DEVELOPMENT AND SMALL FARMER ORGANIZATION OF ASPARAGUS PRODUCTION IN CENTRAL THAILAND

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ABSTRACT

A survey has been carried out in 1990 among Green Asparagus producers, in tambon Thung Kwang, Kamphaengsaen District of Nakhon Pathom Province, in order to assess the differentiation of cultivation practices, their agronomic and economic results and farmer needs for technical references in relation to the functioning of each type of Agricultural Production System (A.P.S.).

Means of production, labour force and capital availabilities, as well as natural environment, labour calendar, family's general objectives influence to a large extent the farmers' decision-making process. Three main types of A.P.S. have been identified according to the constraints and potentialities for Green Asparagus production.

A wide range of variation among the itineraries of techniques performed has been identified as a consequence of farmer different plantation management strategies. This underline the importance of a well targeted technical message and the unsuitability of any normative, standard "package" advice to be extended to all growers.

The typology based on the three main farm models can explain part of the yield differentiation and economic output. It is also useful to provide technical advice adapted to these various A.P.S. specific objectives and constraints. At the same time, this agronomic survey is a key tool to identify relevant research topics which are well connected to farmers' circumstances and needs.

INTRODUCTION

Asparagus has been introduced by Kasetsart University in cropping systems of Thailand central region in 1986 following several years of on-station trials.

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Thank to a farmer organization having contracts with marketing companies, Green Asparagus production benefits from a pluri-annual price guaranty system which makes it very attractive in comparison to other more traditional vegetable productions, such as onions, coriander, chinese cabbage, chillies, etc.. This crop presents also the advantage of increasing the regularity of labour requirements in the context of scarcity of temporary hired labour at peaks.

In such conditions, Green Asparagus production increased very rapidly during the two last years (see figure 1). There is a high diversity of Agricultural Production Systems which are adopting Asparagus production: from very small family-based holdings to big landowner -using a majority of wage earning labour force. This fact creates a very important heterogeneity among these asparagus producers. Important differentiations have been noticed in the cultivation practices as well as in the final production output whereas all the farmers have

been advised in the same way by extension services.

Their decision making process depends on the specific objectives, constraints and potentialities of the Agricultural Production System (A.P.S.) they are operating.

Consequently, any technical judgment or advice cannot be made by only taking into account the agronomic feasibility but must also include a pertinent understanding of the A.P.S. functioning. Thus, in reality, the problem is that there is as much different situations as number of A.P.S.. The proposed solution to this consist

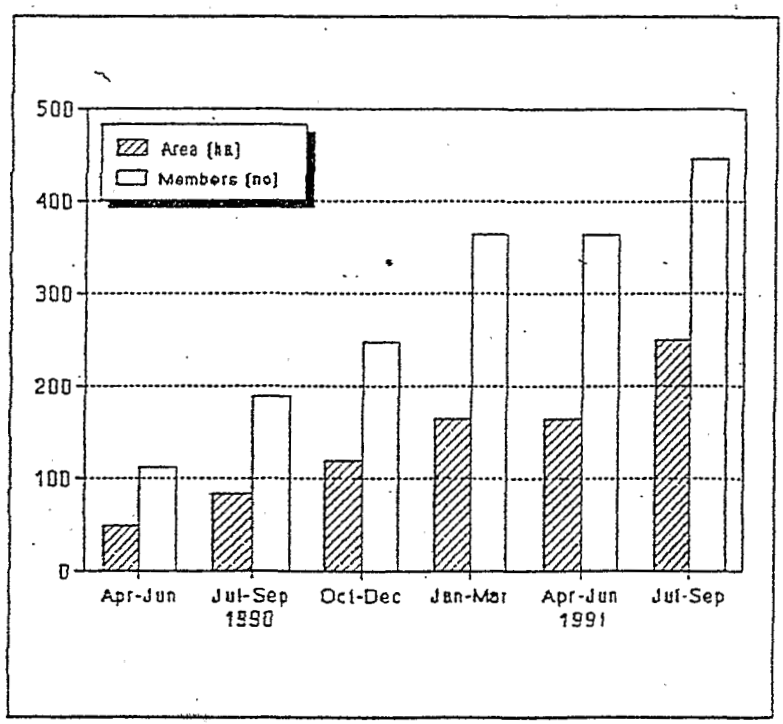


Figure 1: Evolution of the number of members and planted area of Thung Kwang green asparagus producer group.

in the identification of a limited number of key A.P.S. having a similar functioning and objectives, in order to be able later to provide appropriate targeting of technical advice at the regional level (CAPILLON, 1986).

