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Announcements, news, views and reviews are welcome, preferably in the I.G.U.'s official languages, French or English.

## From the Editor

The Editor wishes to thank all colleagues who have kindly contributed materials for Land Use Systems and requests that readers continue the supply. This newsletter is a 'spasmodical' rather than a periodical and thus does not have a fixed publication schedule. Prompt publication can be assured so long as the flow of items continues so please assist.

Le rédacteur veut dire merci à tous les collègues qui ont contribués quelques communications à Land Use Systems et en plus il prie qu'ils continuerent. Ce feuilleton est publié quand l'opportunité s'offrit et ainsi il n y a pas une date fixée de publication. On peut s'assurer d'une publication vive si l'offre des matériaux se continuera.

# Land Use in the Andean Region of Ecuador: from Inventory to Dynamic Analysis

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The prime defects of 'classical' land use surveys such as those of the British Land Utilisation Surveys were, first, that they were carried out at a large scale, thus requiring considerable (in these cases largely unpaid) labour, and second, that they were static overviews unsupported by any formal means of monitoring change. It was the realization of these defects, together with impracticability of using labour-intensive survey methods in often-remote and barely-settled regions that led to Australia's Commonwealth Scientific and Industrial Research Organization (CSIRO) undertaking the development and successive refinement of methods of land resource inventory of which land use surveys were part. Elsewhere similar cost-effective methods were evolved; in the United States by the Department of Agriculture working from the standpoint of soil conservation and in Canada, during the 1950s, with the objective of rural zone planning backed by legal sanctions. Subsequently and via inter-American organizations land inventories were similarly developed in South America: 'ONERN' in Peru, 1962; 'COPLANARH' in Venezuela, 1968 'CETENAL' in Mexico; 'RADAM' in Brazil, 1970; 'ERTS Bolivia' in Bolivia, 1974, and in Ecuador 'PRONAREG' founded in 1973. In Ecuador the 'National Programme of Agricultural Regionalisation' is but one part of an inventory of renewable natural resources undertaken in 1973-74 by the Ministry of Agriculture and Livestock in 1973-74.[1]

1. This inventory is supported by the French government through ORSTOM, that government's [illegible]anisation for overseas scientific and [illegible] research.



Amongst those countries which have undertaken wide-ranging inventories at the national level a number of common characteristics have appeared. In particular is the preponderance accorded to the physical environment as the prime object of study. Secondly, in terms of methods, the means are set up by which data are acquired through aerial photography and photo-interpretation and the results are then expressed by cartographic techniques. These two fundamental characteristics are to be found in the land use inventory of the Andean region of Ecuador but with an adaptation of photo-interpretation techniques to the particular conditions of very heterogenous documents and a particular attention to human problems.

The purpose here is not to deal with questions of methodological and technical adaptation but simply to underline the importance of cultural factors in land use. This point of departure would appear trivial were it not for the fact that this professional field and consequently its discourse is very much dominated by 'masters of inventory' who continue to attribute much to physical factors.

To move quickly on to a sketch of the Ecuadorian inventory. Here only a few aspects can be considered as evidence of the principal determining factors and of the results obtained. It is essential to establish its amplitude, its exhaustiveness and its quality before proceding to a methodological critique.

Here it is important to underline one of the survey's great weaknesses, one which is not peculiar to it but one intrinsic to the genre itself. The inventory has a tendency to solidify an image of reality on paper, when in reality the countryside is in perpetual transformation. How then to sieze that

which evolves, of which in the landscape we see only the trace? How to grasp it other than in its often fugitive, immediately-observable consequences? How to keep alive this perception of change and how to give utterance to it? What are the underlying causes of such transformations?

## Physical factors influencing present land use

The strong relief of the Andes imposes abrupt bioclimatic gradients which are translated into a very marked zonation of vegetation. The most representative transect from west to east is one more or less parallel to the first degree of south latitude. It would begin at an elevation of about 300 m in the coastal plain, rising to the 6 300 m summit of Chimborazo, descending to 2 200 m in the inter-Andean couloir, rising again to an altitude of 5 000 m to reach bench-mark 900 in the Amazonian piedmont - all this in a distance of some 150 km. On the western piedmont are to be found orange trees, coffee and cocoa, with further up the slope, potatoes and natural grasslands. The summit zone is marked by bare rock, ice and snow, from place to place girdled by permanent high-altitude grasslands. The higher levels of the interior slope are devoted to the cultivation of barley, beans and potatoes. Next comes the zone of maize with numerous local crop associations which reflect a more humid climate by including orchards of apples, pears or peaches interplanted. Lower down appear plantations of citrus, grape-vines and avocadoes. The eastern exterior slope is almost totally covered in forest although the Amazonian piedmont carries sugar-cane and tea.

