

633.72:631.25

DECREASING EXTENT OF TEA PLANTATIONS. CHANCE FOR AGRICULTURAL DIVERSIFICATION OR ECOLOGICAL THREAT?

R. Humbel*†

(University of Zurich-Irchel Winterthurerstrasse 190,
CH-8057 Zürich, Switzerland)

Since 1956, the extent of Sri Lanka's tea cultivation has continuously been reduced by an overall amount of 20%. Political, economical and agro-ecological reasons are responsible for this reduction which, however, has proved to be far from uniform in the different regions of tea cultivation of the country. The southern Galle and Matara districts have experienced a significant increase of area cultivated with tea (mostly by smallholders). Other areas, especially those with tea cultivations in the midlands, are characterized by decreases ranging from 20 up to 50% of the formerly cultivated area. Detailed investigations in the central core-area of mid- and highland tea cultivation (Kandy and Nuwara Eliya Districts) revealed the extent and location of such areas of landuse transformation.

Physical, climatic and other ecological variables as well as economic and political factors are relevant for these processes. The changes from tea to rubber, minor export crops, forest plantations, rangeland, sparsely used cropland, and natural forest since 1956 and vice versa are investigated and adopted as six indicators to permit an evaluation of the success and extent of agricultural diversification programmes and of the extent of potential ecological hazards.

A small amount of former tea land was successfully recultivated for agricultural diversification (crops like vegetables, tobacco, coffee, cacao, spices) and redeveloped into fuelwood plantations and settlements to cover the needs of a growing population for housing and various infrastructure. Still, the major part of former tea lands was just abandoned and left fallow. Such sparsely used areas, covered thinly by grass, ferns and scrub, are susceptible to ecological hazards like soil erosion and landslides, particularly if they are located on steep slopes.

It is recommended that greater effort be directed towards an ecologically stable and, in addition, economically profitable utilization of these lands. Such projects could contribute to the conservation of the already scarce remaining reserves of tropical rain forest by lessening the pressure on forested land for new development and by securing fuelwood and timber supplies from planted trees rather than from the destruction of natural forest.

INTRODUCTION

The ideas and findings presented in this paper are to a large extent a part of a research study started in 1986 on the subject of "Changes of the Area under Tea

* The Institute does not necessarily endorse the views expressed in papers contributed by persons other than members of its staff.

† Paper presented at the International and Interdisciplinary Symposium on Ecology and Landscape Management in Sri Lanka—Conflict or Compromise?—held in Colombo, 12-26 March 1990.

Cultivation in Sri Lanka since 1956". This study is carried out under the technical supervision of Prof. Dr K. I. Itten, Dept. of Geography, University of Zurich, as well as of the Tea Research Institute of Sri Lanka, especially its Deputy Director (Research), Dr S. Kulasegaram, as well as the officers of the TRI Land Use Unit, Messrs M. B. A. Perera and J. P. Fonseka. The study is expected to be completed in 1990 and be published as a Ph. D. thesis.

The Tea Map of Sri Lanka

A preliminary result of this study is a comprehensive Tea Map of Sri Lanka which was printed at the Survey Department of Sri Lanka and published in late 1988. This map shows areas cultivated by tea in 1956 and the 1980's as well as the corresponding area increases and decreases. Therefore, this map provides an excellent overview on the spatial distribution of area changes of tea cultivation in Sri Lanka since 1956. The map is accompanied by a statistical list of area figures of tea cultivation for the ten Sri Lankan administrative districts where at least some tea is cultivated, and these statistics are reproduced in Table 1.

TABLE 1 – *Area statistics on tea cultivation in Sri Lanka*

Administrative District	Present tea cultivation		Cultivation in 1956	Changes since 1956
	Reference year	Area (ha)	Area (ha)	
Kurunegala	1981	270	280	– 4 %
Matale	1981	5390	9080	– 41 %
Gampaha	1981	10	30	– 71 %
Kegalle	1981	5300	10170	– 48 %
Kandy	1981	28000	52530	– 47 %
Nuwara Eliya	1979/81	60620	73240	– 17 %
Badulla	1982	35620	45960	– 22 %
Monaragala	1982	1150	1800	– 36 %
Colombo	1981	220	240	– 10 %
Kalutara	1981/84	3800	4020	– 5 %
Ratnapura	1983	20970	26410	– 21 %
Galle	1983	15740	10570	+ 49 %
Matara	1983	19910	12470	+ 63 %
Hambantota	1983	90	90	—
SRI LANKA		197090	246890	– 20 %

Map and statistics both reveal that there is undoubtedly an overall trend of decreasing tea area in Sri Lanka since 1956, amounting to a loss of about 20 % of the former tea land by the early 1980's. The distribution of these areas of decrease is however, less than uniform compared to the entire tea area of the country. While the areas in the northern midlands, the central highlands, the Uva basin as well as the Sabaragamuwa province all encounter and confirm the general declining trend, we can on the contrary observe remarkable increases in tea cultivation in the South. These increases reach 50 % and more in the districts of Galle and Matara. They consist of the typical smallholders' tea areas which came increasingly under cultivation from the tea boom in the 1950's onwards. Due to the general population pressure and the increasing demand for land, employment and income, settlements as well as agricultural areas were considerably expanded in these formerly rather loosely populated areas. Whenever tea prices were high and the expected profits better than for competing crops (especially rubber and cinnamon), tea cultivation was extended, partly on account of other agricultural commodities.

While the traditional high-quality and high-yielding tea areas in the districts of Nuwara Eliya, Badulla and Ratnapura experienced tea area decreases close to the entire country's average of 20 %, the oldest tea areas in the northern and western midlands of the Kandy, Matale and Kegalle districts account heavily to the entire reduction of tea, showing up to 50% less tea acreage now than in 1956. They are often neglected and planted with old, sometimes degenerated and usually low-yielding seedling tea, and therefore economically less than attractive. Planted frequently on steep slopes without much consideration for soil conservation measures (contour planting, terracing, proper drainage, shade trees), extensive soil erosion has occurred in many places, which, in a vicious circle, again had negative implications on the vigour of the tea plants, the size and density of the bushes, the quantity and quality of tea produced. While economics did not prevent negligence of such tea plantations, this even more accelerated loss of soil and diminished the possible profits from tea even more, up to a degree when planting, fertilizing, maintaining, and finally plucking of the tea fields was completely given up.