MATERIALS AND METHODS

In order to understand the coherence of the cultivation practices performed by farmers and more widely the role of Green Asparagus production in their A.P.S., an agronomic survey has been carried out by DORAS Project in tambon Thung Kwang (Kampaengsaen District, Nakhon Pathom Province) in 1990.

1 - Sampling:

The sample of surveyed A.P.S. was defined, by the previous global APS typology work, carried out among 16 farms in the same area (NARITOOM, 1989). This study aimed at understanding A.P.S. general functioning: natural and technical environment, production means, history, objectives. It was contemporary with Green Asparagus introduction in the local cropping system, thus it provided information about the transformations linked to the adoption of this new production. The availability of such knowledge on main characteristics of A.P.S. functioning helped us delimiting our analysis to a more detailed diagnosis on asparagus cropping systems[1] only. So, the first sampling was performed among the farm surveyed in 1989 which operated Asparagus plantations in 1990.

The second criterion taken into account for the sampling was to maximize diversity of the observed asparagus cropping systems. Priority was given to the analysis of a wide range of cultivation practices rather than looking for a representative sample of regional situations. By such an approach, it was possible to understand the differentiation among the itinerary of techniques[2] performed, in relation with specific constraints and potentialities of each type of A.P.S., and to identify a hierarchy of limiting factors to be improved by research work. The following stage consisted in verifying whether the sample could effectively represent the diversity of regional agrarian structures. This second sampling reduced the sample size to ten A.P.S..

1. CROPPING SYSTEM = the succession of crops and techniques performed on a plot of land. It expresses the farmer's choice of plant population combinations to reach his objectives in a given natural and socio-economic environment.

2. ITINERARY OF TECHNIQUES = a logical and well ordered combination of the techniques applied to a crop by the farmer to achieve his objectives (SEBILLOTTE, 1978).

2 - Method of data Collection:

A semi-structured guideline, based on open questions, was designed and tested in order to adapt it to the specificities of the local cropping system. Each green asparagus plot has been surveyed for the one year period following transplantation. Data collected concerned:

- Plot characteristics and environmental conditions.
- Labour force availability and work calendar for farm different activities.
- Equipment (purchase price and date, nature of use...)
- Transformations of the cropping system due to asparagus crop introduction.
- Farmers' short and long term objectives.

Itineraries of technique comparison implied, for each operation to homogenize collected information. For each plot and each operation the following data have been recorded: operation date or frequency, labour force, working time, equipment, environmental conditions during the operation, the reasons of this practice and the expected results on the plantation status.

However, this approach is not limited to notice farmer's remarks, even if by survey technique it is often the only way to get information on certain problems. Analyses of yield variability complete the survey work, in order to define productivity limiting factors and to link them to farmers' cultivation practices.

RESULTS AND DISCUSSION

The building-up of a typology has to take into account both agro-technical and socio-economic factors which are characterising each type of A.P.S..

1 - ENVIRONMENTAL CONDITIONS:

1.1 - Agro-ecological potentialities for green asparagus production:

The main features of the natural environment have been described in SRIJANTR 1990. Two main land types have been identified in the area depending on topography and soil characteristics.

	Upland	Lowland
Soil characteristics	Loam to silty clay loam texture. Well drained.	Silty clay loam to clayey texture. Somewhat poorly drained.
Land Use	Sugar cane plantations, Vegetables, Orchards or Field crops, and Settlement site.	Pre-germinated broadcast or, less often transplanted rice.
Agronomic constraints,	Soil sensitive to crusting (high silt content)	Poor drainage.
Problems	Saline and sodic soils in transitional area.	

Cropping systems as well as itineraries of techniques managed on those A.P.S. are related to the characteristics of the available land. Asparagus introduction implied the choice of suitable land or land development works before transplantation of the seedlings.

* *On lower paddy soils,* two main practices can be observed:

-The first one consists in the same management than on upland loamy soil: plantation on ridges after levelling. But most of the plantation gave so bad yield (2 kg/day/rai) that farmers stopped producing on those plots. This result is mainly due to soil/water relation limiting factor, water table being too high.

