GENERAL COMMENTS RELATED TO RAPID RURAL SURVEYS, CERRADOS

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Crop-pasture integration

What is crop pasture integration?

There is obviously considerable confusion regarding its meaning. Many people in EMBRAPA and CIAT take the term to mean pasture renovation or pasture establishment via one crop of rice or, less commonly, a cycle of some other annual crop. An even narrower view that crop pasture integration = Barreirao is common among some EMBRAPA staff members, especially at CNPAF. It is felt that a much broader interpretation of the term would better serve our purpose in resource management initiatives presently being contemplated. The broader interpretation suggested here does not exclude the renovation of degraded pastures via rice or other annual crops. It does, however, expand the concept to include other strategies for capturing the potential synergism between annual cropping and perennial pasture-based systems. The most obvious of these options is the use of ley farming systems in which annual crops are alternated in well defined rotations with multi-year cycles of perennial pastures. But ley farming is not always the optimum solution. On some farms, the presence of different soil types and varied topography will result in a number of land-use capability classes, the best of which are sometimes appropriate for continuous annual cropping. Intermediate classes are often best suited to ley-farming, while on many properties, the poorest land may be safely used only for permanent pastures or forest reserves. Crop-pasture integration obviously has both temporal and spatial dimensions.

Rotations afford the best opportunity for synergism between the two components, however, the two activities can be highly complementary even though they never physically occupy the same space. Crop residues and by-products are valuable sources of feed for livestock, especially during the dry season and for more intensive management of dairy and beef cattle. The proper use of animal manures and residues resulting from confinement feeding has the potential of enhancing the efficiency of nutrient use and contributing to the maintenance of soil fertility, organic matter and soil tilth.

Do pastures inevitably degrade?

In well managed integrated systems, legume-based pastures should not degrade significantly during a normal three to six year perennial cycle even in the humid tropics. The decision to rotate back to crops may depend more on the opportunity cost of not taking advantage of the crop production potential of the

rejuvenated soil than on the need to renovate degrading pastures.

Alternative strategies for efficient resource management

The economic and ecological sustainability of agricultural production systems in neotropical savannas may well benefit more from crop-pasture integration than from any other single initiative. Crop-pasture rotations are not, however, a panacea nor the only answer to problems of resource degradation and lack of economic sustainability. In searching for solutions and defining research initiatives to be undertaken, other options should be given due consideration. Our experiences in the rapid rural surveys and elsewhere have revealed that innovative farmers are experimenting with other options and, in many cases, have made striking advances in conserving soil and water while reducing costs and maintaining, or even increasing, yields. Direct seeding using minimum or zero tillage at planting is widely known and used. In at least two locations, researchers and collaborating farmers have developed cropping systems based on the use of continuous living mulch covers using perennial forage legumes or grasses. The cover crop is chemically controlled, before or at the time of direct planting, sufficient to reduce competition until the new crop forms a canopy and competes effectively with the permanent cover. In many regions, farmers are double-cropping after soya with a 'safrinha' (a short season second crop) of millet or maize, often mixed with a volunteer stand of soya. The resulting forage may be grazed or, depending on date of planting and late season rains, may be harvested for silage or hay, used as a green manure crop or serve as a cover during the dry season and for direct planting in the next season.

The importance of biotic stress

The surveys have supported and reinforced our perception that biotic stresses are among the major constraints in continuous annual cropping as well as in perennial pastures. Heavy late season weed infestation in soybean fields is easily and widely observed from the roadside and is cited by many producers as the principal justification for rotating soybeans with maize. Diseases and nematodes are also frequently given as major concerns. Stem canker is not a new disease but appears to be spreading rapidly with the potential for severe impact on soybean production. Nematodes are perhaps one of the most serious threats to soybean production in the Cerrados and relatively little is known of the effects of different forage species on levels of field infestation, since many of the species have only recently been collected from the wild and are unknown components in production systems. It is known that some species are capable of markedly reducing harmful nematode populations during a pasture cycle but it is entirely possible that other species may even increase populations. Weed invasion is often listed as one of the major causes of widespread pasture degradation. All of the above underlines the importance of including this aspect of sustainability in any research initiative, with emphasis on integrated control, taking advantage of biological control where possible and using appropriate crop-crop

or crop-pasture rotations to mitigate biotic stress. The need for involving weed scientists, plant pathologists, entomologists and nematologists in resource management research from the outset is obvious. They may be as important, if not more so, than the soil scientists and agronomists who have tended to take the lead in resource management research.

On the selection of farmer collaborators

I have often expounded on the importance of careful selection of farmer collaborators. It is my opinion that the probability of success in on-farm research and validation and subsequent adoption and diffusion of technology is directly related to the degree to which the farm owner is involved in the day to day operation of his enterprise and to the extent that he depends on the farm for his livelihood. This leads us to a logical order of preference in the selection of collaborators as follows:

1- Owners who live on the land, depend on the land as their principal source of income and are involved in the day to day operation of the farm.

2- Owners who live in the municipio, depend on the land as their principal source of income and are involved in the day to day operation of the farm.

3- Owners who live nearby, have other sources of income but are directly involved in the management of the farm if not its day to day operation.

4- Owners who live in the city, have other sources of income, but visit the farm regularly and are involved in its management.

5- Owners who live in the city, for whom the farm is a hobby or one of several business investments, visit the farm only once or twice a year and have little to do with its management.

This order of preference may seem too obvious to be discussed but in too many instances in the past, the order seems to have been inverted. The reasons for this are also obvious but all too often, the results of such collaboration have come to naught. True, it is often difficult to do on-farm research with very poor small farmers because of their lack of flexibility in the use of limited land, lack of implements and other infrastructure to carry out the work, and inability to assume the additional risks which the new technology often implies. If these limitations can be overcome, the effort is usually well rewarded in terms of research results, adoption and diffusion. In the Brazilian cerrados the selection of effective collaborators may not be so difficult since it is common to find small to medium size properties with varying degrees of

mechanization whose owners fall into one of the first two or three categories and likely represent a far better bet than those in the last two categories. The owner-operator who becomes a committed partner is almost certain to have far greater interest in the outcome of the work and more likely to become an adopter and diffusion agent in his community than the 'Ferias de Natal' city farmer/rancher.