MATERIALS AND METHODS

The approach of compiling an inventory of landuse changes on a country-wide level requires comprehensive, again country-wide, as well as thematically consistent coverage of the data sources selected to perform such a study. In addition, to detect changes of the geographic distribution and extent of such a landuse category, at least two sets of data, based on quite different years, are required. Sri Lanka is particularly lucky to possess two such complete data sets: the landuse map series of 1956/61 and a similar series of 1979/90. Both landuse map series are based on air photo interpretation. The data source of the first series is an island-wide coverage of 1:40,000 aerial photographs taken in 1956 which were assembled as semi-controlled photo mosaics and finally published in 1960/61 in 74 map sheets of 1:63,360 (1 inch : 1 mile) scale. The new series uses air photos in different scales taken after 1979. Landsat satellite images served as geometric base for the compilation of the photo interpretations. This series is published district-wise in the scale of 1:100,000. Published maps of both series can be obtained from the Survey Department of Sri Lanka. Since the new landuse maps are based on aerial photographs of different years, this inconsistency in time is also part of our results. Table 1 specifies what exactly is meant with "the 1980's" for the different districts.

After the necessary scale adjustments, corresponding map sheets of these two series were superimposed one onto the other on a light table, and subsequently, the areas mapped in both maps as tea were compared. Corresponding to this rather simple, visual and analog methodical approach, similar visual, practice-oriented methods were selected for corrections of geometric incompatibilities between the map series and for various other problems. Increases and decreases in the area under tea were mapped separately, and so were all relevant landuse classes which have either preceded or followed tea cultivation. All these different types of changes were divided among the administrative areas they were part of and finally measured using an electronic area meter in order to compile a comprehensive table of area statistics.

Geographic distribution and reasons for tea area changes

For various reasons it was decided to adopt the administrative districts and sub-districts (or, officially, Assistant Government Agent Divisions (AGADs)) as units of choice for our statistics as well as for the (carto-) graphic representation of results. As an additional advantage, this corresponds also to the mapping and statistics approach of the Sri Lanka/Swiss Remote Sensing Project and its land-use map series 1:100,000. Figure 1 shows the location, size and names of all the 102 AGADs relevant for tea cultivation.

Similar to the Tea Map of Sri Lanka, Fig. 2 shows the extent, geographic distribution and importance of the present tea cultivation for the different AGADs, while Fig. 3 shows the corresponding area changes. Figure 2 clearly reveals the absolute importance of the central highland, especially the Ambagamuwa Korale, Nuwara Eliya and Kotmale AGADs of the Nuwara Eliya district. There are two other regions of fairly significant importance for tea cultivation: the northeast of Matara district, or the Deniyaya area, and finally the Uva Basin in the Badulla district. We have to be aware, though, that the uneven size of the AGADs may distort the impression of this and the following figures to some extent, since the shades are usually in proportion to the absolute values encountered for the particular AGADs.

Figure 3 confirms what has been mentioned earlier about the uneven distribution of tea area changes. The south, mainly the Morawak Korale and Hinidum Pattuwa AGADs in the Matara and Galle districts form really the core of tea increases which, to a lesser extent, also occur in the southeastern Kalutara and the central Ratnapura district. Due to the very small absolute areas cultivated with tea, the increases for two AGADs of Kurunegala district are considered insignificant. The decreases are concentrated in the midlands of the Kandy and northern Kegalle districts.

Indicators for agricultural diversification

The basic question of this entire symposium—Conflict or Compromise?—is translated for this investigation into: Diversification or Ecological Threat? In order to attempt to find a reply to this crucial question, indicators shall be used to test the significance of both these possible hypotheses. Our statistics are not looking only into the category tea but include information about other landuse categories related to the changes in tea cultivation, i.e. landuse types prevalent before new tea cultivations had started are analyzed as well as new landuses established on former tea land. Certain of these categories respectively their changes in relation to tea may serve as acceptable indicators for the success of diversification or for the significance of possible ecological dangers.

