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Agricultural Efficiency in Nepal

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Introduction

This paper seeks to examine the efficiency of agriculture in Nepal. The importance of agriculture in Nepal need not be emphasized. Agricultural sector contributes about 60 percent in the total CDP of the country, according to 1981 census 91 percent of the total economically active population of the country are related with agricultural activities. The need to measure and assess agricultural efficiency lies in the fact that there are now more and more mouths to be fed. The increase in agricultural production has remained insignificant but increase in population has remained rapid. The annual growth rate of population in Nepal during the period of 1971 and 1981 was 2.66 percent. But the growth rate in agricultural production during this same period was only less than one percent. It has been calculated that during the period 1972/73 to 1982/83 production of rice and maize, two most important staple crops, had negative growth rates of -0.89 and -1.26 percent per year respectively.[1] Consequently Nepal is fast losing its position as a food grain exporter and is becoming a food grain importing country. Further, there is no scope to bring more land for cultivation. When seen in these lights, the need to assess agricultural efficiency in Nepal becomes clearer. Attempts to analyse agricultural efficiency in Nepal have been few and far between. Chapagain analysing agricultural output as defined as the sum of the gross values of production of major crops (paddy, maize, wheat, barley, millet, sugarcane, jute, oilseeds, tobacco, and potato) and input variables like land, labour, fertilizer, improved seeds, modern implements, etc. revealed that total productivity of the

The author would like to extend his heartful acknowledgement to prof. Dr. Soorya Lal Amatya for providing helpful suggestions.

1. Govind P. Koirala, "Population and Economic Development in Nepal", **Occasional Papers in Humanities and Social Sciences**, Vol. 2(1985), pp. 55-63

country remained almost constant during the period 1961–1974.[2] The average annual productivity growth in all regions during the same period was positive except for the Far Western Hills. Eastern Hill and Far Western Terai showed a more than one percent growth in productivity per annum while the Western Hill the Western Terai, and the Eastern Terai showed an increase in productivity by about one half to one percent.

Analysis of aggregate crop output for major food grains (paddy, maize, wheat, millet, and barley) during the period of 1971/72 to 1979/80 revealed that the overall annual growth rate in production for the country has remained negative at -0.73 percent and the average productivity for the same crops declined by about 9 percent in the Hills and by about 1.31 percent in the Terai over the period of 1971/73 to 1977/80.[3] Amatya while examining the various related aspects of agriculture in Nepal found that the yield of food crops per hectare is higher in the Hill districts than in the Terai and the Mountain districts.[4] Using the average yields of food crops per hectare which were derived by the aggregate yield of paddy, wheat, maize, and potato Nepa; Atlas of Economic Development illustrated that the yield of food crops are comparatively much higher in the Hill districts, moderately so in the Mountain districts of Eastern and Central Regions, and quite low particularly in the Terai districts.[5] The atlas also revealed that the Mountain districts in the Far Western Region stand as distinct area of Low productivity.

Objective and Methodology

Agricultural efficiency can be measured by different methods e.g., by

2. Devendra P. Chapagain, "Agricultural Productive Pattern in Nepal and Its Regional Variations", in Bhavani Dhungana (ed.), **Research, Productivity and Mechanization in Nepalese Agriculture** (Kathmandu: CEDA, 1976), pp. 124–173.
3. Mahesh Banskota and Iswor R. Lohani, **Nepalese Agriculture: A Comparative Evaluation** (Kathmandu: CEDA, 1982), pp. 37–39.
4. Soorya L. Amatya, "Agriculture", in Mahesh Banskota and Nirmal K. Bista (eds.), **Nepalas Economy: an Overview** (Kathmandu: CEDA, 1980), pp. 192–232.
5. R. K. Shrestha and P. Sharma (eds.) **Nepal: Atlas of Economic Development** (Kathmandu: National Council for Science and Technology, 1980), p. 44.

input/output analysis, by the analysis of marketing and distribution of production, etc.