This pattern is particularly the function of the fall in temperature with increasing altitude but it also reflects rainfall variation strongly conditioned



by exposure. In intertropical mountains, phenomena linked to exposure are less related to the orientation of slopes to the sun than to their orientation to wind. On islands the well-studied contrast between windward and leeward slopes is repeated in the Andes where the massif can be considered as an 'island' emerged from the lowlands. The equatorial location of the mountain chain in Ecuador and its morphology, two parallel cordilleras with the inter-Andean couloir ranged between, complicates this schema rather little. The two exterior slopes, the northwestern and the southeastern, face the wind whereas the interior slopes are always to the leeward.

The piedmont zones register annual rainfall in excess of 2 000 mm, sometimes more than 4 000 mm, whereas the bottom of the couloir receives less than 750 mm and in extreme cases less than 500 mm. Salinas and the Chota basin, which are particularly enclosed, show annual rainfall of 300 to 350 mm.

## Cultural factors influencing land use

The size of the units of production is another very important factor determining land use. In the Andes of Ecuador, 77 per cent of the holdings are less than five hectares in size and these occupy 12 per cent of the total agricultural area. Holdings larger than 100 ha represent one per cent of all holdings but 45 per cent of the total agricultural area. This contrast between large and small units is translated into a land use contrast for the holdings less than five hectares in size have, on the average, 80 per cent of their area in cultivation, 15 per cent in grassland and five per cent in natural vegetation or other uses (including farmsteads) whereas the holdings larger than 100 ha have only 12 per cent in cultivation, 42 per cent in grassland and 45 per cent in natural vegetation and other uses.

What is not stated by the statistics but which has been verified in the course of study, is the major difference in farm practices which also parallels these types of holdings and is reflected in tillage, manuring, insecticde treatment, methods of transport and of harvesting and so forth. Their expression in the landscape is not obvious but enquiries have confirmed their pertinance. On the other hand parcellation appears as an obvious facet of property in the landscape. Large plots indicate large holdings whilst small plots are the sign of small holdings. This was found always to be true during the course of the study and much use was made of this methodological shortcut.

The attention traditionally lent by agricultural geography to the distinction between irrigated lands and lands cultivated with rain as the sole source of water, and the differences in cultivation systems that this implies, is also very important in the Andes. Irrigation not merely makes good chronic moisture deficit (and this finds its most spectacular expression in the dry inter-Andean valleys where oases and 'gallery terrain' come into view) it is also an essential insurance against irregularity of rainfall. Irrigation as much as the size of holdings forms a large part of cultural phenomena.

Another phenomenon of prime importance marks this mountain environment, namely erosion. Certainly it is active everywhere but here it causes great gashes in the landscape. It is most often the result of an interaction amongst particular physical conditions - slope, precipitation, violent winds, fine-grained volcanic materials - and a form of human exploitation without precautions. Once affected, an eroded zone cannot have the same land use as neighbouring areas.



These four factors appeared essential to the survey for they truly determine land use types. Paradoxically, the population density, although important, received less attention. The greatest densities can be found in the maize-growing zone or in the barley-potato zone and since these are generally occupied by Indians there is a correlation with size of holding which has already been taken into account.

In order to make the survey both effective and rapid, attention was focussed on those factors most easy to observe in the landscape. It was necessary to work quickly since an area of about 80 000 $km^2$ had to be covered. This implied important methodological choices in the systematic use of air-photo coverage. Inadequacies of scale, between 1:45 000 and 1: 70 000, the great variation in the dates of photography so far as season and year were concerned, the differing flight-lines, did not permit the direct identification of crop-patterns, still less the cultural associations on the aerial photographs. What was researched was the images of the determining factors discussed already, of which the interaction permitted the delimitation of physiographically homogenous areas which at first sight appeared to be homogenous in land use. It should be noted that the soil characteristics were not examined directly. Formed on relatively homogenous parent materials of volcanic origin, their spatial variation, moreover, is linked to local differences in climate already taken into account as the first factor of variation in land use.