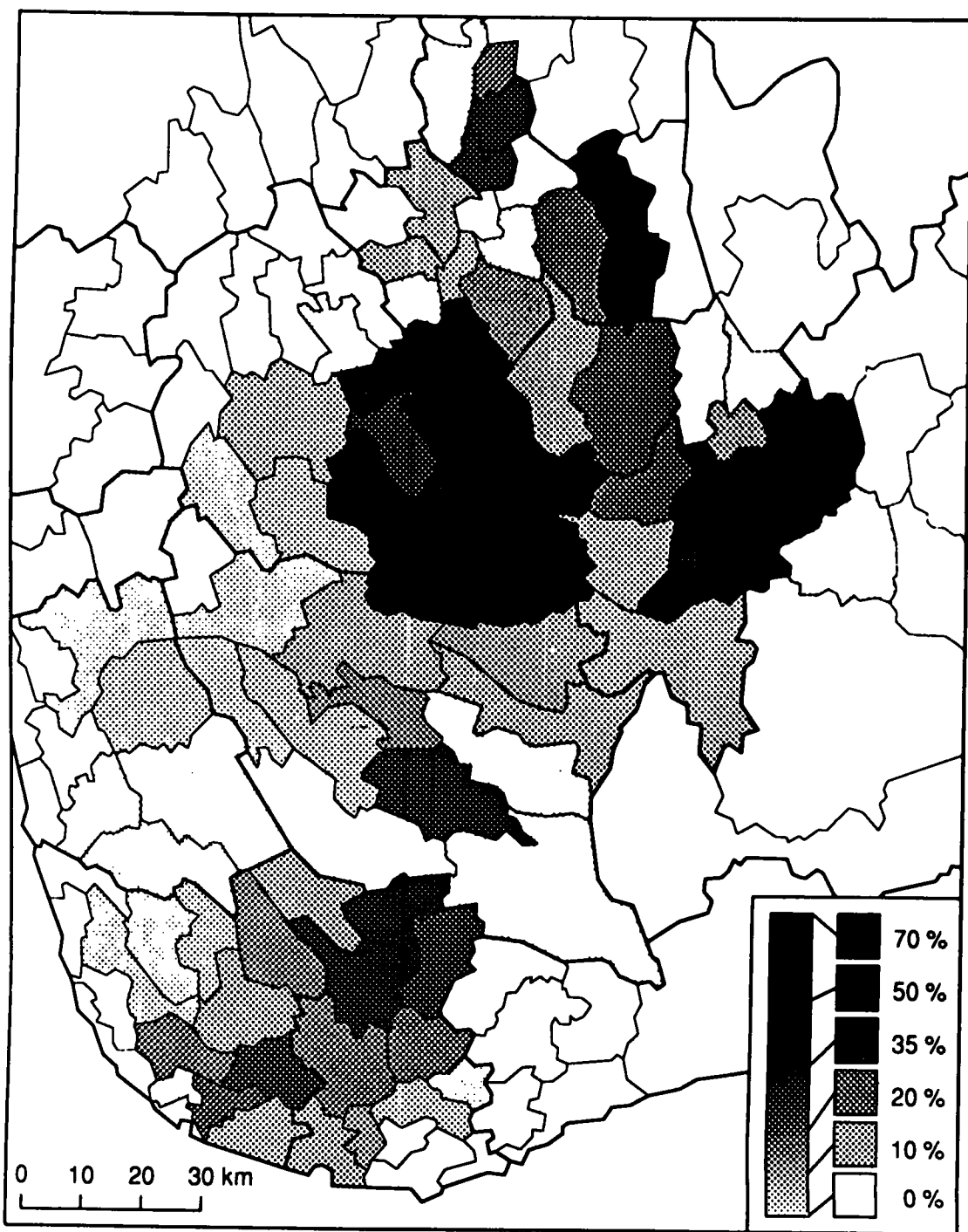


Fig. 2 – Tea cultivation in Sri Lanka in the 1980s (in % of the area of each AGAD)

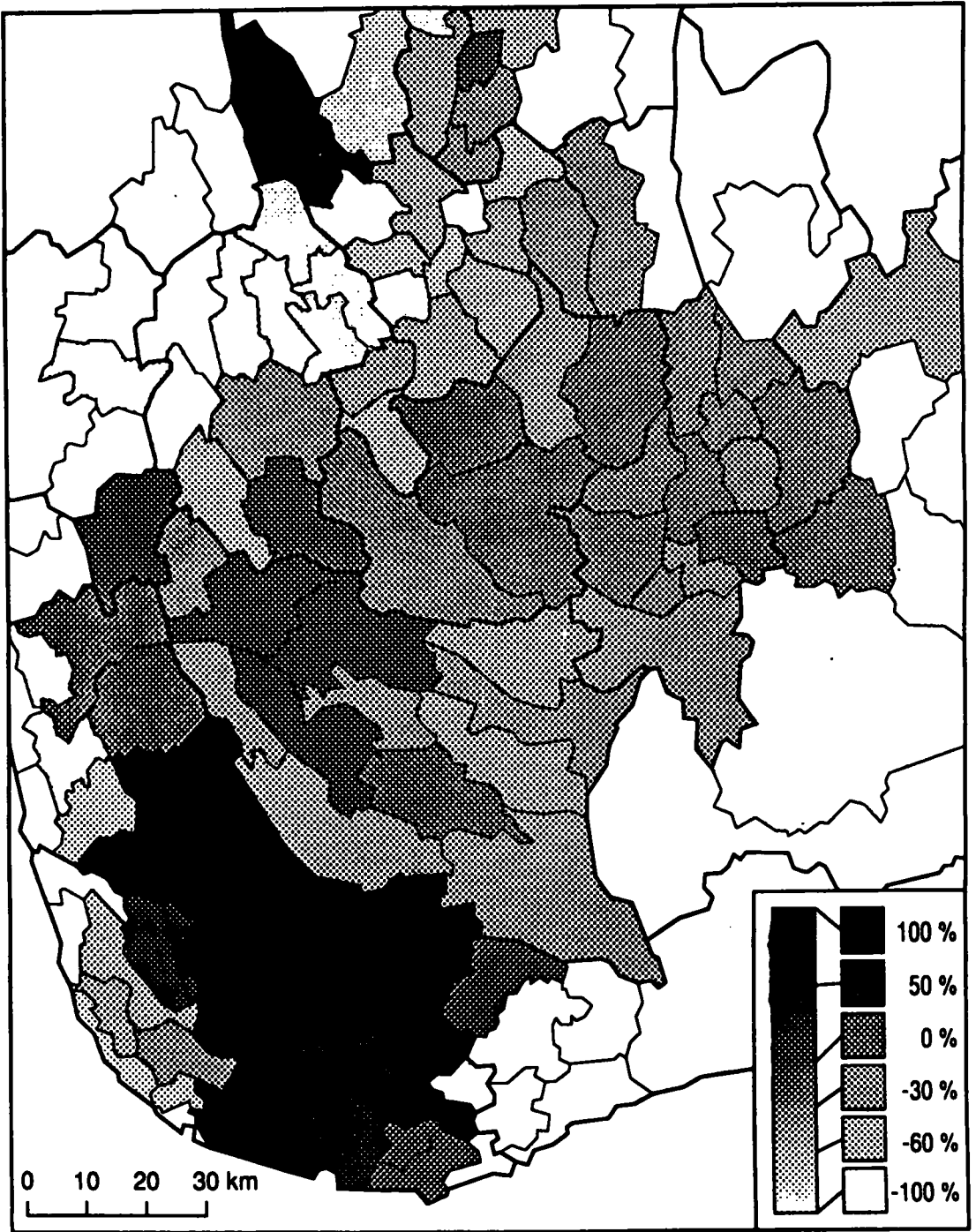


Fig. 3 – Tea area increases and decreases between 1956 and the 1980s

Rubber

There is an overall decrease of rubber and a corresponding increase in tea, but with various regional exceptions (Fig. 4; Kegalle and Kalutara districts). The Galle and Matara districts in southern Sri Lanka comprise the most important former rubber areas being converted now into tea. In addition, the Atakalan Korale and Ratnapura AGADs (Ratnapura district) and the Yatiyantota AGAD (Kegalle district) have experienced the same development on a larger scale. We assume that during the latter half of the 1950's, the so-called Rubber Boom, the rubber cultivations were expanded considerably, not significantly on account of former tea, though, but sometimes on rather marginal areas. In later years, with rising tea and falling rubber prices, such areas, in addition to new, virgin land, would have been converted into tea.

