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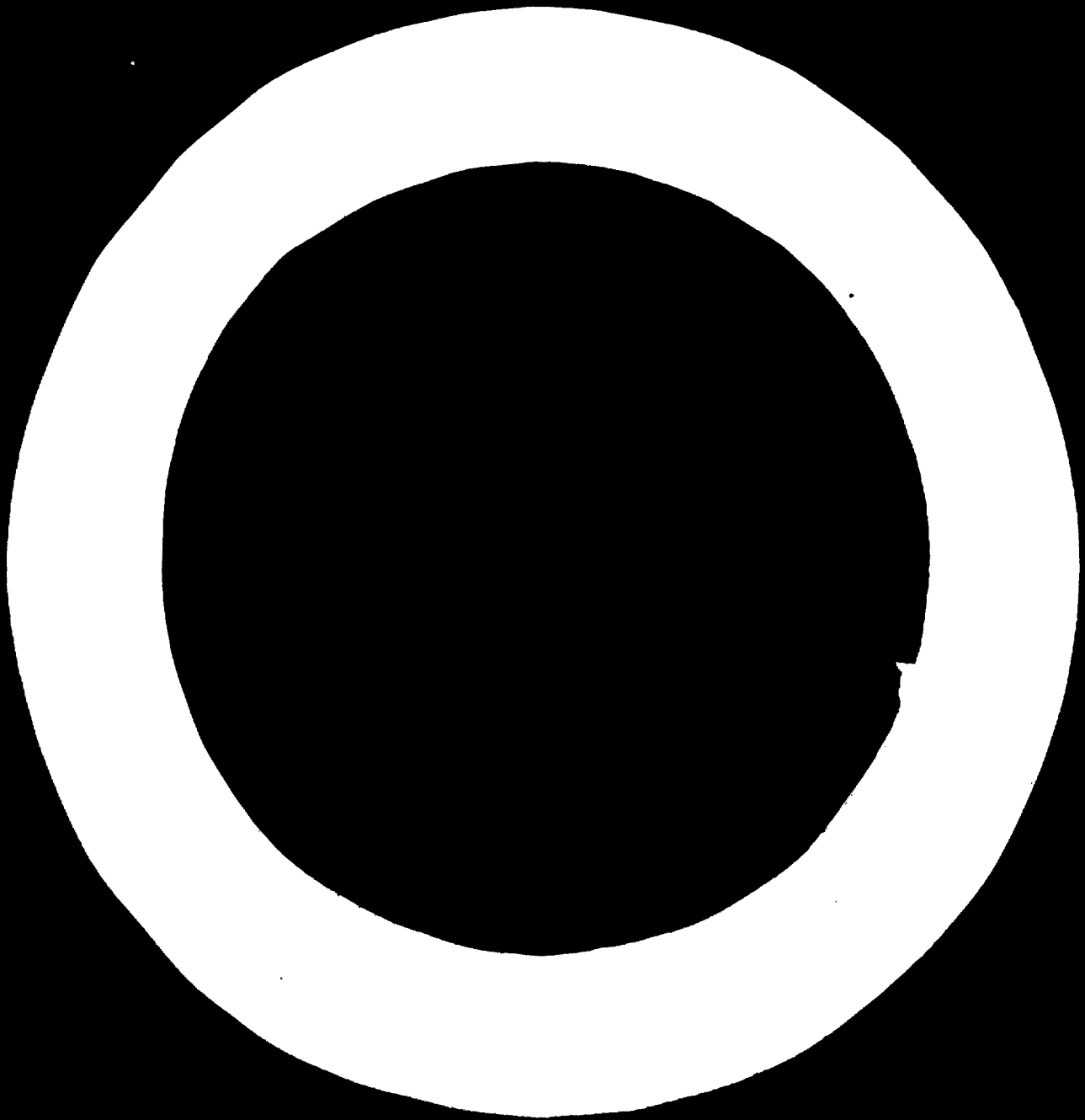Rubber

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## WORLD SYNTHETIC RUBBER MARKET IN 1980 [1]