## The presentation of results - the maps

The first series is at the scale of 1:50 000 comprising 128 sheets. Those covering the unutilized lands of the exterior slopes of the Andes were

omitted. In this map series the determining factors discussed previously are emphasised such that all cultivation systems are classed in order of importance and regrouped as a function of the percentage of the occupied land in each class. The provenance of these results is exclusively the ground survey. This verifies or corrects the details of photointerpretation and records the agricultural patterns of the homogenous zones. Thus the map does not bear upon a particular point in space but translates into cartographic form the overall situation in each zone.

Three percentage classes were used to present the results: 0-40 per cent in the first class, 40-70 per cent in the second class and more than 70 per cent in the third class. In the less-peopled southern Andean zones where agriculture is scattered, a fourth class, from 0-10 per cent was added. The natural vegetation was treated in the same way as cultivated areas and its percentages were added to those for cultivation in order to describe the overall vegetative cover of the zone. These maps reflect the analysis of the terrain with quite considerable precision and in recent years they have been very much used in planning projects or in agricultural developments which have been undertaken in Ecuador. They have been used in the creation of irrigation zones, in opening up of new roads, in drainage basin planning, in organization and production. They constitute a first-hand document in field study. This is the inventory-based map which has served as the direct source for two further series.

The second series is that of thematic maps on the scale of 1:200 000 reworked from the basic data on 1:50 000 maps. Each map emphasises one of the determining factors or a single land use, for example



maps of erosion, irrigation, large holdings, a map of utilized land in contrast to areas in natural vegetation and finally a map for each major crop: maize, wheat, grassland, coffee and so forth. The whole area studied is covered in 11 sheets and for each composite sheet there are some 15 thematic maps depending upon the crops present. These maps correspond to the immediate needs of the management and programmes of the Ministry of Agriculture of which the organizational structure is very sectoral in nature comprising, for example, separate programmes for coffee, for bananas, for cereals, for forests. It is for these purposes that the maps were prepared.

The third cartographic series is also on the scale of 1:200 000 and this is a synthesis in which land use types are emphasised. This map is, from the scientific and geographical points of view, the most interesting. It permits work with other students in the social sciences and acts as a meeting-point in interdisciplinary analyses. With the demographer Daniel Delaunay, population change between one census and another was compared in terms of the pattern of the most representative types of land use. Early discussions with the sociologist or the economist of the survey group had shown co-workers the choice that is available in this zonation for the initiation of spot enquiries.[1]

1. This point has been taken up in another paper 'Du paysage à la planification' which will appear in a collective work from Laboratory 96 of CNRS and ORSTOM 'A travers champs, Agronomes et Géographes', éditions de l'ORSTOM, Collection Séminaires et Colloques, Paris, 1985 - to appear.

Proposals for new land uses (maps of suitability or of potential) prepared by agronomists of the Ministry are above all based upon the data collected on the physical environment, supported equally by knowledge of the present land use and by the determining factors already discussed, in particular the dimensions of farm plots as reflecting the size of holdings which, as has already been suggested, influences technical management and for the social approach to problems.

Of the three cartographical series, the map of land use types and vegetated landscapes is the most rich, a synthesis of observations on the physical environment as used by man, the pivot of physical and social enquiry. New surveys and therefore a further deepening of research have been necessary to understand the articulation of elements mapped at the 1:50 000 scale and the functioning of the types which have been presented. The premisses of the definition and cartography of systems of agricultural production have thus been tackled.

At this point it is wished to make some reflections on capturing land use change. The cartographic representation of present land use, such as has been realized from national inventories, has a quite strongly-marked static character. How to capture and to explain the movement which perpetually transforms systems of production when cartography is an instantaneous snap-shot of a situation, a vision of a given moment?

Dynamics can be captured in certain original systems for which it is of consequence that they be shown as such on the map. These types endeavour to encompass the major changes in progress. Several complementary types thus permitted the identification of zones containing pioneer fringes of forest



clearing and underline the great stages in the progress of the colonization of new lands because they are visible in the landscape and observable on aerial photographs. There, indeed, lies the first response but, the author is aware, that is not fully satisfying. How to show dynamism? How to reveal the motors which drive land use change?

