Typology of Physical-Geographical Factors for Rural Planning

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Introduction

Rural areas should not be seen, however, just as the source for population pressures upon the towns. They are also, potentially at least, the "breadbasket" of the nation. Rural areas need to be nurtured, not neglected. Sensible rural land management and planning is only possible if an evaluation has been made of the resources and limitations, not only in terms of human, political, and economic factors, but also in terms of the physical character of the land.

Regarding financial resources distribution as well as research and planning, rural areas have always been relatively neglected. As the result of concentration of population, capital and life quality in towns, in general, rural areas are considered to be a source of population pressure on towns as well as agricultural zone with the prime purpose to feed its own population (self-content and independence of agricultural production), with a potential to export in case of so-called agricultural surplus.

It causes certain limits in rural planning: evaluation of rural potential comes as the basic prerequisite for the efficient planning and utilization, not only from the standpoint of political and economy factors, but also in terms of physical characteristics of the land.

Rurual Land Evaluation

The aim of any rural land evaluation is its classification based on its suitability to define ways of land use. In addition to that, information of vital significance is land suitability for agriculture production. The quality of its pedologic cover, steepness of its slopes, natural land drainage and climate character, in addition to other factors, must be analyzed in order to obtain the most adequate estimation of land suitability for agriculture.

The starting point for any rural land evaluation is mapping and systematic recording of the physical characteristics of the land surface.

The evaluation type and procedure depend on the area size, purpose of the evaluation itself and resources available: anyhow, a preferred sequence of operations would be (Dent &Young, 1981):

1. Examination (interpretation) of satellite and aerial shots;
2. Additional site research;
3. Analysis of gathered information;
4. Lab analysis of soil specimens and field monitoring;
5. Mapping (map compilation);
6. Report preparation.

Certain general classifications of land capability already exist and some of them have been widely used in terms of the world level: FAO, USDA, LUCC etc.

Physical features of land are mostly shown as resources or limitations in terms of a possible breeding of certain agriculture cultures.

The fundamental physical-geographic research results were therefore used in order to evaluate a possible agricultural output, i.e. they have to be relevant for land use planning (example: studies of insolation impact on land use). In relation to that, the land could be classified on the basis of its economy or ecology quality in order to perform their conservation and revitalization by planning.

It is necessary to point out that land physical-geographic research is not the only relevant one for the needs of the evaluation, but it is necessary to have an interdisciplinary approach in the research. We would like to point out that, in spite of the research scientific basis, the evaluation process itself is affected by certain subjective attributes, based on individual opinions and estimations, especially in choosing the most adequate land piece for a certain purpose (Lichfield, et al., 1975).

Therefore, the land evaluation must be seen only as one of many approaches that are useful in rural planning.

Water Resources

An agricultural development can not be planned without knowledge on water supply potentials. Water supply potentials can be investigated on the level of national or regional planning, or based on special studies for certain rural regions. Research, evaluation and mapping of surface and underground water resources are a continuous need, especially in terms of safe potable water.

Irrigation projects, in this sense, are one of typical solutions; being very demanding enterprise in terms of investments, they demand serious physical-geographical research prior to engineering phase.

The parameters that must be included into the research are as follows (Mahler et al., 1970):

- Climate;
- Geology;
- Geomorphology;
- Hydrogeology;
- Pedology.

The results of the above research must be known prior to socio-economic analyses and engineering assessments (i.e. before the feasibility study) and the draft of the major project.

Soil Resources

Soil resources research is done within a special pedologic/pedo-geographic study and gives information on the structure, texture, rooting depth, drainage and stoniness (as major physical features).

Mapping of the land is also done by traditional methods and stereoscopy. The obtained results can be used for soil classification based on its suitability for farming (certain cultures growing) or as the basis for land managing, as one of the basic premises for rural planning.

The study has to contain the following information as well:

- Drainage requirements;
- Artificial fertilizers to be applied;
- Machinery types that must not be used;
- Need for inter-cropping to prevent erosion;
- Need for terracing, contour ploughing or other conservation measures;
- Need for fallow periods/crop rotation (Young,1978).

Botanical Resources

Even though all botanical resources are endangered, a special problem on the global level is woodland loss due to need of domestic fuel industry, because of road construction or expansion of agricultural lands as well as a number of natural causes such as fire.