by

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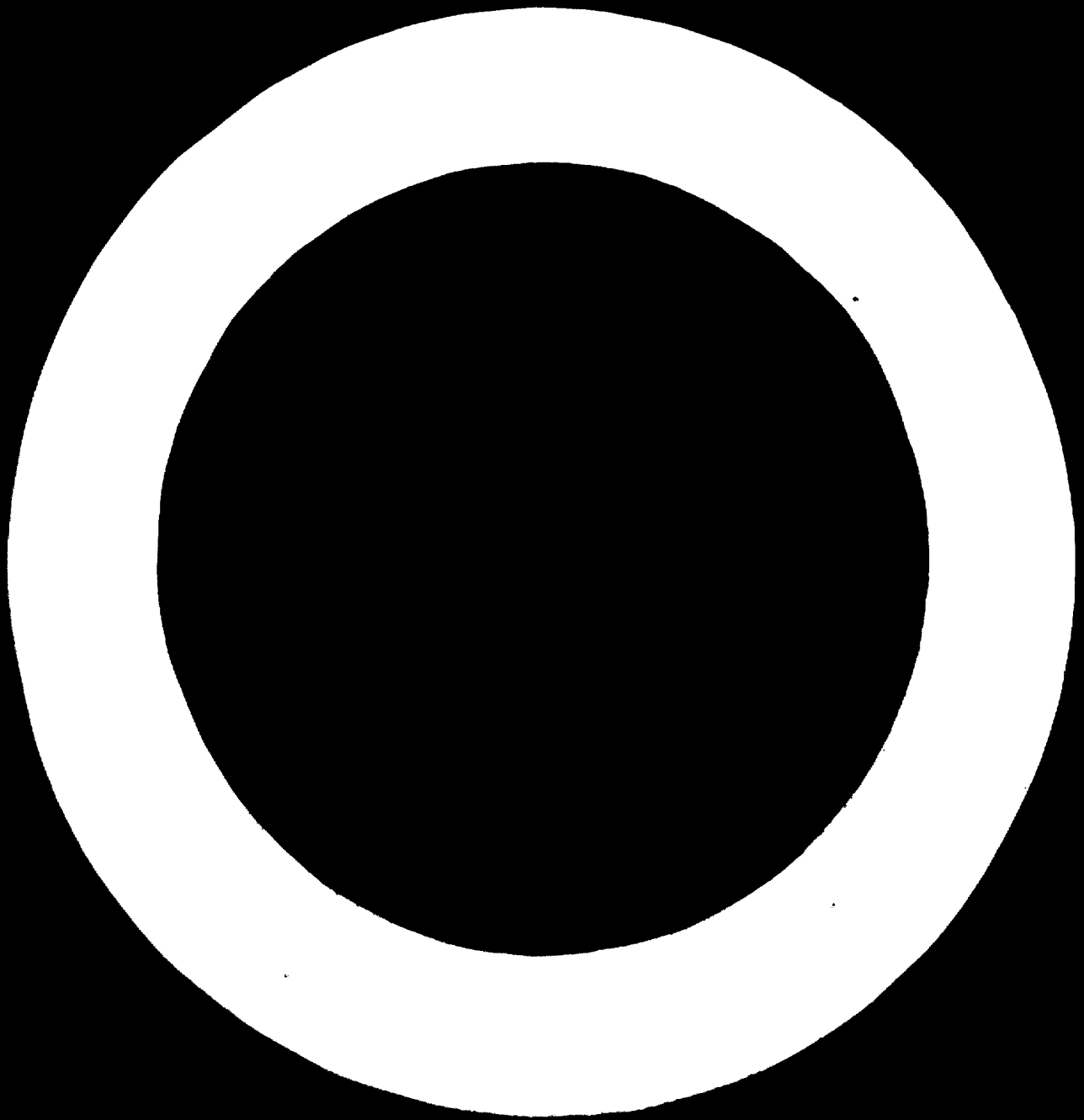
# I. BASIC PREMISES

1. Analysis of future markets for synthetic rubber (SR) is complicated by the fact that there are no official statistics for the production/consumption of SR by socialist countries. We can therefore assess the markets only for the world excluding socialist countries and in the sequel the word 'world' has this connotation.

2. It is necessary to proceed as follows. It is unrealistic separately to forecast production/consumption of SR and natural rubber (NR) and then to examine imbalances. That is not the way the system works. NR production is by its very nature relatively price-inelastic whereas the future build-up of SR capacity will be extremely dependent on future price trends. It is therefore realistic to assume that world SR capacity will more or less grow to fill the gap between total (NR + SR) rubber consumption and net NR supply, as it has done in the past. The ability or otherwise of SR producers correctly to assess the size of this gap is an important feature determining price movements both in the short- and medium-term.

3. The term 'net' NR supply has been used because part of the NR supply is consumed by the socialist countries and is thereby removed from the gross supply as far as estimates of world (ie excluding socialist countries) SR markets are concerned.

4. With this framework the problem of attempting to assess future world markets for SR can be split into three:

> (a) projection of NR gross supply
> (b) allowance for the difference between gross and net NR supply
> (c) projection of total (NR + SR) rubber demand.

5. We then use the identity that:

> market available for SR
> = total demand - net NR supply

whence, by combining information on the uncertainties in the two projections (NR supply and total demand), it becomes possible to assess the range of the market available for SR.

## II. GROSS NR SUPPLY

6. The fact must be faced that the broad pattern of NR production over the next decade is for all intents and purposes fixed now: the trees are in the ground. As with all forecasting exercises there is of course room for manoeuvre: there will be some year-to-year fluctuations (eg price-induced) which will introduce a measure of 'noise' into any forecast; some allowance must be made for future use of yield stimulants.

And major changes in the long-term price situation
would affect matters such as planting/replanting
policy though such might take a long time to work
through the system.

