0.6 for rural-nonfarm linkages can be applied. This gives a value of R2250, which should be distributed over the portion going to the farm household (R1250 assumption) and the portion going to the nonfarm household (ice. R1000). Th nonfarm household is assumed to receive 75% of its income from farm-nonfarm linkages (in this case R1000) and 25% of its income in remittances (i.e. R333.33). Consequently, the nonfarm household earns a total of R1333.33. If the indicative income for this type of household is also R5000, then the farm household supports 1333.33/5000, or 0.26 nonfarm households.

parameters were used to calculate actual net farm income for each of the four models. Actual net farm income was then compared to indicative net farm incomes. Household models were then rescaled--up or down-oto conform to indicative net farm incomes. The basic characteristics of the rescaled models are presented in Table 1.

Ta 1e 1. Main characteristics of the four indicative farm models.
Variable E. Cape Summer Peri-urban W. Cape
grain
5.
39
45.0
cultivated (ha) 5 _
irrigated (ha) 1.5
herd size (LSU)
m-
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___-
_-___
____
_-__
8740
main activities wmegrapes
, vegetables
Source: see Annex 1-4.
Notes: -The rate of return on livestock assets, taking into account all cash and noncash forms of income is assumed to.
equal 34% per year (Tapson, 1990:147-167). .
-Stocking rates vary from 5 ha/LSU in the summer grain area to 6 ha/LSU in the Eastern Ca pe.
-Avcrage physical yields of unirrigated maize range between 0.48 tons/ha in the Eastern C ape and 1.36 tons/ha
in the summer grain area.
.
maize
cattle
vegetables
maize
cattle
maize
5. Aggregation
For each of the agro-ecological zones studied, the aggregative net impact of a land redis tribution
process which would incrementally replace currently existing farm units in the commercial areas by
the indicative models arrived at above is evaluated as follows.
(i) land availability of arable and non-arable land in the commercial sector is estimated using official statistics (Eastern Cape, summer grain, and Western Cape) or a rough estimate (in the case of perieurban areas);
(ii) land redistribution is assumed to incrementally range between 10 and 50 percent of land availability;
(iii indicative models replace currently existing commercial farms as land is redistribut ed,
taking into account arable and nonarable land constraints;
(iv) rural livelihoods created (farm and nonfarm) are calculated;
(v) rural livelihoods lost (farm and nonfarm) in the commercial sector are calculated;
(vi) net rural livelihoods gained are calculated by subtracting (v) from (iv); and

10
(vii) capital costs of the establishment of farm households are calculated, representing
70
percent of capital assets (land, livestock and machinery).
The following results are presented in Table 2:
(i) net rural livelihoods (farm and nonfarm) created;
(ii) net rural livelihoods created under the assumption that indicative household incomes are increased by 20 percent; and
(iii) capital costs to be borne by equity or grants
The interpretation of the results take into account that the area under consideration onl y represents 28
percent of agricultural land in the commercial sector. On the total agricultural area in the commercial
sector, farm employment was estimated at 1.17 million in 1991.
Ta le2 Rurallivelih ds ained das ciat frmc it c
40%
222,222
386.403.
222,522
22,222
1,442,476
_
-
02710
land redistribution -
10% 30% 50%
Periurban 194,733 584,199
Summer grain 96,601 289,802
’ 56,142 168,425
13,144 39,432
360,620 1,081,858
-
sensitivity analysis: indicative household income increased by 20%
-
160,178 480,533
74,977 224,930
44,916 134,747
9,903 29,710
289,974 869,920
_
Eastern Cape
Western Cape
otal
H
Periurban
299,906 374 883
179,663
39,613
1,159,892
-
_
-
588
2,028
Summer grain
Eastern Cape
Western Cape
total
Capital cost (R millions)
ll
47 294
Periurban
Summer grain 507 1,014 1,521

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