Is it a question of economic motors such as prices on international and national markets? Is it a question of the dynamism engendered by demographic growth or yet the impact deriving from the political leadership of the state, the status quo, or agrarian reform or agrarian reform combined with the colonization of new lands or the subsidy of certain products? These phenomena are not directly mappable because they can only be captured through their consequences via the spatial transformation of the agricultural landscapes. Another example might be that of the profound impact that the recent decline of petroleum exploitation has had on agriculture. The direct and indirect effects of it are very important but cannot be expressed as such in the work discussed here. Cartography is a preferred mode of expression in the study of land use but it is more than a little static in nature, at least in its present form.[1] Because of this fundamental limitation, the cartography of present land use

1. The development of information science (cartography and computer-assisted graphics) opens new perspectives for research, not only because of the possibilities of data storage and treatment but also by reason of the evolution of cartographic support which is no longer needs to be printed paper. Magnetic tapes and cathode-ray screens give much greater flexibility in the continuous dynamics of evolution and in simulation.

generally falls into one of the two following classes - maps of land use in the strict sense and maps of the evolution of land use.[1]

## Transformations of Land Use

The scope of this article does not permit going into detail. It is possible, however, to draw out certain tendencies present which have been identified throughout the region. This examination is the point of departure for a new consideration which demands another mode of enquiry centred upon collaboration with the social sciences.

### (a) Pioneer fringes

The image of a cloth, moth-eaten then rapidly devoured is without doubt that which best reflects this phenomenon of nibbling at the great plant formations till recently little touched by agricultural activity. These pioneer fringes develop in Ecuador in two preferred locations, one in the dense evergreen forest and the other on high-altitude grasslands. In the first instance it is a matter of people descending into the plains and Andean foothills and in the other an ascent into the cordilleras. Whereas the first process is quite common in tropical areas of South America, the second seems most exceptional for the highland environment is now more usually the object of abandonment than reconquest. Why this very general expansion of the oecumene at the expense of the saltus or of the selva of which numerous examples can be given in Ecuador?

1. Here the Map of Change in French Rural Space, 1950-1980 [La carte des mutations de l'espace rural français] by Pierre Brunet presented at the International Geographical Congress in Paris, 1984 is noteworthy.



In an earlier study it was shown that in the 15th century the oecumene of the northern Andean region in Ecuador seems to have been rather more extensive than at present. There has thus been a regression and a period of expansion has once again arrived. The first reason holds well in explaining spatial variation of population: decline during the colonial period and pacification and settlement of the indigenes in large regroupment villages. These were followed by contraction on the ground followed by growth to the present day. From 6.8 million inhabitants in 1974, the population of Ecuador passed 8.5 million in 1982. Between 1962 and 1974 growth was even stronger at 3.3 per cent annually. The pressure upon land became more marked therefore, despite real technical advance. In the case of over-small holdings emigration occurred, towards the towns or towards other lands. Movement to new lands, however, is possible only where accessible reserves exist.

Accessibility is not merely physical. Much has been said of the role of Amazonia in Brazil or of the opening up of routeways for petroleum development in the northeast of Ecuador (Barral, 1977). Their role is undeniable in the development of the regions concerned but it is also necessary to take into account legal accessibility. This is because the forested lands may be considered 'open lands', 'tierras baldias' of which the state may, in the manner of colonial concessions, give away rights of ownership whilst ignoring the rights of Indian communities for whom the best of the reserves have been agreed. Thus accessibility lies in the law of colonization. This at once has legalized and provoked a movement which had earlier existed, spontaneously, a movement towards the foothills but one numerically of little importance.

The rise of settlement towards the mountains on the one hand and in the inter-Andean couloir derive equally from population growth. Here the legal basis of accessibility is given by the agrarian reform law. The wide expanses of high-altitude grasslands, the paramo, used as very extensive grazing lands by the haciendas have been cut up, divided and assigned privately to the peasants in the context of co-operatives. The land use transformation is immediate - almost total clearance of the land and widespread, rapid putting to the plough. Cultivation replaces herding. Thus the high altitude system of cultivation, based upon the rotation of potatoes, beans and barley with subsidiary sheep and goat-rearing, is extended.

In the older systems, the flock furnished wool above all and also ensured the transfer of fertility from the grasslands at higher levels to the ploughlands. In the new system the association between herding and cropping is less carefully articulated for it is apparently less necessary. The reserves of soil fertility are important and spectacular yields are achieved in the initial years of cultivation. Such yields trigger an acceleration of the process of clearance but this also brings degradation in its train. These pioneer systems are, in a manner of speaking, systems of 'mining' since they obtain their success by the extraction of reserves accumulated by the natural environment.[1]

1. A brief remark needs to be made concerning the altitudinal limit of cultivation. Although it cannot be identical in all places by reason of local variation in climatic conditions, it has been seen to have risen in those areas where it was already high. It now reaches 3 700 to 3 800 m in several regions and even exceeds these limits in several places.