Minor export crops

Minor export crops comprise spices, coffee, cacao and certain fruits; propagating the cultivation of these is the declared target of various agricultural diversification schemes and subsidies. We can observe from Fig. 5 that such efforts had a significant success mainly in Kandy district, to a lesser degree also in eastern Kegalle district, southwestern Matale district, central Ratnapura district, northeastern Galle and northwestern Matara district. The fact that subsidies for diversification are offered irrespective of the administrative or agroecological area possibly accounts for the rather equal distribution of such diversifications between the different AGADs.

Forest plantations

Besides the minor export crops, the establishment of new forest plantations is the second-most important indicator for positive results of agricultural diversification and reductions of the extent of tea cultivations. The major areas of newly established forest plantations lies in the upper catchment of the Mahaweli river and its tributaries like the Kotmale Oya as well as the upper catchment of the Kelani and Kalu Ganga (Fig. 6). Planned efforts to protect the environment of these catchment areas, specifically in connection with the Accelerated Mahaweli Programme, and strategies to encourage tea estates to plant their own fuelwood plantations in order to become more self-sufficient in regard to energy, are thought to be responsible for this. The second-most important area of new forest plantations is in the Haldummulla AGAD in southern Badulla district where tea is planted along the agroecological margins impeding profitable cultivation, thus forming an additional incentive to convert uneconomic tea areas into possibly more economical timber plantations. On the other hand, various areas, shown in dark tones in Fig. 6, experienced new tea encroachments on previous forest plantations, although to a much lesser extent area-wise.

Indicators for ecological threats

Rangeland

We are coming now to some indicators pointing to ecologically more problematic and probably unplanned, undesired conversions of former tea land. The conversion of former tea to rangeland (grass and scrub areas) is considered to be one of these. Fig. 7

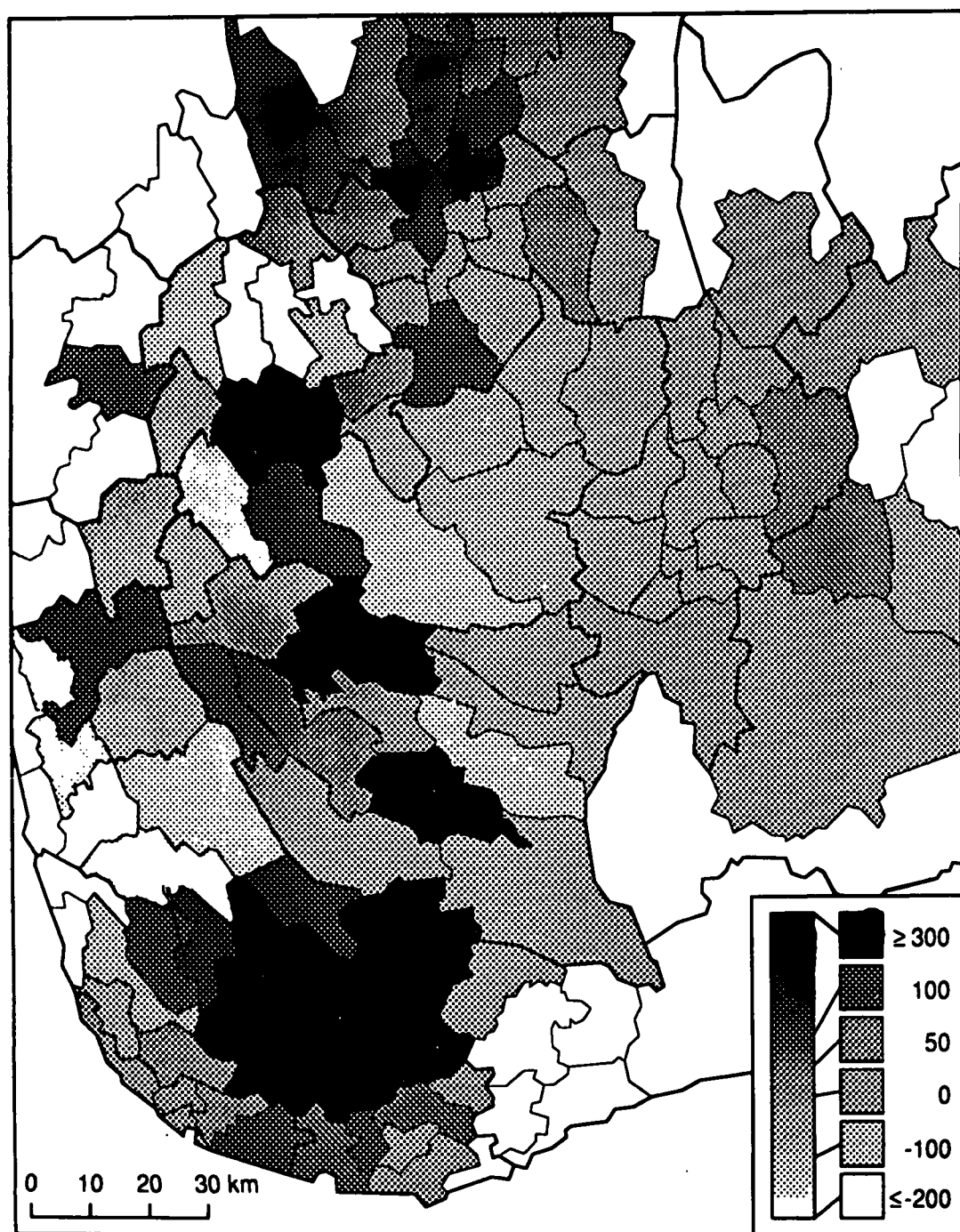


Fig. 4— Area changes of rubber versus tea between 1956 and the 1980s (in ha)