Inventory and biomass control (especially forests) is imposed as the prime task in order to protect bio-cover, possible re-cultivation, protection from erosion, but providing the raw material basis for future needs for construction material and fuel source.

Bio-geographic research for the needs of rural planning includes the determination of endangered and rare species, mode of forestry resources management in order to increase production, autecology, climatic and site tolerance, resistance to competition and diseases (Doornkamp, 1985). The above research has a particular importance for planting of new bio-cultures in order to compensate for the above-mentioned losses or other mentioned purposes as well.

Bio-geographic research is naturally necessary not only for the needs of correct exploitation of botanical resources (forests, pastures, medical herbs etc.), but also for prevention and repairing negative anthropogenic influence on botanic resources in general. Forests cutting in order to extend agricultural land or to obtain building or cellulose material, setting anthropogenic fire in forest areas, degradation of phitocenologic structure of pasture vegetation, due to an extensive cattle-breeding, are only several of many man influences on botanical resources (Jankovic, 1990). Therefore, different ways of phitosanation of vegetative cover (fig. 1) as well as other prevention and sanitation measures must be included in planning.

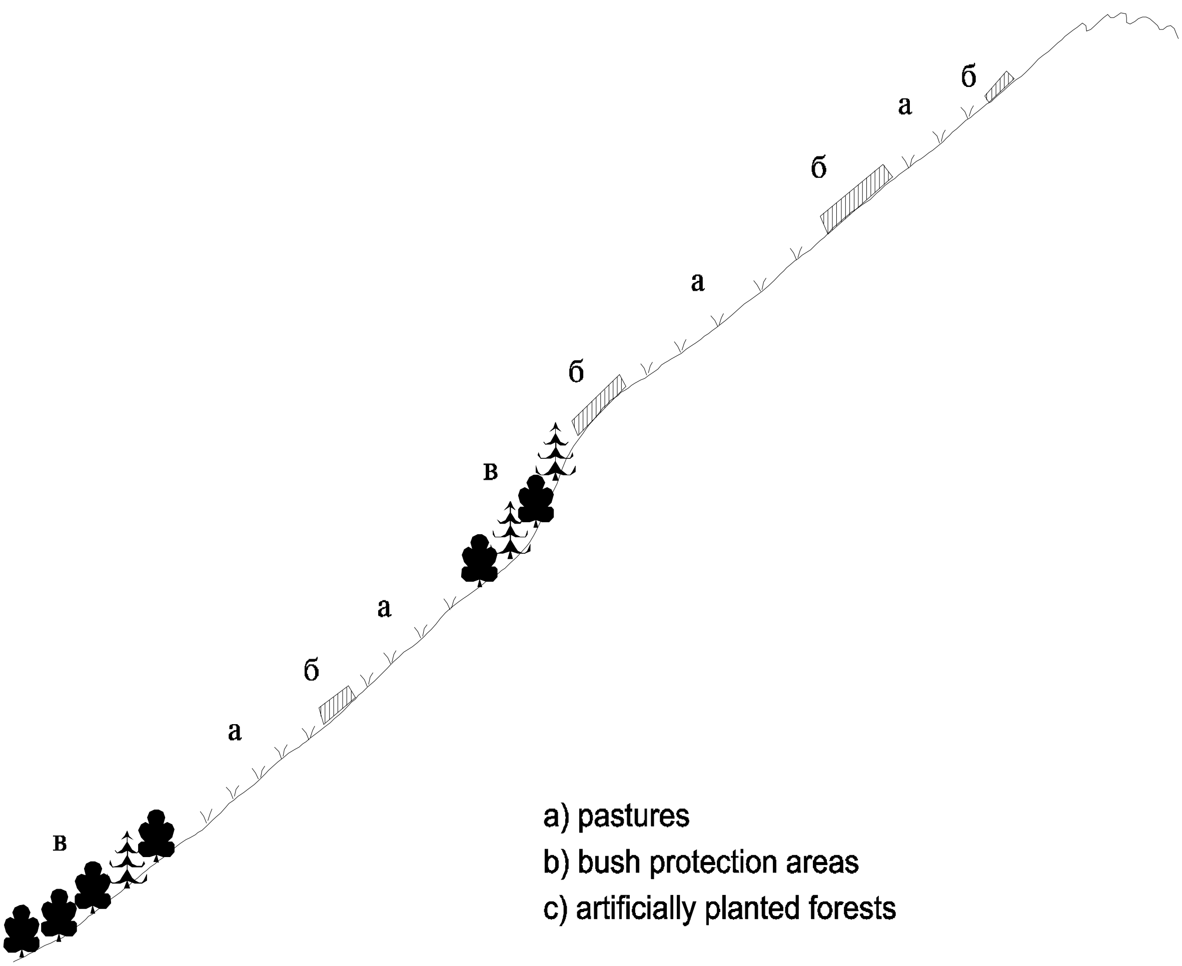

Figure 1. A complete phito-sanation of pastures on steep slopes (Jankovic, 1990): *a). Pastures; b). Bush protection areas; c). Artificially planted forests.*