- "Chinese" ridges: wide rows separated by small permanently flooded drains used for irrigation ("sprinkling boat") and drainage. They lower the depth of water table from surface and improve drainage of the upper horizons. This is the case of Farm D. However this technique doesn't allow to reach the same yield than on loamy soil. But it seems to be the only way to produce asparagus on heavy clayey soil in the region, the previous practice having completely disappeared over one year. - Another solution is to add some 30 cm of loamy soil to raise land level and improve soil characteristics at the same time (Farm H). This artificial transformation of the land creates environmental conditions similar to those of upland plots which are more suitable for green asparagus production. Such an investment can

be justified by the high economic value of the crop and the local availability of top soil transport at reasonable costs.

* *On upland loamy soils* of the irrigated low terraces: most of the green asparagus plantation (90%) are located here. Environmental conditions are usually homogeneous for the different A.P.S. and offer good potentialities for green asparagus.

Finally, land characteristics are an important factor because they could imply special development before Asparagus production is started or even can present a real obstacle for the adoption of this crop.

Two main agricultural seasons can be distinguished by temperature and rainfall variations along the year: dry and cool from November to February: Average Monthly Temperature (A.M.T.) = 25 C) and the hot season from March to October (A.M.T. = 30 C) making green-asparagus production continuous. A first harvest can be made as early as 5 - 6 month after transplanting 4 to 6 months old seedlings. Best quality production is obtained during the cool season, rapid growth rate (due to the high temperatures of the hot season) increasing the % of outspect yield.

Most of the precipitations are due to the monsoon heavy rainfall from May to October and represent an average of 1100 mm per year in the studied area (see Figure 2). Availability of irrigation water (canal and artesian wells) compensates for rainfall deficiency from November to April. In such a bio-physical environment, spear harvest can be staggered 8 months along the year.

1.2 - Socio-economic potentialities for asparagus production in the studied area.

Regional economic development characterised by a good road network, an easy access to Bangkok and its airport and port, thus to the international market, is an important local comparative advantage for export vegetable production such as green asparagus. The rapid agro-industrialization of the western part of the central plain has included local farmers in new commercialised systems: from traditional vegetables, sugar cane and livestock crops to export productions, swine or poultry integrated farming systems. They benefit from efficient networks for distribution of farm inputs and marketing of their products.

Figure 2:

Frequential climatic analysis
Kamphaengsean District
Nakhon Pathom Province.