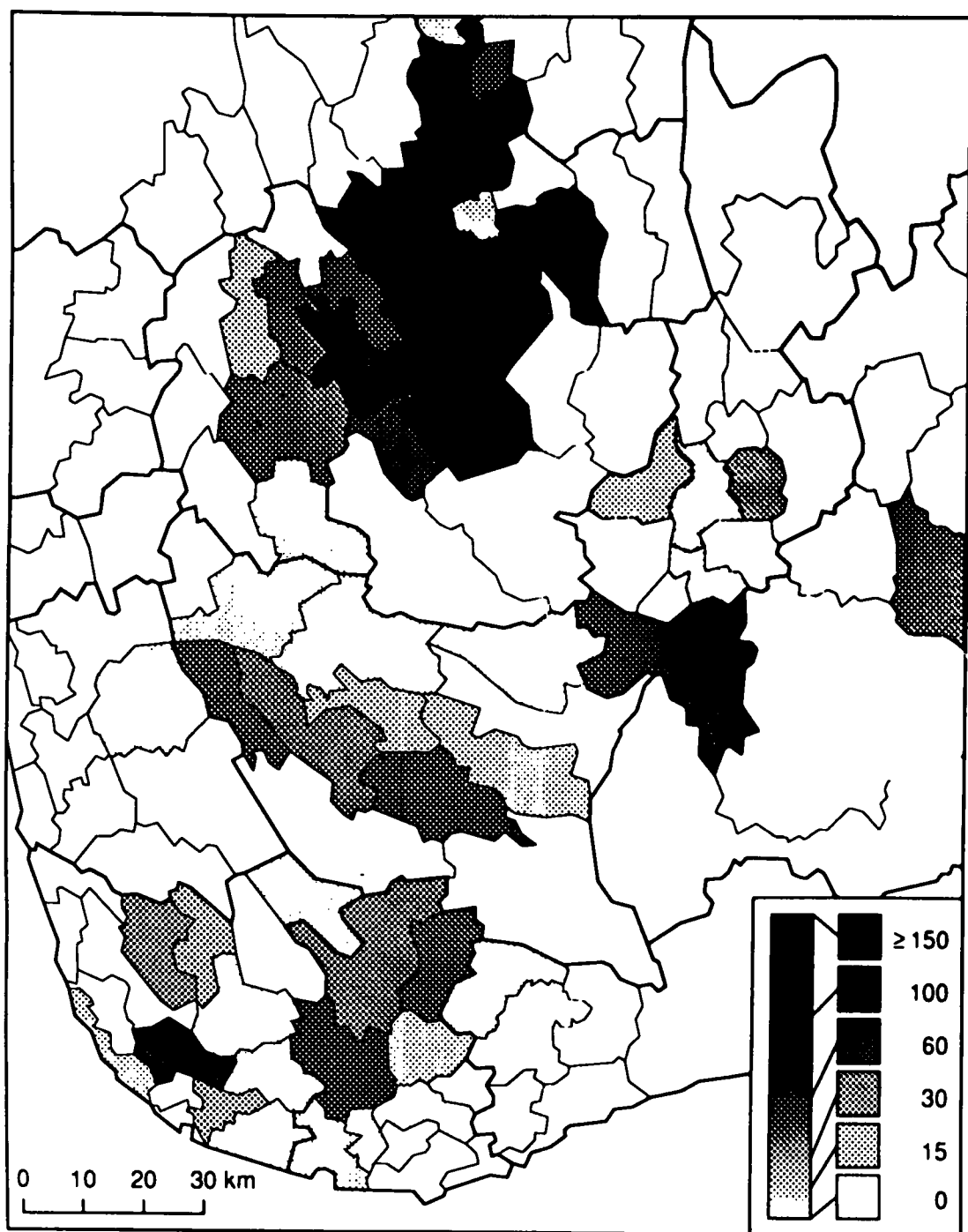


Fig. 5 – Diversification of former tea land into minor export crops (in ha; since 1956)