In this paper an attempt has been made to assess agricultural efficiency in Nepal in terms of a simple measure: the output per unit of land. The higher rhe output per unit of land, the higher is the efficiency of agriculture. The output per unit of land is influenced by many factors like favourable physical conditions, application of inputs and technology and a host of socio-economic factors. The output per unit of land is a reflection of all these factors.

Determining agricultural efficiency on the basis of output per unit of land was first proposed by M. G, Lendall.[6] He ranked countries according to output per unit of land for certain crops which were common to these countries. Following this method, Stamp selected certain countries and ranked each country for each crop according to output per unit of land.[7] He then averaged the ranking values to obtain 'ranking coefficients from which he determined the agricultural efficiency of those selected countries. Shaffi applied this technique to measure the agricultural efficiency in Uttar Pradesh, India.[8]

A slight variation of this technique has been used to assess agricultural efficiency in Nepal by district and by region. Instead of using ranking values of productivity (defined as output per unit of land) for each crop for each district this paper uses productivity values directly to obtain agricultural efficiency (AE) values for each district Six crops-rice, maize, wheat, millet, barley, and potato-are selected for the analysis. These crops are cropped in all 75 districts of the country. A ten year (1972/73 – 1981/82) average productivity figure is obtained for each district. Productivity is measured in terms of output in metric ton per hectare of land for each crop. Productivity for all six crops are averaged to obtain AE values for each district. To illustrate the ten year average productivity for the six crops in Darchula district are 1.91, 1.52, 0.80, 1,13, 0.83, and 4.08 metric

6. M.G. Kendall, as cited in L.D. Stamp, **Our Developing World**, Second edition (London: Faber and Faber, 1960) p. 104.
7. Stamp, **Op. Cit.**
8. Muhammad Shaffi, "Measurement of Agricultural Efficiency in Uttar Pradesh" in R.P. Mishra (ed.), **Contributions to Indian Geography: Concepts and Approaches** Vol 1 (New Delhi: Heritag Publishers, 1983)' pp. 203-215.

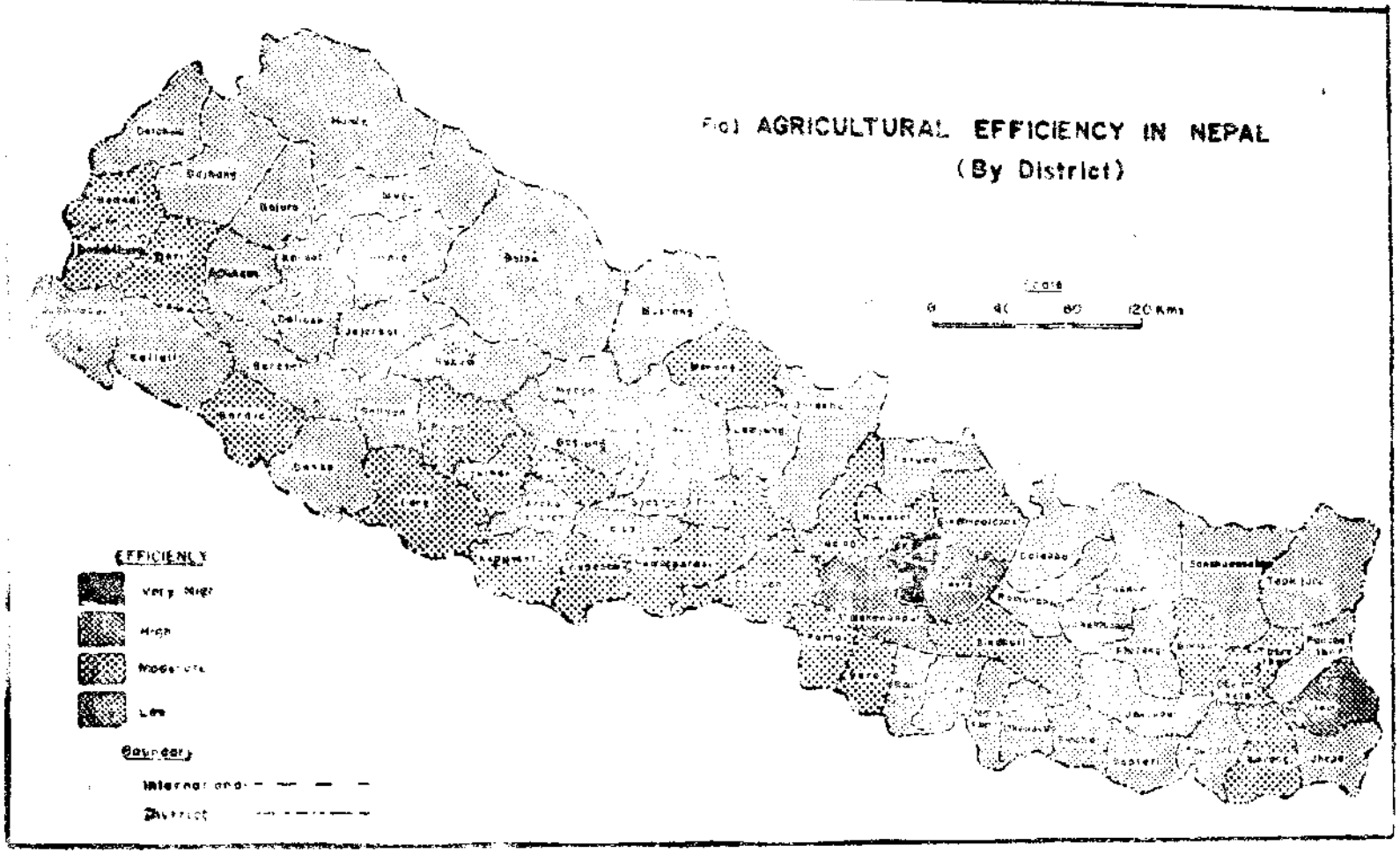
ton per hectare. These values then are averaged to obtain AE value which is 1.71. AE values for development and geographical regions are also obtained by averaging AE values of districts of respective regions.