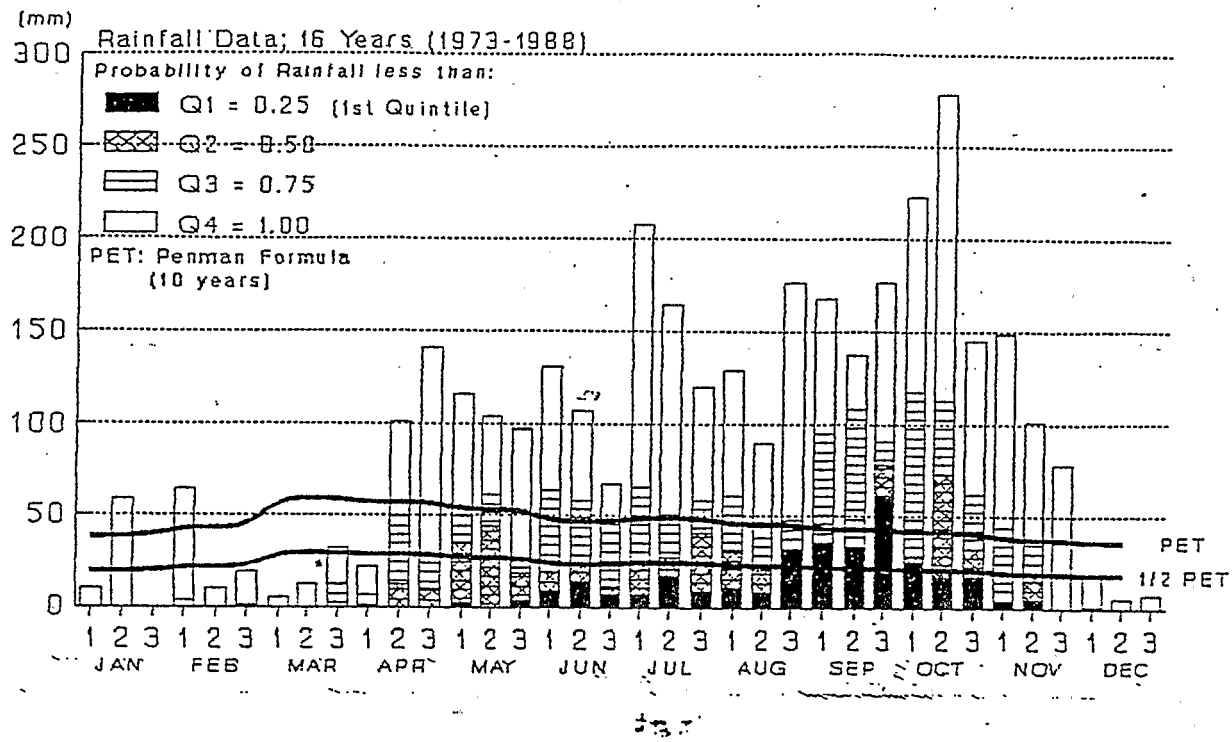
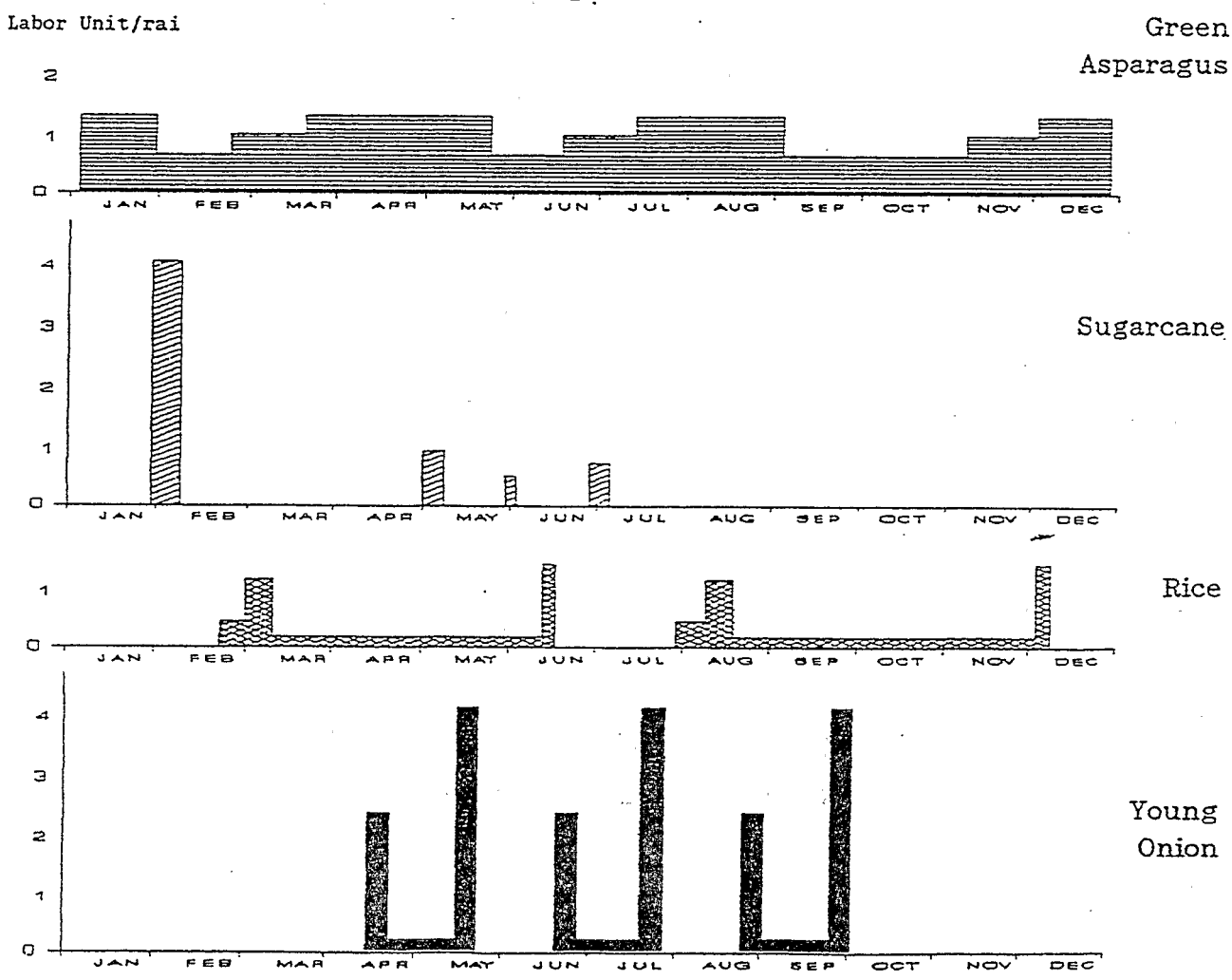