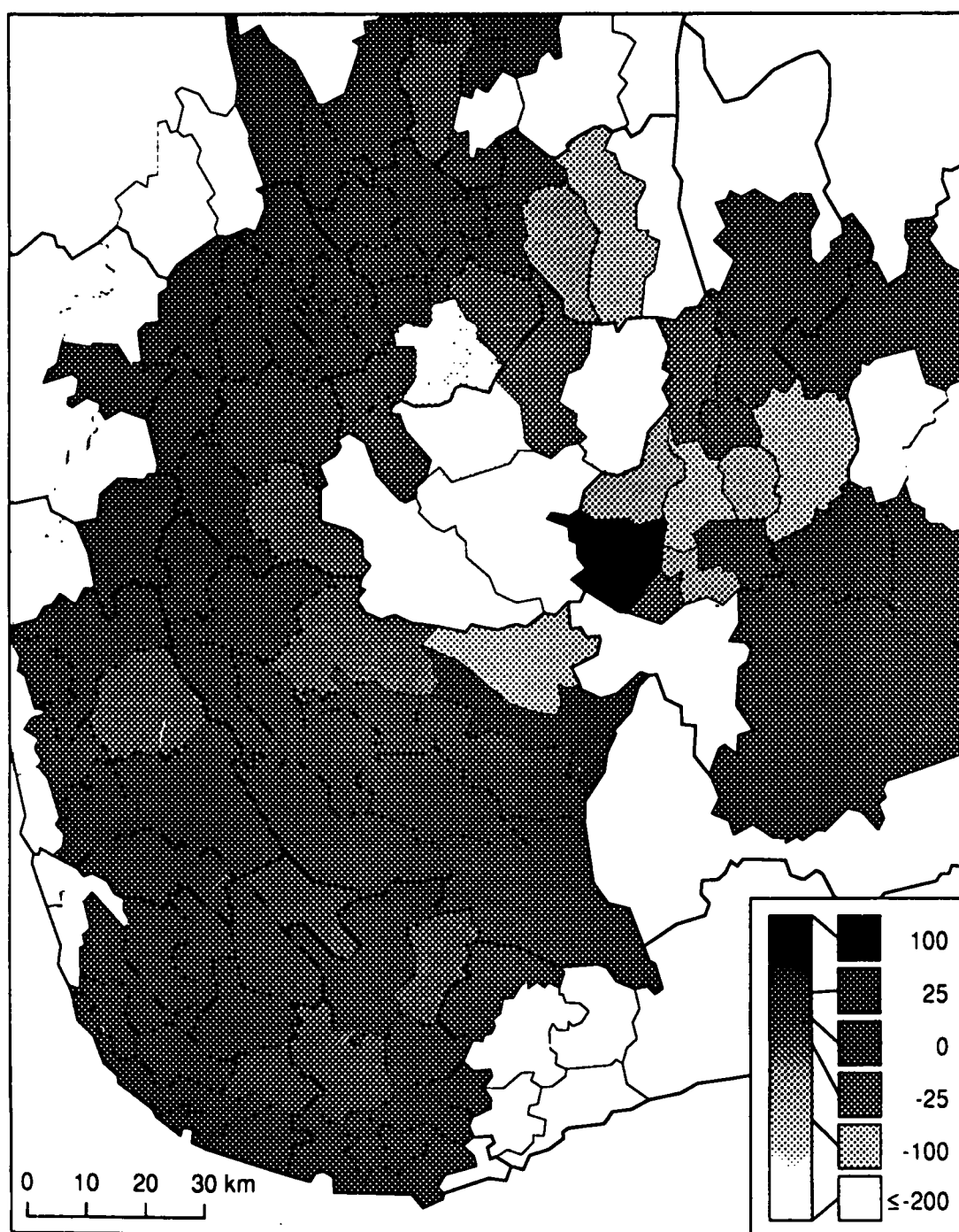


Fig. 6 – Area changes of forest plantations versus tea (in ha; from 1956 to the 1980s)

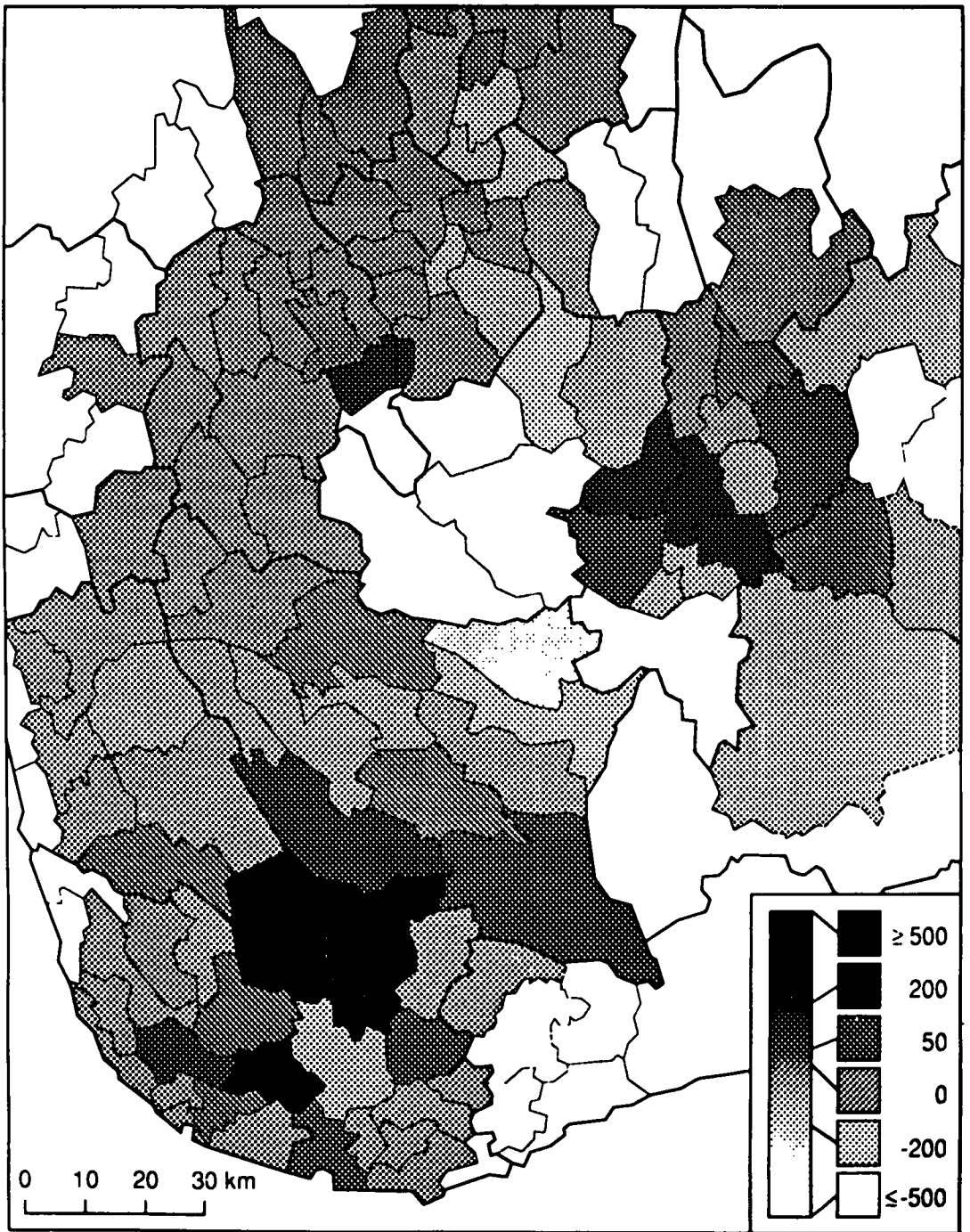


Fig. 7 – Area changes of rangeland versus tea (in ha; from 1956 to the 1980s)

shows two distinct areas of decrease on account of new tea plantations as well as a large area in the highland, the center of the island, where the opposite effect is observed. In the southern Nuwara Eliya district, Ambagamuwa Korale, Nuwara Eliya, Kotmale AGADs, in Kandy district, primarily Pasbage Korale, Panwila and Uda Dumbara AGADs, encompassing the Knuckles area, as well as in the Haldummulla AGAD and the Imbulpe AGAD of Ratnapura district we notice significant increases of rangeland on account of abandoned tea cultivations, thus building large areas of a kind of semi-artificial *Patanas*.

In central Badulla district instead, as well as to a larger extent in the northern Galle and Matara districts (Hinidum Pattuwa North and South, Morawak Korale West AGADs), a significant amount of new tea replaces former grassland. Overall in Sri Lanka, however, tea decreases led to an increase of 1600 ha of rangeland.

Sparsely used cropland

This category, including *chena* land (shifting cultivation), sparsely used rainfed upland (permanent dry cropping), and neglected and recently abandoned cultivation of plantation crops including tea, proves to be the most important one in regard to the analysis of tea area changes, area-wise, and also in regard to the potential for planning measures.