Mean AE value for all 75 districts and their standard deviation are also calculated for the description of their efficiency. AE values below the mean are treated as indicative of low efficiency. Values between the mean and mean + one standard deviation are taken as indicative of moderate efficiency. Similarly, values between mean + one to mean + two standard deviation and mean + two to mean + three or more standard deviation have been taken as indicative of high and very high efficiency respectively. Data on productivity for the period for all six crops by district are obtained from the Agricultural Projects Service Centre (APROSC) data bank.

Agricultural Efficiency by District

The mean AE value for all districts is 2.05 with the standard deviation (SD) of 0.18. As many as 45 districts, which is 60 percent of the total number of districts, have AE values below the mean (Figure 1, Table 1). Twenty four districts (32 percent) have AE values between mean and mean + 1SD, i,e , 2.05 to 2.23. Only three districts (4 percent have AE values between mean + 1SD and mean + 2SD, i.e., 2.23 to 2.41. Similarly, there are three districts (4 percent) with AE value between mean + 2SD and mean + 3SD and over, i.e., 2.41 to 2.59 and over

Bhaktapur with AE value of 2.86 is found to be the most efficient district in the country followed by Kathmandu and Lalitpur. These three districts of the Kathmandu Valley are the only districts that can be described as the districts of very high efficiency. This very high efficiency of the Kathmandu Valley districts can be attributed to many factors. Climate in the valley is favourable for agriculture and the valley is endowed by highly fertile fluvio lacustrine soil. Most of the agricultural lands in the valley are irrigated by canals or by traditional **kulos**. The use and availability of agricultural inputs also is quite high in the Kathmandu Valley But the most important factor that make the valley most efficient from agricultural point of view is the high intensity of cultivation. The farmers of the Kathmandu Valley are famous for their intensity of the work in the field


AGRICULTURAL EFFICIENCY IN NEPAL
(By District)
Scale
0 40 80 120 Kms
EFFICIENCY
Very High
High
Moderate
Low
Boundary
International
District

In second or high efficiency group there are three hill districts–Ilam Makawanpur and Kavre. High efficiency in Ilam is the result of several factors like well managed farmlands where agriculture is practised intensively. In Ilam food crops have to compete with cash crops like tea and cardamom. As such, cultivation of food crops is carried out in an intensive way. Deforestation is comparatively less pronounced in Ilam.