7.   It is a simple matter in principle to forecast NR
production by direct analysis of existing and foreseen
planted areas combined with knowledge as to future
yields.   In practice this can be done only if the
data exist.   They do, reasonably well, in Malaysia,
and P.O. Thomas published a comprehensive analysis in
1970 giving projections up to 1980 (1).   He estimated
2·13 million tons for 1980.   This estimate undoubt-
edly needs revision - upwards.   Taking into account,
for example, the Second Malaysia Plan (2), together
with wider exploitation of yield stimulants, it would
be prudent to assume that Malaysian NR production in
1980 will approach 2·5 million tons.

8.   Such calculations cannot be done with any certainty
for other main producing territories.   Some idea of
where the world total might lie can be obtained by
noting that Malaysian production has represented about
40 per cent of the total over 1960-70 with a tendency
for this percentage to rise recently (44 per cent in
1970).   If Malaysian 1980 production is 2·5 m.tons
and if this then represents 45 per cent of the total
a figure of 5·6 m.tons for world 1980 NR production
results.   This is probably near to an upper limit.
Just where the lower limit lies is a matter of judge-
ment.   For the subsequent analysis the requirement
is to assess confidence limits at a reasonable level
- 90 per cent is proposed.   Examination of various
published estimates together with recognition of the
fact that some allowance must be made for the

difference between production and supply suggests
that it would be prudent to set the upper confidence
limit at a little above the figure just noted and to
set the lower limit 1 million tons below.   Thus it
will be assumed without further discussion that <u>the
confidence limits (90%) for 1980 world NR supply
are 4.75 to 5.75 m.tons</u>.

## III.   NET SR SUPPLY

9.   Consumption of NR by socialist countries has
fluctuated around the 0.5 to 0.7 m.tons mark in the
past decade.   There is no logical framework for
projecting this into the future and all that can
rationally be done is to set arbitrary commonsensical
limits.   Here the upper limit for 1980 has been set
at 1.5, the lower at 0.5 m.tons.   It is a simple
matter to investigate the effect of changing these
limits.

## IV.   TOTAL CONSUMPTION

10. It is important to recollect that we are con-
cerned to estimate total (NR + SR) consumption by
the world excluding socialist countries.   This is
an aggregated quantity composed of derived demand
for various products in every country.   Ideally,
one would like to make product-by-product country-
-by-country projections and then to sum these in
terms of rubber consumption.   This cannot be done
simply because the data do not exist: very few

countries break down their consumption in useful
detail.    In practice one is forced to use aggregated
data even though this is an imperfect method.    For
projections up to say 10 years ahead it is perhaps
adequate.    For longer time-horizons this would not
be so and it would be essential to study growth
trends in parameters such as population, vehicles per
household and so on.

11.    Given that the data base consists of a time-
-series of world (or national) total rubber consump-
tion there are three essentially different approaches
to projection:

> (a) conventional time-series analysis
>     using a mathematical growth model
>
> (b) correlation approaches in which
>     rubber consumption is related to
>     other features such as GNP,
>     vehicles, etc.
>
> (c) econometric analysis of many
>     parameters including price.

12.    The writer believes that method (c) is basically
impracticable despite its logical attractions.    In
particular, attempts to use price as a forecasting
parameter are complicated by the fact that the price
of natural rubber follows essentially a random walk
(3) and is in principle unforecastable in the long
term.    A further difficulty is that it is now
becoming evident that the entire rubber price scene
is likely to change during the coming decade as a
result of major cost-inflation in the petro-chemical/
SR sector.

13.   Concerning method (b) it has been argued by many experts (eg R.G. Brown (4)) that the use of multiple correlations involving parameters other than that which is to be projected will almost certainly magnify the uncertainties.

14.   Method (a), supplemented where needbe by examination of parallel trends in cognate parameters (eg vehicles) is as practicable as any and has the advantage of simplicity.

15.   Orthodox time-series analysis of total rubber consumption 1950-1970 (Fig.1) using a conventional logarithmic growth model gives a median 1980 figure of 12·4 million tons (metric).   This figure is blurred by two features: (a) 'noise' - year-to-year fluctuations about the model   (b) imperfections in the model itself.   The former is assessable, the latter is not (there is nothing sacrosanct about the logarithmic model; other models can be used to fit the data very well).   For a given model the confidence limits of a projection can be obtained (5). Thus for 1980 the 90% limits with the log growth model are 11·7 to 13·2 m.tons, a range of 1·5 m.tons.

16.   It would be prudent to assign wider confidence limits than this.   The model assumes, in effect, a constant growth rate with fluctuations.   In fact, sophisticated analysis using cumulative sum techniques (6) reveals that there was a marked change in growth rate, from about 5·2 per cent per year up to 1960 to 6·9 per cent thereafter.   Thus one must guard against the possibility that world demand might 'permanently' shift back to a low growth

level or remain at the higher level. For this
reason it is reasonable to widen the limits and it
is suggested that <u>the 90% confidence limits for 1980
world total demand be set at 11.5 to 13.5 m.tons.</u>

## V.  THE SR MARKET IN 1980

17.  It will be recalled that the object of the
exercise is to assess the range of the market
available to SR by subtracting estimates of NR net
supply from total rubber demand.  To do this, it is
first necessary to convert the estimates of confidence
limits into 'standard errors of the forecasts' and
this has been done by assuming that the errors are
Normally distributed and that we are dealing in
effect with samples drawn from a large population
(neither of these assumptions is of major consequence
as far as the ultimate conclusions are concerned).