In the south, where we find an overall increase in tea, the welcome effect of converting such sparsely used cropland into the more intensive, profitable and possibly also ecologically stable tea cultivation is indicated (Fig. 8). The traditional tea districts further north all encountered strong developments in the opposite direction, most prominently the Uda Palata and Pata Hewaheta AGADs of Kandy district. Exactly these areas provoke anxieties regarding possible negative ecological impacts of the measured 20 % decrease of tea cultivation in Sri Lanka.

Forest

In many areas, especially in the areas of general tea increases in southern Sri Lanka, new tea plantations were established on former forest land. This also includes areas where in general an overall negative development of tea cultivation is observed (Fig. 9). This is indeed most alarming and every effort should be made to stop this tendency. To a lesser extent, there are the more marginal tea AGADs where the reduction of tea areas started early so that a certain amount of former tea land has developed into a new, semi-natural, secondary type of forest. Most prominent here are the Panwila and Meda Dumbara AGADs (Knuckles area) and the Uda Dumbara AGAD of the Kandy district as well as the Kotmale and Uda Hewaheta AGADs of Nuwara Eliya district.

Table 2 gives a statistical overview on all the six indicators discussed. For simplicity the changed figures are here accumulated for the entire areas of the administrative districts. It is to be noted that negative figures represent a reduction of former tea land in favour of the listed new landuse types, while positive figures stand for a corresponding increase of cultivated tea area.

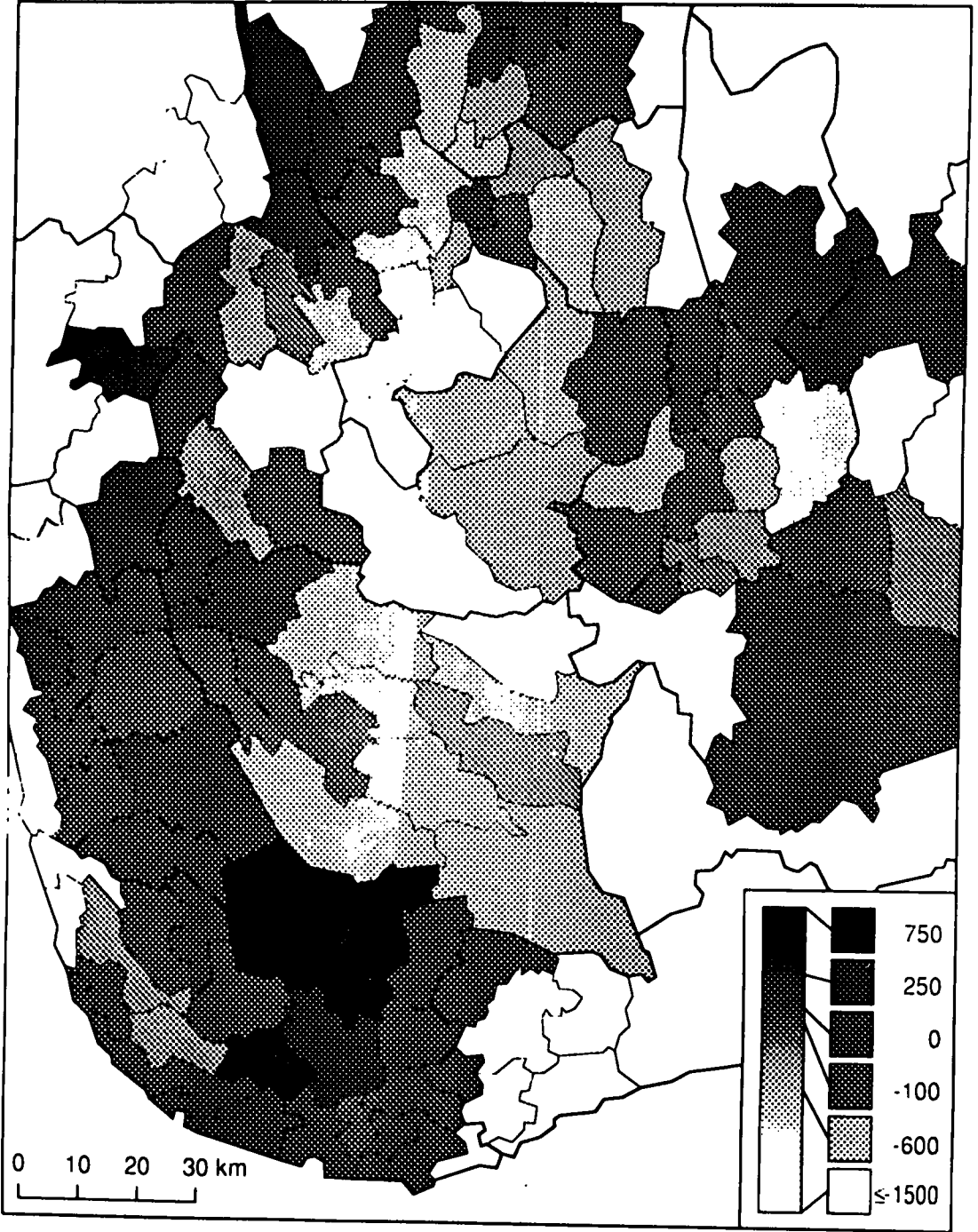


Fig. 8 – Area changes of sparsely used cropland versus tea (in ha; from 1956 to the 1980s)