Figure 4:

Cropping calendar of the main productions in Kamphaengsaen District



Regarding social aspects of local environment, one's remarks a category of well experienced traditional vegetables growers, most of them of Chinese origin, who can afford to take risks such as starting with a new crop. It is the case for most of the green asparagus producer group committee members who maintain a strong bargaining power, facing up to the marketing companies. The support of this efficient farmer organization has largely contributed to the success of asparagus production dissemination in the area (NARITOOM C. and CASTELLA J.C., 1991).

2 - CONSEQUENCES OF GREEN ASPARAGUS CROP INTRODUCTION IN THE LOCAL AGRARIAN SYSTEM

2.1 - Improvement of the A.P.S. economic results:

The following table presents the results of the on-farm survey conducted among 10 A.P.S.. General characteristics as well as the economic performances for green asparagus production are displayed for the first year of production.

The economic results of the asparagus plantations were satisfactory in nine out of ten cases; in several situations, the levels of labour productivity (= value added/worker/year) and family income (= value added-hired labour-interests-taxes-other social related costs) which are reached by these farmers is extremely high. The only failure recorded was due to a poor choice of land and poor maintenance of the crop during the first year. The table shows also that the best economic results (obtained by Farm B) are produced with very limited fixed costs (no need to invest in expensive equipment) and a reasonable level of inputs of some 10,000 to 15,000 Bahts per rai during the first year (generally, the costs of seedlings and fertilizers only are making one third of the total each).

Finally, a key reason for the success of green asparagus in Kamphaengsaen area is that the adoption of this production allows the local small farmers to achieve their own economic objectives: the maximization of the value added per land unit (up to 62,000 bahts/rai/year) or family labour unit (up to 66,000 Bahts/worker/year) for the very small and small (less than 1 ha per family labour unit) A.P.S. respectively. If compared with other local productions (see Figure 3) green asparagus can provide a very high value added per worker (20 times the value added produced by a sugar cane crop under the current farmer practices) guaranteeing the economic sustainibility of the small A.P.S., including in many cases through the reimbursement of past debts (TREBUIL and DUFUMIER, 1990).

APS	A	B	C	D	E	F	G	H	I	J
Farmed area (rai [1])	11	3	70	7.5	11	7	31	44	77	93
Productions -Sugar cane	6	-	2.5	-	3	-	22	26	60	78
-Rice	2	-	14.5	5	-	-	-	10	-	-
-Vegetable	-	-	1.2	-	-	-	1	-	-	-
-Asparagus	1	2.2	2.7	2.5	6.5	7	8	8	11	15
-Other	-	-	53 Cassava	-	-	-	-	-	2 Mango	-
Animals (heads)	2 Geese 6 pigs	-	-	-	-	-	-	10 cows	100 pigs	-
Labour force -family	1.5	2	6	2	6	2	9	6	7	6
-Hired	-	-	-	-	-	2	-	2	4	8
-Asp. area per worker	0.5	1.1	0.7	1.3	1.0	1.1	1.0	1.1	1.1	1.3
Economic data * Gross product	2000	74500	4900	47800	44500	53500	56600	37400	56700	63500
Input	3750	11300	13190	14900	9760	14850	15600	12940	10875	12100
Gross margin	-1750	63200	35810	32900	34740	38650	41000	24460	46325	51400
Fixed costs	0	1310	840	330	890	770	1600	1900	540	2250
Value added	-1750	61890	34970	32570	34350	37880	39400	22560	45785	49150
Labour productivity per worker	-875	66311	24979	40713	34350	41431	35439	24723	51921	63895
Family income	-1750	61400	32450	31178	33300	34637	37950	15060	41094	44535

* Economic results for one rai of green asparagus plantation one year after transplantation (in bahts[2]).