Table 1

Agricultural Efficiency in Nepal by District

1. Districts of Very High Efficiency (2.41 - 2.59 and over)

Districts	AE Value
1. Bhaktapur	2.86
2. Kathmandu	2.73
3. Lalitpur	2.67

2. Districts of High Efficiency (2.23 - 2.41):

Districts	AE Value
1. Ilam	2.38
2. Makawanpur	2·33
3. Kavrepalanchok	2.24

3. Districts of Moderate Efficiency (2.05 - 2.23)

Districts	AE Value	Districts	AE Value
1. Rupandehi	2.20	13. Rolpa	2.09
2. Nuwakot	2.19	14. Sindhupalchok	2.08
3. Parsa	2.17	15. Kapilvastu	2.08
4. Pyuthan	2.17	16. Doti	2.08
5. Sindhuli	2.16	17. Bhojpur	2.07
6. Chitaun	2.16	18. Tanahun	2.07
7. Bara	2.15	19. Dadeldhura	2.07
8. Manang	2.15	20. Morang	2.06
9. Nawalparasi	2.15	21. Dang	2.06
10. Dhading	2.14	22. Gulmi	2.05
11. Bardia	2.13	23. Tehrathum	2.05
12. Dhankuta	2.11	24. Baitadi	2.05

4. Districts of Low Efficiency (below 2.05);

Districts	AE Value	Districts	AE Value
1. Kaski	2.04	24. Kalikot	1.96
2. Parbat	2.03	25. Ramechhap	1.95
3. Okhaldhunga	2.03	26. Arghakhanchi	1.95
4. Lamjung	2.03	27. Dolpa	1.95
5. Panchthar	2.02	28. Sankhuwasabha	1.95
6. Mahottari	2.02	29. Palpa	1.95
7. Udayapur	2.01	30. Khotang	1.94
8. Taplejung	2.01	31. Dolakha	1.94
9. Sunsari	2.01	32. Siraha	1.94
10. Saptari	2.00	33. Baglung	1.93
11. Syangja	2.00	34. Bajhang	1.92
12. Myagdi	2.00	35. Sarlahi	1.91
13. Surkhet	2.00	36. Mugu	1.91
14. Rasuwa	2.00	37. Gorakha	1.90
15. Mustang	1.98	38. Kanchanpur	1.89
16. Banke	1.98	39. Jajarkot	1.89
17. Rukum	1.98	40. Achham	1.88
18. Dailekh	1.97	41. Jhapa	1.88
19. Solukhumbu	1.96	42. Kailali	1.87
20. Sallyan	1.96	43. Humla	1.87
21. Rautahat	1.96	44. Bajura	1.84
22. Dhanusha	1.96	45. Darchula	1.71
23. Jumla	1.96		

Source; Derived from ten year (1972/73–1981/82) productivity data provided by APROSC.

agricultural efficiency of the district. High efficiency in Makawanpur probably is the result of the fact that agriculture in this district is practised in flatlands and valleys which have good quality soil. The district also have favourable climatic conditions. High efficiency in Makawanpur may also be the result of the close proximity of the district with the Kathmandu Valley. High efficiency in Kavre is attributable to the fact that it includes highly fertile extensive valleys like Banepa Valley, Valley of Panchkhal, etc. where system of agriculture is similar to that of the

Kathmandu Valley.

Twenty four districts have shown moderate agricultural efficiency. Nine of these are Terai districts, two are Mountain districts and the rest 13 are Hill districts. About 60 percent of the districts are Hill districts Terai districts account for about 33 percent and the Mountain districts for about 7 percent. This fact shows that the Hill districts are more efficient than the Terai districts which are considered more fertile and more productive. High efficiency of the Hill districts is attributable to the fact that majority of agricultural works in the Hills are concentrated in the fertile river valleys where soil type is alluvial. But again the most important factor for high efficiency of agriculture in the Hills, as in the case of the Kathmandu Valley, is the intensity of agriculture. In the Hills there are few good agricultural lands but population pressure is very high. As such agriculture in the Hills is conducted more intensively than in the Terai. Rupandehi with moderate efficiency, is found most efficient among the Terai districts. One important point to note is that Terai districts do not appear in the first two very high and high efficiency groups. This point also shows that the Terai districts have comparatively low agricultural efficiency. Another point to note is that Manang which lies in the Inner Himalayan Valley region also shows moderate agricultural efficiency despite the fact that it has unfavourable climatic conditions.