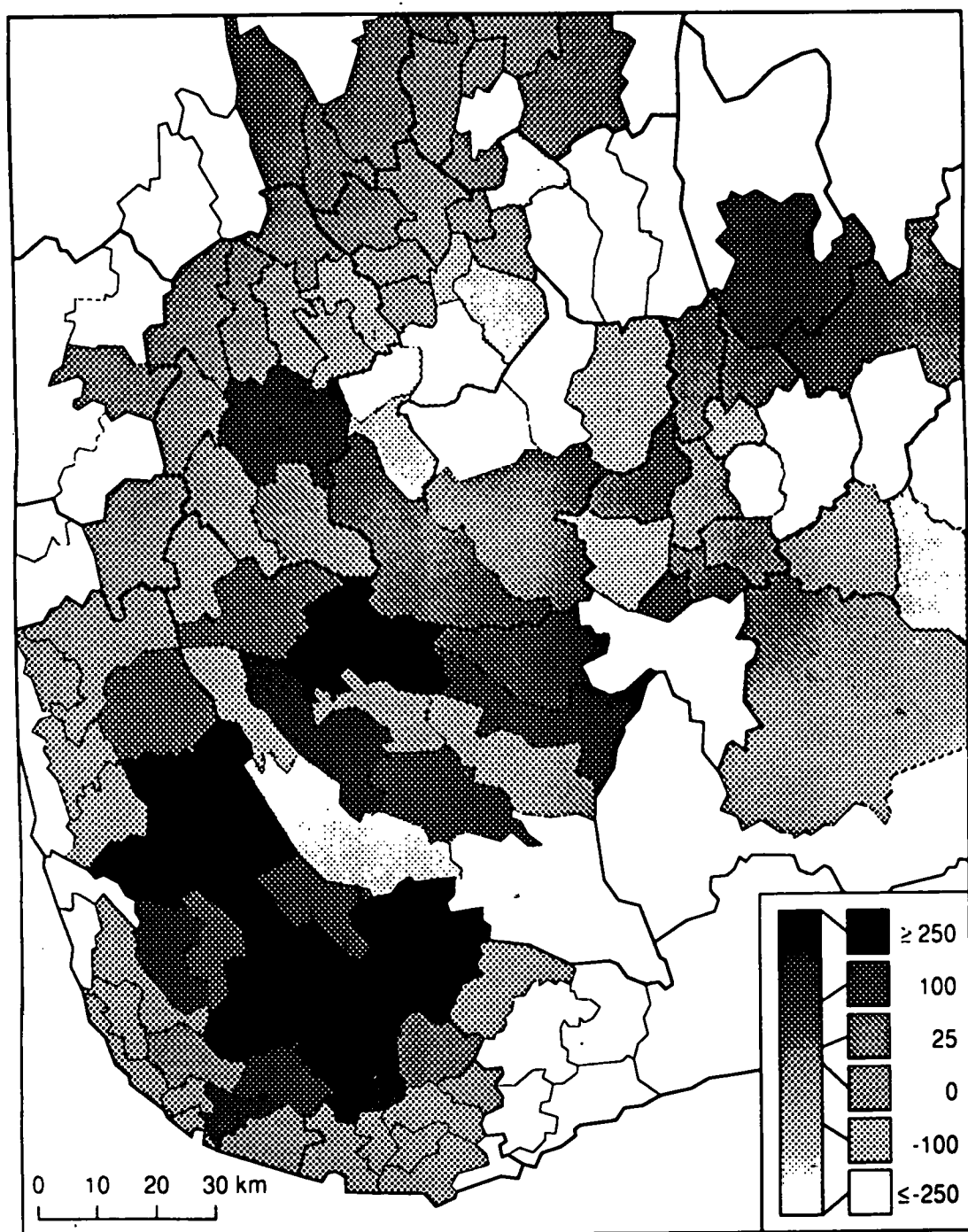


Fig. 9 – Area changes of natural forest versus tea (in ha; from 1956 to the 1980s)

TABLE 2 – Area changes of tea versus some indicator landuse categories (in ha)

	Rubber	Minor Export Crops	Forest Plantations	Rangeland	Sparsely Used Cropland	Natural Forest
Matale	266	- 349	- 427	- 486	- 1856	- 365
Kurunegala	14	—	—	8	- 23	3
Gampaha	—	—	—	—	- 10	—
Colombo	- 27	—	—	—	—	—
Kegalle	- 519	- 266	- 28	11	- 3361	51
Kandy	282	- 2061	- 305	- 1653	- 11474	- 2131
Nuwara Eliya	- 74	- 79	- 1318	- 2471	- 2722	- 402
Badulla	105	- 119	- 613	362	- 4440	- 815
Monaragala	44	- 33	5	- 80	- 344	- 129
Ratnapura	681	- 203	- 65	- 143	- 4782	560
Kalutara	- 730	- 4	- 15	- 27	- 107	934
Galle	1302	- 212	- 5	2312	1259	1449
Matara	1876	- 175	- 14	543	1231	2509
Hambantota	—	- 6	—	—	30	10
SRI LANKA	3220	- 3507	- 2785	- 1624	- 26599	1674

Note: Negative figures represent a reduction of former tea land in favour of listed landuse; positive figures represent increase of cultivated tea area.

CONCLUSIONS AND RECOMMENDATIONS

In an attempt to reply to my original question—Diversification or Ecological Threat?—I feel tempted to say: Chance for Agricultural Diversification *and* Ecological Threat.

Undoubtedly some former tea areas have been diversified into other crops, but compared to the overall decrease in tea, this has been a rather limited extent, less than 5 %. Another maximal 5 % may have been re-afforested before 1982. Newer efforts to protect the upper Mahaweli catchment area in the later years of the 1980's possibly added somewhat more to this figure. Another significant portion of former tea land was used for village expansion and other infrastructure and appears today as built-up or homestead land, roads, etc. Due to the still existing, although somewhat reduced population pressure, such a development seems unavoidable and, at least in the short-term, tolerable.

The majority of abandoned tea land, however, was just left as it was. It slowly became sparsely used cropland or rangeland, being utilized sparsely in an unplanned, uncoordinated manner. These areas are definitely prone to pose an ecological threat, especially because in many cases, the steepest (and therefore most difficult and costly to maintain and pluck) tea fields of estates had been abandoned in the first hand. Soil erosion and degradation, silting of rivers and reservoirs, land slides and other natural hazards are possible consequences from this development. All efforts should be taken by the planners and decision-makers of Sri Lanka to convert uneconomic tea land (as well as, of course, other abandoned land) into more stable and ecologically as well as economically more desirable types of landuse.

ACKNOWLEDGEMENTS

I am most indebted to Prof. Dr K. I. Itten for his continued support to my study and for all his efforts, only through which it became possible for me to attend this symposium and to complete this paper. Thanks go as well to Mr A Herzog and Mr P Schmid, Dept. of Geography, University of Zurich, for programming and documentation of the cartographic software packet "PS Copam", which was used to produce Fig. 2 to 9, and for their enormous patience and continued help to overcome all the problems and loopholes that seem unavoidably associated with computer-assisted processing and presentation of geographic data.