18.  For total rubber demand the standard error so
obtained is 0.6 m.tons; for NR gross supply it is
0.3 m.tons.  The standard error of the difference
is therefore 0.7 m.tons[*].

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[*] the standard error of the sum or difference of two
parameters is equal to the square root of the sum of
squares of the standard errors of the two parameters.
This holds provided that the two parameters are
independent as they are - effectively - in this case.

19.  The final calculations merely involve calculation of the median SR market (median value of total demand (12·5 m.tons) minus median value of NR net supply (5·25 m.tons minus either 0·5 or 1·5 m.tons) and calculation of the 90% confidence limits of this (median ± 1·64 times standard error).   Table I shows the result, together with growth rates for the decade based on the 1970 trend value for SR consumption (4·7 m.tons).   The same results are shown graphically in Fig.2.

Table I   SR markets (1980) and growth rate (1970-80)

| NR uptake by socialist countries (m.tons) | market (million tons) | | | growth rate (per cent) | | |
|---|---|---|---|---|---|---|
| | LL | M | UL | LL | M | UL |
| 0·5 | 6·65 | 7·75 | 8·85 | 3·6 | 5·0 | 6·3 |
| 1·5 | 7·65 | 8·75 | 9·85 | 4·9 | 6·3 | 7·4 |

(LL: lower (90%) limit;  M: median;  UL: upper limit

## VI.  COMMENTS

20.  Given the basic premise of this paper - that the future market available for SR is just the difference between total rubber demand and net NR

supply then it is hard to confute the conclusions
set out in Table I and Fig.2. True, other fore-
casters might come up with slightly different
projections and/or different estimates of the
uncertainties but there is no case for supposing
that radically different conclusions would emerge.
It is possible to argue against the basic premise;
to propose that SR can grow as it pleases, in effect
squeezing out NR. But this is not really a tenable
viewpoint: if the SR producers were to adopt such a
strategy then the relatively slight price elasticity
of NR production would see to it that prices (both
for SR and NR) would be so low that further capacity
expansion for SR would be quite unattractive and we
would have the familiar SR cycle: excess capacity -
low prices - cutback. Given the present NR supply
growth rates there is simply no room for faster
growth on the part of SR.

21. The markets and growth rates of Table I may
look remarkably low but as Fig.3 reveals the
projected situation is very much in line with
current trends. SR consumption has shown a con-
sistently declining growth rate ever since its peak
(1954-63). Gross NR supply has, conversely,
accelerated, largely a result of the massive
replanting programmes set in motion during the
1950s. The inference from the present analysis
is that growth rates for the two types of rubber
during the coming decade will tend to become rather
similar to one another.

22. As far as additions to SR capacity are concerned the inference is that it would be sensible for the SR producers to think in terms of restricting annual additions to capacity to not more than about 400 000 tons. Only if total rubber demand grows faster than the median rate (6 per cent per year) so far observed would larger capacity additions prove justified. Fig.4 portrays this, the past capacity data being from Ruebensaal (7).

23. A final point needs to be made with some force. The uncertainties in 10-year projections are far larger than most forecasters care to admit. With the techniques used in this paper the range between the 90% limits turned out to be 2 million tons for total demand and 1 million tons for gross NR supply. And there is much uncertainty attached to net NR supply because of lack of some analytical means for projecting NR uptake by socialist countries. Because of these uncertainties (and there is no honest means of resolving them) and because the size of the SR market is determined by the difference between two uncertain quantities it is inevitable that estimates of the 1980 SR market should have wide confidence limits (roughly 7 - 10 m.tons). If the future course of the world rubber scene is to develop sensibly - and both sides of the producing industry must surely wish this to be so - then the SR producers must come to terms with these limits, recognizing that these may well turn out to be much lower than earlier suppositions and simple extrapolations of past growth rates migh suggest.

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## CAPTIONS TO FIGURES

Fig.1 - World (excluding socialist countries)
total (NR + SR) rubber consumption
1950-70 with projections to 1980.
The projections are based on a logarith-
mic growth model: the broken lines give
the upper and lower 90% confidence
limits

Fig.2 - World (excluding socialist countries) SR
consumption 1956-70, showing the 1980
estimates as described in the text.
There are two median levels corresponding
to the two assumed levels of NR uptake by
socialist countries.

Fig.3 - Growth rates for SR consumption and NR
supply (exports). These are annual
rates for the ten years up to and
including the year, obtained by least-
-squares curve fitting to a logarithmic
growth model. The projected rates for
the 10 years ending 1980 are for SR
those of Table I and for NR those
corresponding to the confidence limits
assumed for 1980 supply (see text).