As many as 45 districts have low agricultural efficiency. Stated otherwise, 60 percent of our districts have low agricultural efficiency. This is a very high percentage. Darchula, westernmost district of Nepal a Mountain district, the lowest AE value of 1.71. Among 16 mountain districts 14 have their AE values below the mean. Two mountain districts, Manang and Sindhupalchok, have moderate efficiency. Low efficiency of nearly all Mountain districts is mainly due to harsh physical environment. e.g. short growing season, low temperature, poor quality soil, low precipitation in the case of the Mountain districts lying in the western half of the country. Absence of irrigation, very low agricultural inputs, extensive method of cultivation, etc, are also responsible for low agricultural efficiency in the Mountain districts. Due to unfavourable environmental condition agriculture is not the only occupation of the people living in these areas. They are also engaged in livestock raising and trading activities.

Among the 20 Terai districts more than half i.e., 11 districts have

below the mean (Figure 2, Table 2). Five regions (31 percent) have AE values between the mean and mean + 1SD, i. e., 2.06 to 2.26. No regions have AE value between the mean + 1SD and mean + 2SD, and only one region (6 percent) have AE value between the mean + 2SD and mean + 3SD and over, i. e., 2.46 to 2.66 and over.

As in the case of district agricultural efficiency, the Kathmandu Valley with AE value of 2.75 is the most efficient region of the country and this is the only region that belongs to very high efficiency group. As already noted down, gently rolling valley plain with fertile fluvio lacustrine soil, favourable climatic conditions, irrigation facility to major part of the cultivated land,high agricultural input, high intensity of agriculture, etc. make the Kathmandu Valley most efficient agricultural region.

Gap between the Kathmandu Valley and other regions in agricutural efficiency is found to be high as indicated by the absence of any region in high efficiency group. Among five regions of moderate efficiency two are from the Terai - Western and Mid Western Terai, two are from the Hills - Central and Eastern Hills, and one is from the Mountain - Western Mountain. Central Hill with AE value of 2.17 shows highest efficiency in the group followed by the Western Terai (AE value - 2.14). Moderate efficiency in the Central and the Eastern Hills, as already noted down, is the result of intensive method of agriculture in these regions. Population pressure in these regions is very high and there is limited availability of arable lands. Agriculture in these regions is confined to valley floor and on lower hill slopes which are terraced. As such agriculture in these regions is practised intensively. Soil fertility is maintained and increased by putting either chemical fertilizers or farmyard manure and compost, availability of irrigation and alluvial soil.

Table 2

Agricultural Efficiency in Nepal by Region

1. Regions of Very High Efficiency (2.46 - 2.66 and over):	
Regions	**AE Value**
1. Kathmandu Valley	2.75
2. Regions of High Efficiency (2.26 - 2.46):	
None	

3. Regions of Moderate Efficiency (2.06 – 2.26):

Regions	AE Value	Regions	AE Value
1. Central Hill	2.17	4. Western Mountain	2.07
2. Western Terai	2.14	5. Mid Western Terai	2.06
3. Eastern Hill	2.08		

4 Regions of Low Efficiency (below 2.06):

Regions	AE value	Regions	AE value
1. Central Terai	2.05	6. Eastern Terai	1.98
2. Central Mountain	2.05	7. Eastern Mountain	1.97
3. Far Western Hill	2.02	8. Mid Western Mountain	1.93
4. Mid Western Hill	2.01	9. Far Western Terai	1.88
5. Western Hill	2.00	10. Far Western Mountain	1.82

Source: Derived from ten year (1972/73 – 1981/82) productivity data provided by APROSC.