The conversation measures, prescribed by FAO (1976) include:

- Leaving land uncultivated, but with some vegetation;
- Inter-cropping;
- Mulching – leaving of humic cover;

- Terracing;
- Contour plaughing;
- Strip cropping;
- Wind breaks;
- Contour ditches

Conservation

The agricultural land, which contains humic material and vital nutrients for crop growth, occupies less than one meter on the surface of the earth (lithologic layer). By its nature, it is a very vulnerable material – mostly soft and easily removed. The most endangered layer must be protected from erosion, and a number of measures, known as anti-erosion methods are being applied, based on physical-geographic investigations, the results of which considerably determine size and kind of actions to be applied at the planned site (Fournier, 1960). In addition to the erosion, destruction of good-quality physical-chemical characteristics, due to exhaustion, wrong use and over-use of fertilizers and pesticides and similar, also occurs very frequently. The accumulation of salt, infective organisms and other pollution material of anthropogenic origin are contaminating the soil. Relative to that, monitoring of state/quality of the soil is imposed as urgent need, and the physical geographers' role is significant in it.

The choice of the most appropriate measure or combination of measures for the conservation depends on site characteristics, planned actions and features of pedologic cover as well. The research of actual and planned state must be approached thoroughly and carefully because, for example, the effects of erosion on both planned site and outside it show as accumulations of materials or accumulations being choked by sediments. Thus, systematic and continuous research, mapping and monitoring of physical-chemical characteristics of the land is imposed as the prime goal in rural planning for the physical geographers. Making a complex study (the phases of which are shown in Table 1) naturally means interdisciplinary team-oriented work because the process of destruction or conservation/reconstruction has its political, economic, social and even cultural causes and consequences. There, where the results of fundamental and applied physical-geographical research must be incorporated into a cultural-social milieu of local population, rural planning must be especially flexible.

Table 1. Phases of making the agriculture development program.

1.	Assessment of land capability, water resources and climate
2.	Define range of possible crops
3.	Define possible alternative farming systems
4.	Evaluate likely community acceptance of alternatives
5.	Assess economic potential of each system
6.	Define operational constrains on shortlist of economically viable systems
7.	Re-evaluate willingness of community to accept the alternative viable systems
8.	Determine system to be adopted
9.	Re-assess land capability, water resources and climate in terms of management practices to be adopted

References

Dent S.D., Young A. (1981*), Soil Survey and Land Evaluation.* Allen and Unwin, London.

Doornkamp J.C. (1985), *The Earth Sciences and Planning in the Third World.* Liverpool University Press.

Fournier F. (1960), *Climat et erosion.* PUF, Paris.

Jankovic M. M. (1990), *Ekologija, biogeografija (fitogeografija) i zastita zive prirode Sarplanine i njenih metohijskih ogranaka na podrucju opstine Strpce.* U Opstina Strpce - Sirinicka zupa; Odlike prirodne sredine (ur. J. Dinic), Geografski institut "Jovan Cvijic" SANU, Posebna izdanja, 37/I, Beograd, 273-366.

Lichfield N., et al. (1975), *Evaluation in the Planning Process. Urban and Regional Planning Series,* Vol. 10, Pergamon Press, Oxford.
Mahler P.J. et al. (1970), *Manual for Land Classification for Irrigation.* Soil Institute of Iran, Publ. No. 205, Teheran.
Rondinelli D. A. (1976), *International Requriments for Project Preparation Aids or Obstracles to Development Planning.* Journal of the American Institute of Planners, 43/3, 314-326.
Young A. (1978), *Recent Advances in the Survey and Evaluation of Land Resources.* Progress in Physical Geography, 2, No. 3, 462-497.
*** **FAO**, (1976), *The Soil: How to Conserve the Soil.* Better Farming Series No. 5, Rome.