LITERATURE REVIEW

Farming systems research and recommendation domain

The farming systems research (FSR) approach has evolved in response to the poor rates of adoption of research results among small farmers. Its function is to complement the more traditional research approach, allowing better decision making on recommendations to farmers and on priorities for technical research. Major components of FSR approach are identification and diagnosis of the target area, problem and priority setting, screening possible solution, on-farm design and experimentation, and assessments of the results. (Byerlee et al. 1980; Shaner et al. 1982; Collinson, 1987)

The diagnosis stage requires the identification of discrete target groups of farmers. Each target group will be composed of farmers operating the same system in fairly homogeneous local circumstances, who can be expected to have the same problems, opportunities and to take up the same new technologies where minor but important variations in local circumstances occur. Thus, target groups are further divided into recommendation domains. Eventually a specific recommendation will evolve through the FSR process for each domain. Target grouping is a stratification device which creates a framework for research and development responsive to its clients, the farmers who take the final decisions on technology adoption.

The term "recommendation" (Zandstra, 1981) means advice in terms of operations, times, equipment, and materials for crop production, presented as worthy of acceptance. Meanwhile "domain" definition refers to the selection of areas of reasonably homogeneous environments. Domain can be called subsystem in the Chiang Mai Valley agroecosystem analysis (Gypmantasiri et al., 1980). They classified the Chiang Mai Valley into 14 subsystems. These subsystems were defined in terms of the availability and reliability of water supply, cropping systems, access to markets and processors, opportunities for off-farm employment and distance from Chiang mai. Moreover grouping area into subsystem or domain could be based on climatic data. However the aspects of the classification depend on their objectives, hierarchical levels and data availability.

After combining "recommendation" with "domain" together, the definition of "recommendation domains" has been proposed by Byerlee et al. (1980) as a group of roughly homogeneous farmers with similar circumstances for whom one can make more or less the same recommendation. Recommendation domains may be defined in terms of both natural factors (e.g., rainfall) and economic factors (e.g., farm size). Recommendation domains may be defined by agronomic and/or by socioeconomic circumstances. The definition of the recommendation domain depends on the particular recommendation. For example, a new variety may be appropriate for all farmers in a given geographical area, whereas a particular fertilizer recommendation may be appropriate only for farmers who

fallow a certain type of soil. Thus the recommendation domain for variety would be different from the recommendation domain for fertilizer. (CIMMYT, 1988). Recommendation domains are made of relatively homogeneous groups of farmers whose farmers are located in sufficiently similar agro-economic condition so that the same advice can be provided by the researcher for the whole group (Sebillotte, 1989).

Analysis and determination of recommendation domain.

1. Cluster analysis.

In recent year, numerical taxonomy by cluster analysis is widely adopted in various scientific fields, such as biology (Sneath and Sokal, 1973), agricultural science (Williams, 1976), and ecology (Pielou, 1984). The concept of this procedure is to measure the similarity of character (variable or attribute) between operational taxonomic unit (OTU).

Hardiman et al., (1990) used cluster analysis by the average linkage method for the identification and classification of farming systems in Qingyang county on the Loess Plateau of Central North China. Data from 26 townships describing socio-agricultural parameter of farm households were standardised and a Pearson correlation matrix was constructed. Parameter with the highest correlation coefficients and largest standards of deviation were selected for cluster analysis. This classification used for selecting areas appropriate for the introduction of new

technologies. However, cluster analysis was suitable for classification of large area such as regional level. In the village and community level, modified stability analysis would be more appropiate method for determination of recommendation domain.

2. Modified stability analysis.

The purpose and strength of on-farm testing is to assess the effect of farmers' management and their resource quantities and qualities on the technology. This provides an opportunity when appropriate analytical procedures are used, to partition the farmer into more homogeneous groups for purposes of making recommendations. Hilderbrand (1984) modified stability analysis for grouping farmers into more homogeneous groups. He considered farmer-managed trials which were conducted over a large number of farms within one preliminary recommendation domain and utilizing two types of materials. One was an improved cultivar and the other, a local variety. No other changes were made from the farmers usual practices. The only constant at each location (farm) was the cultivars. Each farmer would subject them to different soil conditions, planting dates, pest control, fertilizer, and management in general. A farm for which the average yields of the two cultivars was high for whatever reason was considered to be a "good" environment for the crop as measured by the average yield. A farm for which yields were low for whatever reason was considered to be a "poor" environment. Environment, then becames a continuous, quantifiable variable whose range was

the range of average yields. Yield for each of the variety could be related to environment by simple linear regression as $Y_i = a + be$, where Y_i = Yield of variety i, and e = environmental index was equal to the average yield of all treatments at each location. By fitting this equation independently for each variety, then plotting the yield response to environment for each variety on the same graph, it was possible to visually compare varieties adaptation over series of environments. Using the same procedure, it was easy to generalize these equation sets to any number and kind of treatments. This analysis provide information for partitioning the farms into various recommendation domains.

Crop research at the Chom Thong Land Reform Project.

A number of on-farm experimentation has been conducted at the Project site since 1985. The area was first physically characterized to determine the potential growing season (Randhawa, 1987) with subsequent studies on disease incidence on soybean in relation to environment and farming practices (Charumas, 1988). A series of cropping systems trials involving sequential double cropping with legumes were also initiated (Insomphun et al., 1987; Taejajai, 1988). The main objectives were to intensify land utilization so that the productivity could be improved which might in turn lead to better livelihood.

The cropping patterns trials indicated that mungbean-soybean was the most agronomicallly feasible and economically viable. Later works on agronomic improvement of post-rainy soybean showed that with the recommended technology soybean yield could be as high as 1.4 ton/ha (Hanviriyapant, 1990). With double dosage of fertilizer 12-24-12 ($N-P_2O_5-K_2O$) at 50 kg/rai, 2.0 ton/ha had been achieved by farmer.

However, some contradictory results were also obtained. Taejajai (1988) did not observe any significant response to fertilizer on soybean crop. Results of most of the on-farm experimentation showed a high degree of variation across farms. No attempt has been made to stratify the tested sites so that alternative practices could be recommended.