Moderate efficiency in the Western and Mid Western Terai probably is the result of the fact that much of agricultural land in these regions is newly cleared forest land where soil is not exhausted and has plenty of plant nutrients. The Western Mountain also shows moderate agricultural efficiency despite the fact that it has unfavourable physical environment, agricultural inputs in the region is very low and the system of farming is extensive. Moderate efficiency of this region probably is the result of the fact that agriculture in this region is confined to the river valleys where soil quality is also of moderate fertility.

Among ten regions of low agricultural efficiency four are mountain regions and three regions each are from the Hills and from the Terai. Far Western Mountain with AE value of 1.82 has lowest agricultural efficiency of the regions. Far Western Terai and Western Hill have lowest agricultural efficiency among the Terai and the Hills respectively. Low efficiency of Mountain regions is due to unfavourable physical environment. But the Terai region presents a contradictory situation. With flat and fertile lands and favourable climatic conditions the Terai should have shown a high degree of agricultural efficiency. But AE values of some Terai regions are lower than the AE values of the Hills and even the Mountain regions. Far Western Terai has second lowest AE value of all regions. Eastern Terai has AE value lower than

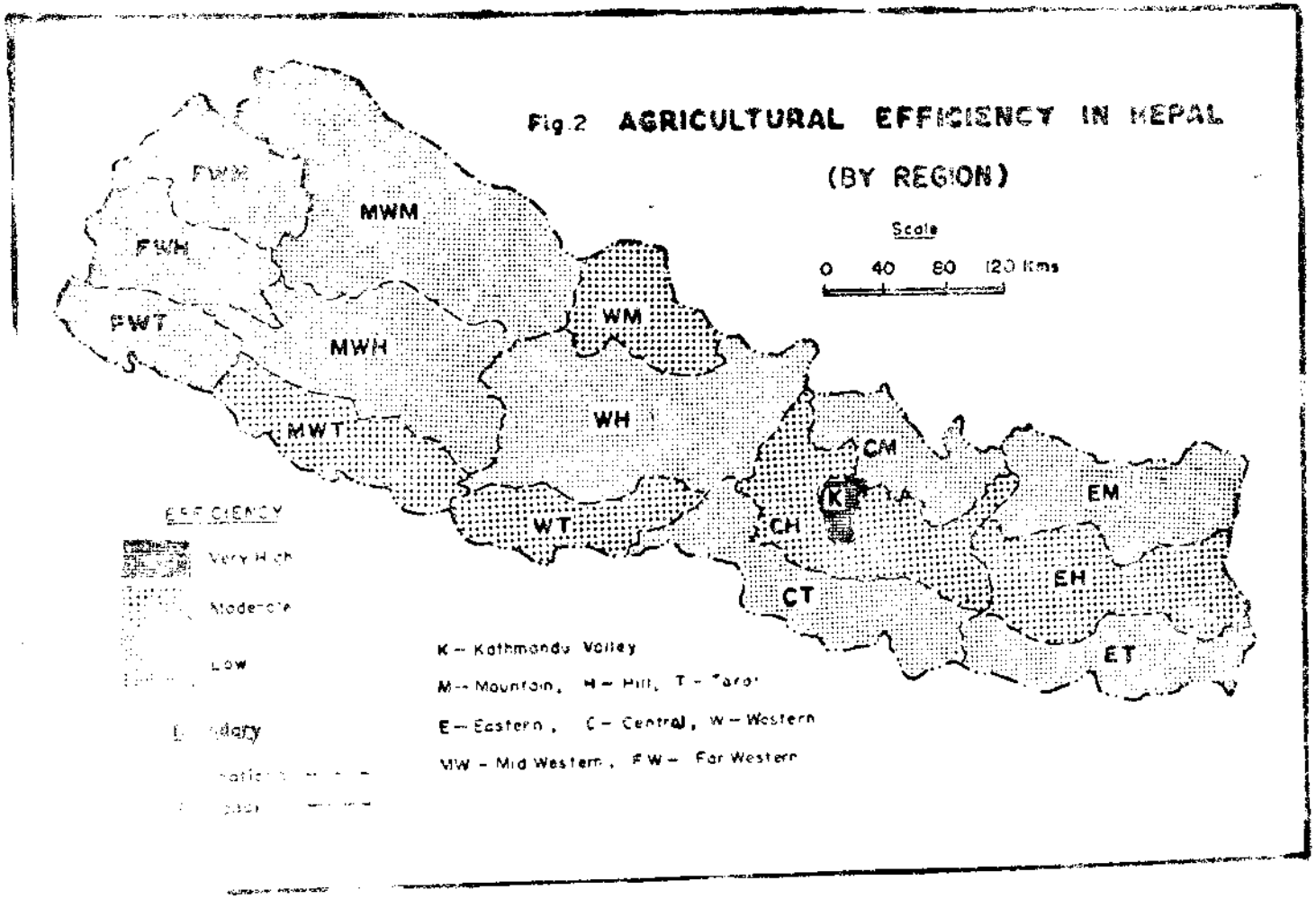


Fig.2 AGRICULTURAL EFFICIENCY IN NEPAL
(BY REGION)
Scale
0 40 80 120 Kms
FWM
MWM
FWH
FWT
MWH
WM
WH
MWT
WT
CM
K
CH
EM
EH
CT
ET
EFFICIENCY
Very High
Moderate
Low
K – Kathmandu Valley
M – Mountain, H – Hill, T – Tarai
E – Eastern, C – Central, W – Western
MW – Mid Western, FW – Far Western

all Hill regions and two Mountain regions. AE values of remaining Terai regions are also not much high. Why are the AE value for the Terai low ? Relatively speaking the physical environment of the Terai is favourable for agriculture, transport facilities are available to market the agricultural products in internal as well as external markets. New agricultural innovations are available due to transportation facilities and also due to close proximity with Indian markets. Furthermore, more than 90 percent of available irrigation facilities in the country are concentrated in the Terai regions. Despite all these favourable conditions the Terai show low agricultural efficiency. This is attributable to the fact that in the Terai there has a very low degree of intensity in agriculture. This is more so in the Eastern and Central Terai where AE values are lower than the western and Mid Western Terai.