(b) Afforestation

As well as mentioning clearance it is necessary to speak of afforestation. Over the last 12 years the planted areas have grown very rapidly and thousands of hectares have long and radically changed their land use. Some of these lands were 'sterile' and eroded. Others have been transformed from high-altitude grasslands and even sometimes, from cereal cultivation to forestry. Much of the interest in forestry has come from large landowners who wish, by means of a stable form of land use, to assure their properties against the risks of the agrarian reform. Interest also derives from small farmers who plant trees on the margins of fields and along the roads to form wooded thickets together with the further interest of Indians who replant recently-abandoned and eroded slopes. Pressure groups have developed which are concerned with environmental conservation to promote and stimulate afforestation. The totality of these elements has created a strong movement. While they reinforce each other they do not rule out the cutting of mature forests and the woodland or scrub formations which yet remain spared in nooks and crannys of the Andes.

Is the issue truly that of reafforestation or better still 're-creation of forest' ['reforestation'] as the Spanish terminology has it? Single-variety forest of Eucalyptus globulus or of pine (generally Pinus radiata with P. patula on the red soils of the southern Andes) replaces the high altitude formations, comprised of a variety of species, which it is not possible to reconstitute artificially and above all is most difficult and less advantageous to exploit. The swing, moreover, is not from natural forest to planted forest but rather from natural forest to cultivation. It is consequently on lands despoiled of their soil by inappropriate

cultivation practices that are afforested, at least in the altitudinal temperate zone. On colder terrain afforestation is effected on high-altitude grasslands which are thus withdrawn from stock-rearing or agrarian reform and thus in the medium-term from cultivation.

A serious evaluation, and one as yet still not attempted, emerges in the need to assess the wider pattern of each of these uses. The first element in such a comparison would be the natural (or, as in Peru, improved) high-altitude grasslands. Such lands can support extensive stock-rearing (or semi-intensive, if improved) and they ensure a reserve of moisture. Oldeman has compared them to a sponge in their role in accumulating moisture and regulating short-falls (Oldeman, 1975). The second element is the forest. Its function as a hydrological regulator is largely admitted in the temperate environment. What is its role in tropical uplands in terms of radiation, potential evapotranspiration and so forth? Its presence excludes stock-rearing. What is its future for lumber, as fuel-wood, as pulp-wood or in land stabilization? Finally, agriculture as the third element in a regional comparison: peasant-based polyculture or plantation, degradation of soils because of 'mining' its mineral constituents rapidly revealing itself in a violent process of erosion, or conservation? Towards which of these three major usages, pastoral, sylvicultural or cultivation ought planning be oriented?

(c) Dairying

A further major land use change has been brought about by the development of dairying and this is a general phenomenon in the Andes of Ecuador. It began on haciendas at the beginning of the century (Barsky, 1981) and has not been dissociated from them, not by



growth of the urban population, nor by changes in life-styles and dietary patterns which accord an important place to milk products nor by the agrarian reform. As they disembarassed themselves of marginal lands in favour of small peasant proprietors, the haciendas undertook a profound technical revolution as the 'hard core' of their enterprises. This was marked by a relative or total abandonment of cultivation in favour of dairying, the development of which was supported by significant inputs of capital. The increase in demand has given weight to the dairying lobby which has laid claim to price increases in order to recoup their investments and to ensure for producers a good margin of profit. Between 1973 and 1982 the price of milk at point of production rose from two sucres per litre to eight.[1]

Faced with the very considerable stability in prices of other agricultural products, the small farmers have equally begun to promote dairying. This movement has still not yet been studied. It is true that it does not provoke a spectacular reorientation for it is done without the heavy equipment of the large properties. The purchase by the haciendas of half-bred Holsteins to improve or replace the indigenous breeds, and the use of appropriate veterinary medecines are amongst the major technical innovations. Stock-rearing is tied to the consumption of crop by-products such as maize stalks but these are no long sufficient to support the growing number of animals. Grasslands extend to the detriment of ploughland as there is a general diminution in the production of wheat, cereals and legumes. In the case of wheat other factors equally come into play.

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1. Over the same period the U.S. dollar rose from 25to 39 sucres.