Fig.4 - Annual additions to SR capacity calculated
from data of Ruebensaal (7). The
suggested 'safe' future range is derived
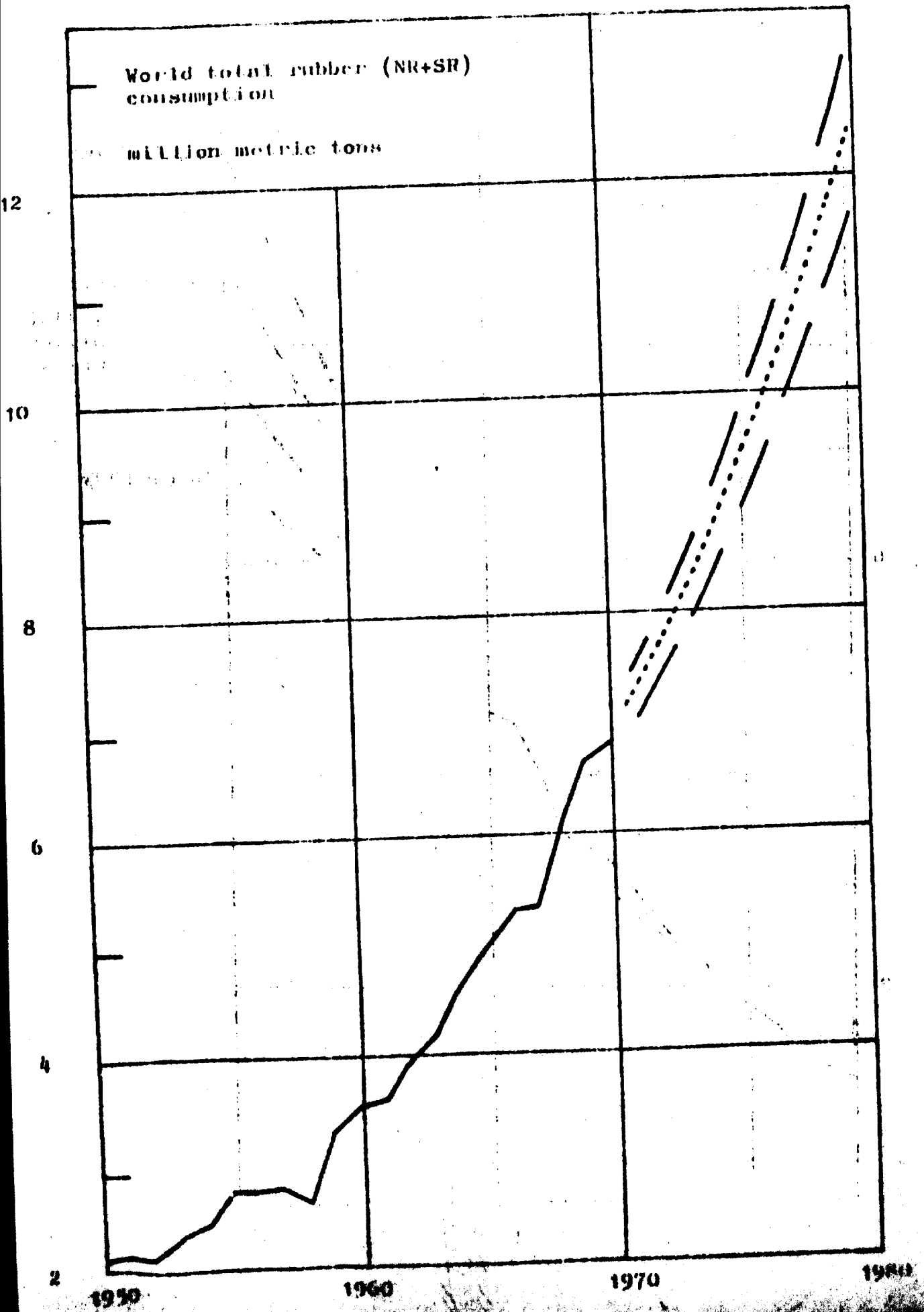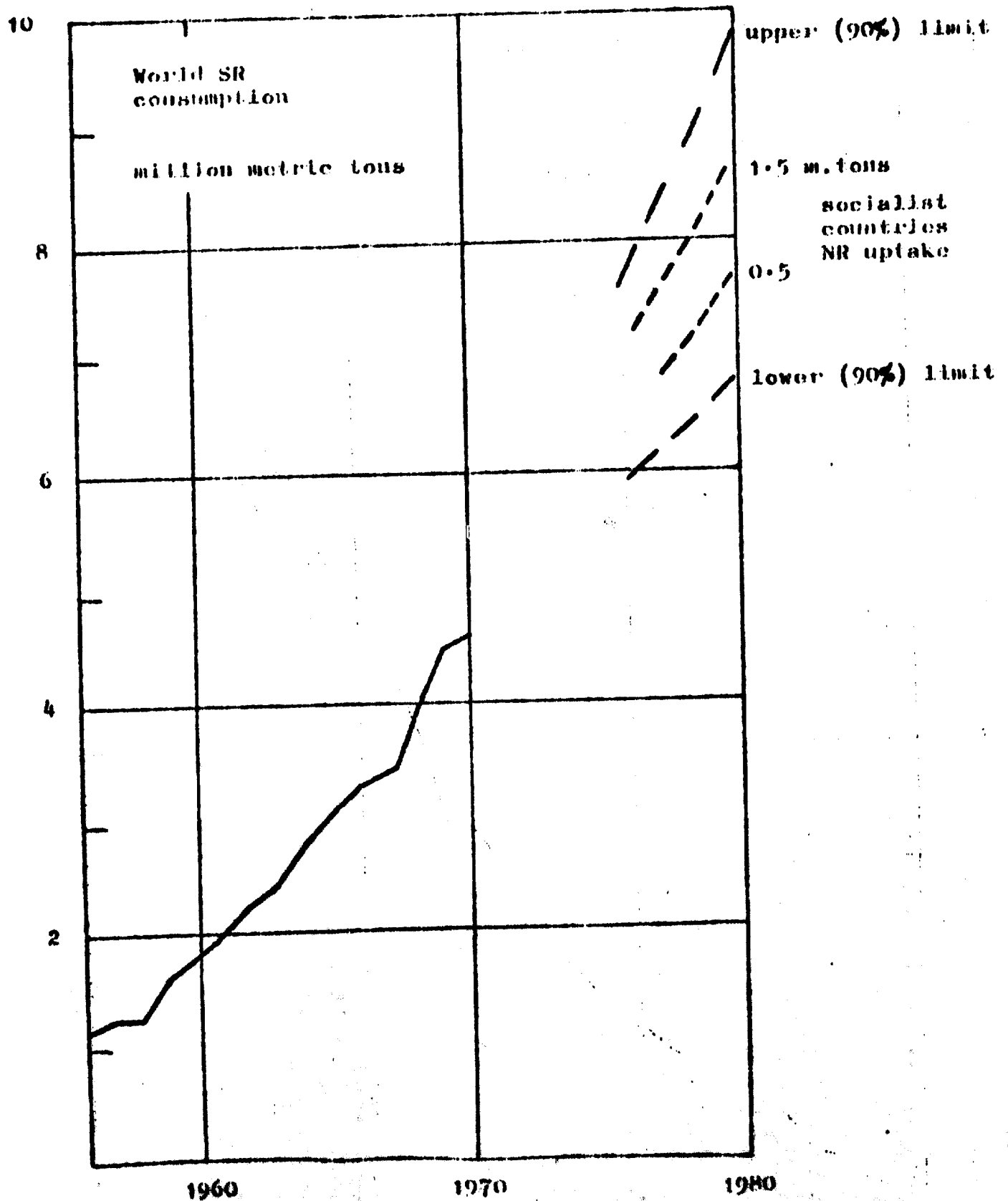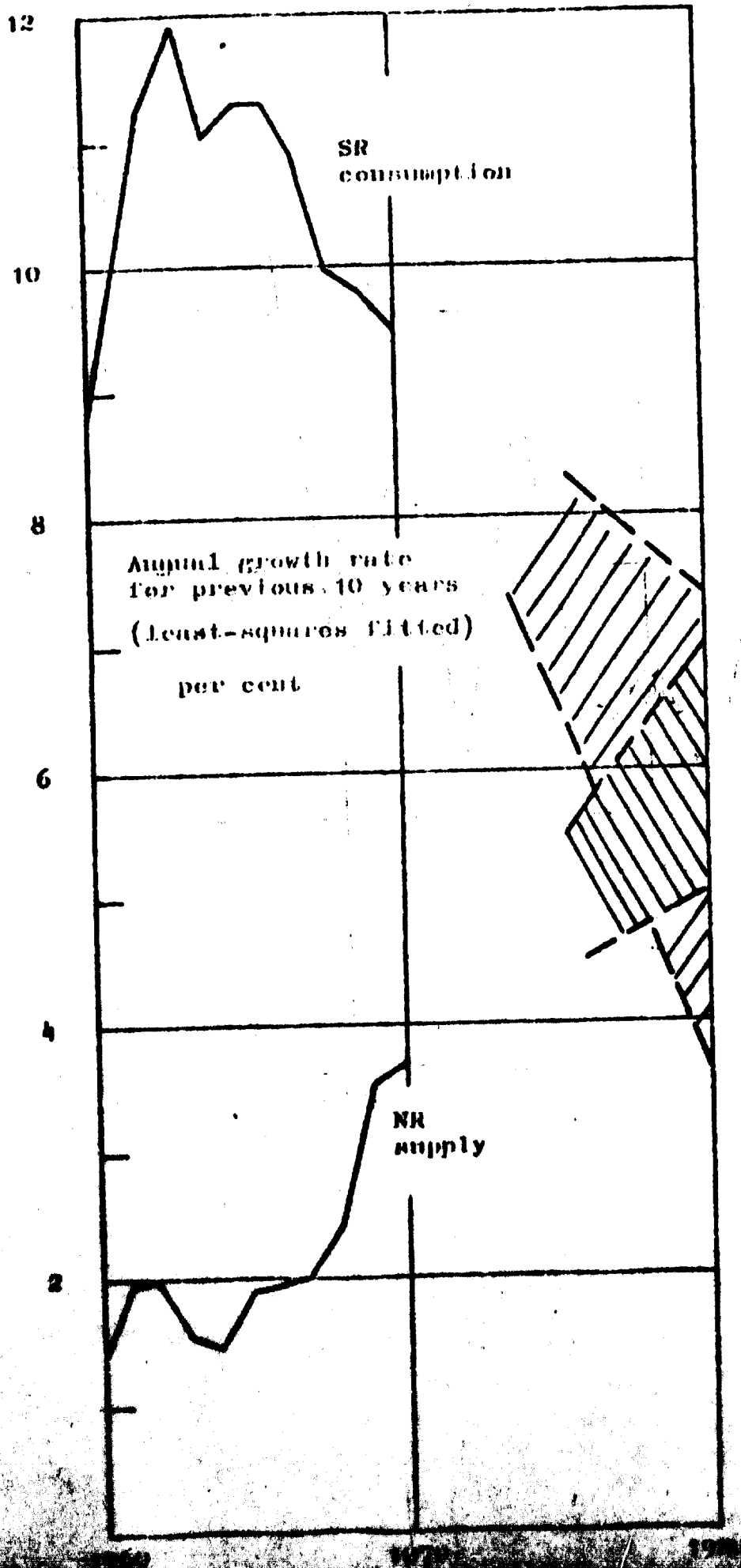from the situation as shown in Fig.2