If low intensity of farming is the major reason behind low AE values for the Terai, the reasons for this low intensity merits attention from a policy point of view. Existing system of tenancy, comparatively low population pressure relative to the Hills and a host of socio-economic and institutional factors, are probably responsible for low agricultural efficiency in the Terai. An understanding of these factors is essential for the formulation and implementation of policies and programmes designed to raise productivity per hectare in the Terai.

Conclusion

This study has revealed that most of the districts have low agricultural efficiency. Kathmandu Valley districts have highest agricultural efficiency in the country. Districts adjoining the Kathmandu Valley have high to moderate efficiency. In general, the Hill districts show higher efficiency than the Terai and the Mountain districts. Among the Hill regions Central and Eastern Regions show comparatively high efficiency. Similarly, the western Terai and the western Mountain Regions evidence comparatively high efficiency in the Terai and the mountains respectively. Far western Mountain Region emerges as a distinct area of low agricultural efficiency.

Since a large percentage of districts have AE values below the mean there is enough scope to increase the agricultural efficiency in Nepal. This potentiality is higher in the Terai districts due to the favour-

able physical environment and the existing infrastructure for agricultural development. If agricultural efficiency of the Terai districts can not be raised 'very high' level in the short run, we should be able, at least, to raise it above the national average. Efforts towards intensifying the farming system in the Terai are therefore essential. Since much of the land is kept fallow in winter the system of double cropping should be encouraged which will increase the gross area for cultivation considerably. But increase in production per unit of land would be possible only after the availability of perennial irrigation facility. Availability of irrigation will considerably increase the agricultural efficiency of the Hill districts. Crop identification, in terms of which crop will give optimum result from the particular type of the land is also important. Identification of agricultural regions on the basis of climatic, soil and crop suitability conditions is of utmost importance for framing regional policies for agricultural development.