(d) The slide of grain-lands

The diminution in areas sown to wheat has been particularly marked during the 1970s. From 99 000 ha sown in 1968 the area fell to 27 000 ha by 1979 and 90 per cent of national consumption was covered by imports. Why this abrupt fall? The first line of investigation doubtless lies in consideration of the profit margins of producers. These have fallen. The state fixed the selling price each year but the costs of production, fertilizer prices in particular, grew more rapidly. The shortfall is explained by the political decision to keep the price of flour at a relatively low level, below the cost on the international market. Certain of the millers were able to purchase the total national wheat production, but this, even though giving higher returns than those on the international market, was poorly remunerated. Other pertinent reasons appear in the extension of pastures in support of the development of dairying or in the expansion (and thus the competition) of barley of which the production is destined for brewing.

These lines of research have not been deepened. Nevertheless the course of field-work has shown a relative persistence, or at least a minimal diminution in grain-lands in the northern Ecuadorian Andes. What justifies locally this persistence? A rapid survey amongst wheat-growers and workers in the Ministry of Agriculture's cereals programme provided two original answers which are probably complementary. On one hand was the powerful attraction of the black market directed towards Colombia where the price of wheat was much higher by reason of the rates of exchange between the two currencies. The buyer would come right to the producer's field to uplift the grain and pay significantly above the local price. On the other



hand the relative maintenance of wheat is also explained, paradoxically, by the cultivation system in the region which gives preference to potatoes. Highly remunerative, though very fertilizer-demanding, potatoes receive heavy doses of fertilizer which still benefit the grain crop in the following year within the context of crop rotation. The manuring of wheat, which appears to producers in other regions as a major handicap, is here no more considered as a constraint since interest in wheat remains supported by the appeal of a neighbouring market.

In 1984 the decision to double the production price of wheat set sowings free and in the course of a recent mission expansion of wheat areas was observed. Still it is necessary to emphasize yet again the difference between the large enterprises which respond very rapidly to market influences and the small-holdings on which the response is slower.

## Conclusion

This article began with the discussion of the present land use inventory in the Ecuadorian Andes. In this discussion the specificity of this work was demonstrated for the survey had to be adopted to particular conditions of the physical and human milieux. The survey was able to present results with a greater precision than that usual in similar studies. Nevertheless it was a static study while serving to underline the difficulty of taking evolutionary situations into account in an inventory. The map, based upon remote-sensing in the broad sense, is the instrument of choice in an inventory but it can be no more than a snapshot at a given moment.

The comprehenson of changes is more complex for a great many factors intervene. Here the instrument of choice is the enquiry. There is great complementarity between land-use zonation which delimits space affected by the same phenomenon, forest clearance for example, and the enquiry which explains it. This multidisciplinary enquiry, encompassing agronomic, demographic, social, economic, legal and political factors gives to the land use inventory its full dimensions. In the examples which have been given here, the multiplicity of the causes of land use change have been emphasised. Perhaps their deep roots in the past have been masked by the considerable attention given to the present. The transformation of some haciendas into agro-industrial complexes followed the adaptation of latifundios at the end of last century and was related to the opening of the Sierra railway. The mountain region is becoming spatially less fragmented. The national oecumene, too, is incorporating the coastal plain where the cocoa boom is in full swing. The novelty today is the beginning of spatial integration of the Amazonian region which to this point had been marginal. The study of local land use changes thus returns to the society which creates them and transforms its habitat.

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Translator's note

Translation from the author's manuscript in French is not literal and has involved a reduction in length.

R.D. Hill

RESUME: L'inventaire est un mode d'approche privilegie pour connaitre la situation actuelle mais il presente le danger de figer la connaissance a un moment donne. Le souci de suivre les evolutions et de comprendre les dynamiques amene a le depasser. L'accent est surtout mis ici sur la complementarite heuristique avec les sciences sociales et agronomiques qui detiennent les cles de comprehension des principales evolutions en cours.

RESUMEN: El inventario es el enfoque privilegiado para entender el estado actual pero expone al peligro de fijar el conocimiento. El deseo de seguimiento de las evoluciones y de comprension de las dinámicas permite superar aquella debilidad. Se insiste aqui sobre la complementaridad heuristica con las ciéncias sociales y agronomicas las cuales tienen las llaves de los principales procesos evolutivos.

## LAND USE CONFLICTS AND EFFECTS ON FOOD SUPPLY IN EGYPT

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Even though the habitable area does not exceed 3 per cent of Egypt's territory, large chunks of arable land are currently being sacrificed to urban development. On the other hand, land reclamation, which provides the only means of compensating for the loss, is costly and sometimes uneconomic. The