# FIGURE 1



World total rubber (NR+SR) consumption
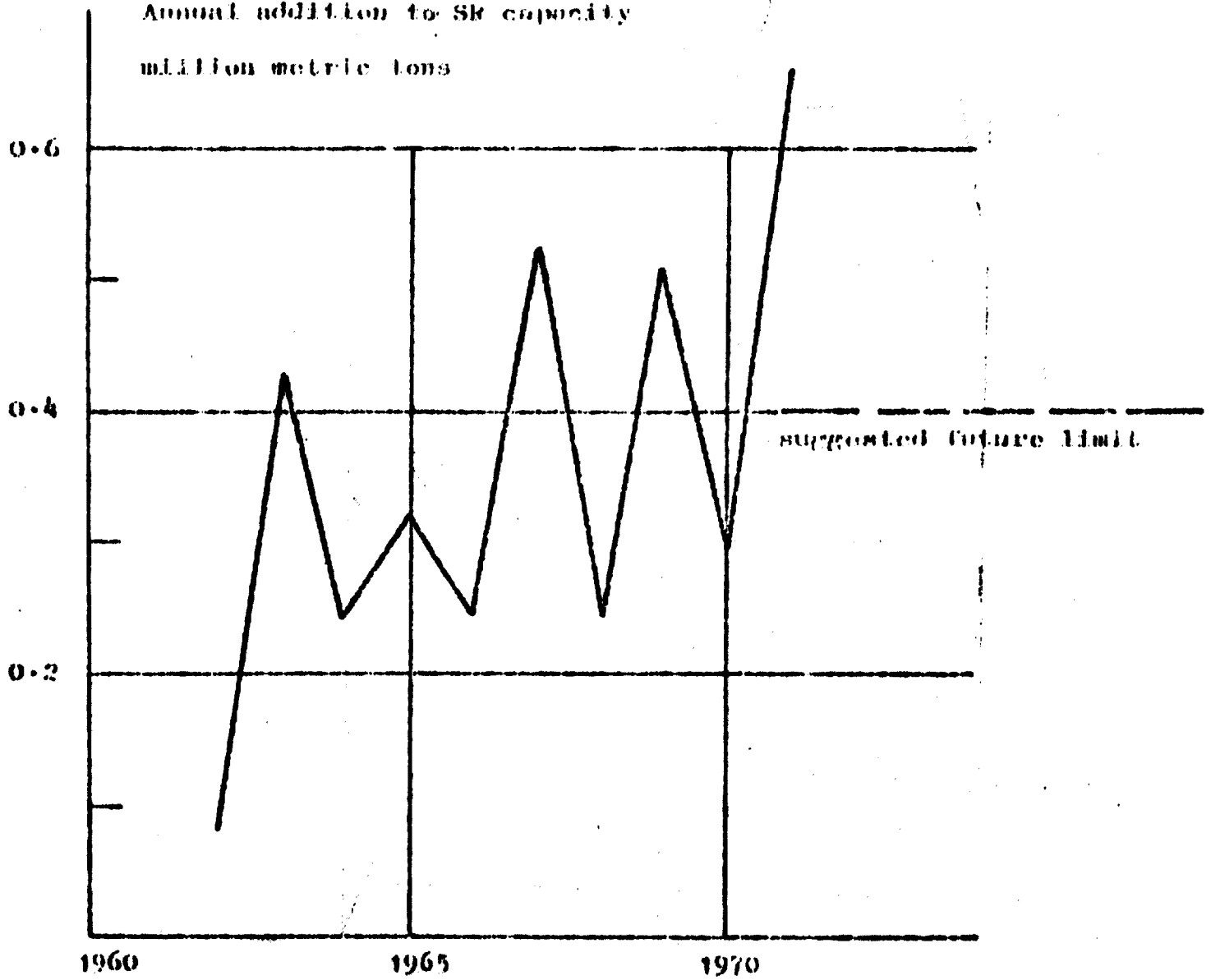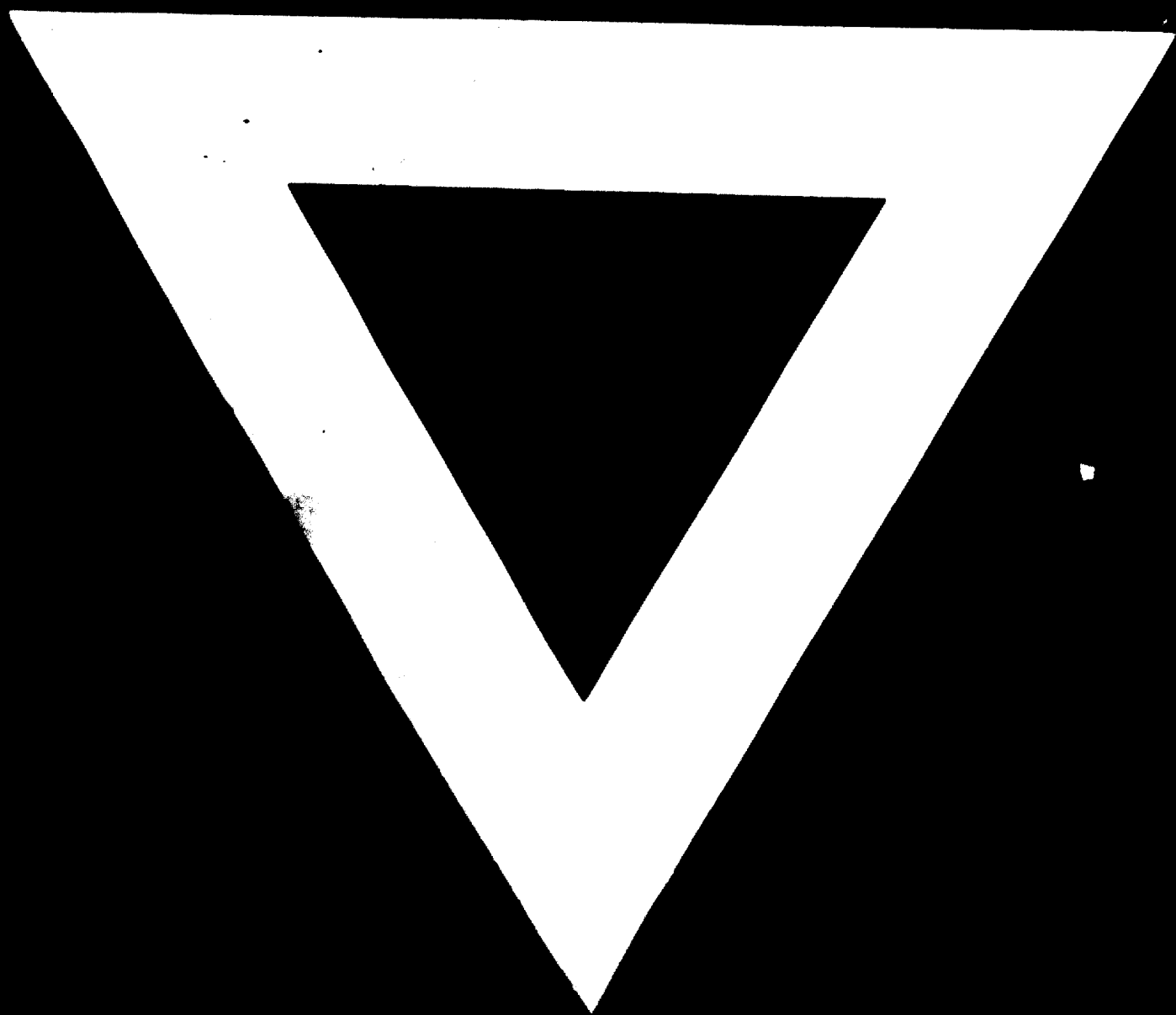
million metric tons

## FIGURE 2



FIGURE 2

## FIGURE 3

## FIGURE 4



Annual addition to SR capacity
million metric tons

0·6

0·4 ——————————————— suggested future limit

0·2

1960   1965   1970

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