Table 1: General characteristics and first economic results of contrasted Agricultural Production Systems in which green asparagus crop has been introduced in Thung Khwang area of Kamphaenssaen District. [1]. 1 hectare = 6.25 rais. [2]. $US1.00 = 25 Bahts

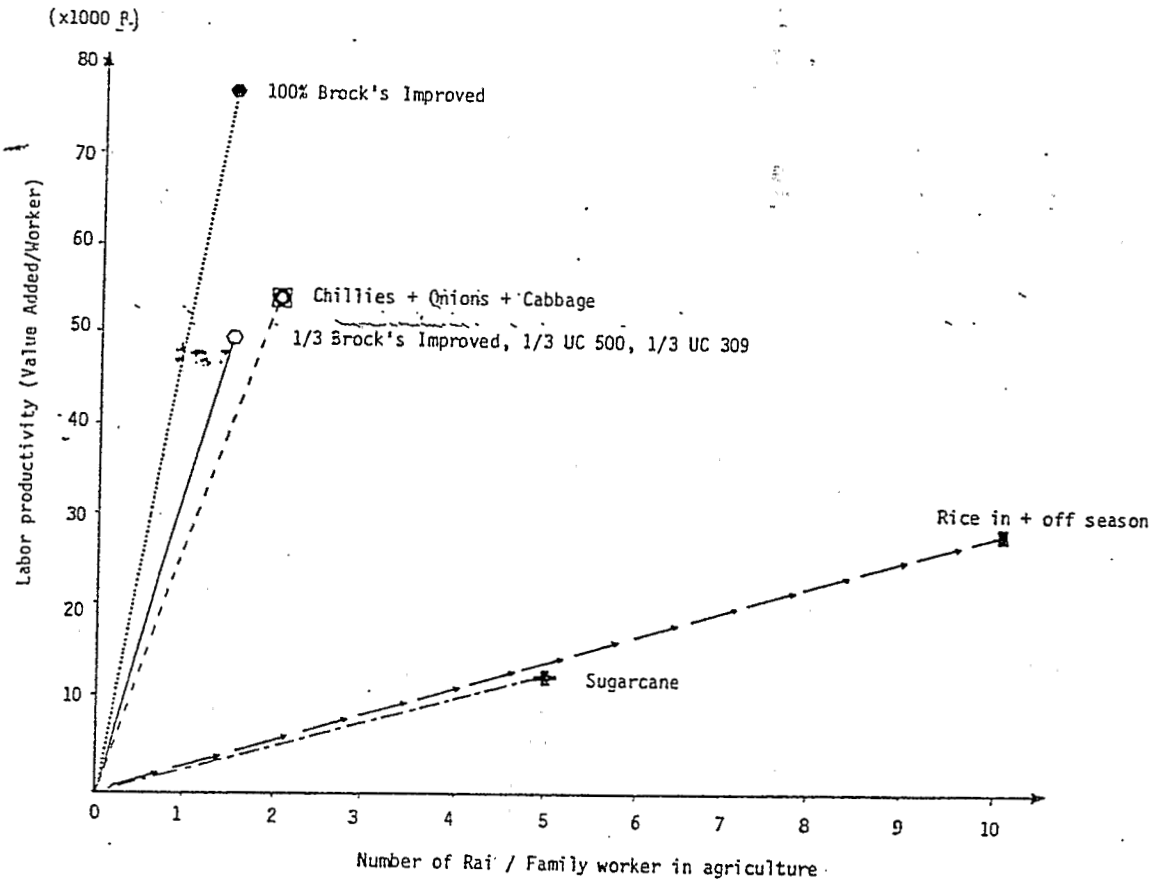


Figure 3: Compared labour productivities of green asparagus production with current main crop productions in Kamphaengsaen District.

2.2 - Improvement of labour force management.

The success of green asparagus introduction in comparison with the existing traditional crops is also due to the improvement of labour force management. If compared with more traditional vegetable cropping systems (chinese cabbage, young onion, coriander, yam bean...), the crop calendar for asparagus production (see Figure 4) is not showing irregular peaks of labour demand during the crop cycle like it is the case at harvesting time for the above-mentioned local vegetables. This characteristic of green asparagus production played an important role in the rapid adoption by the local farmers because of the growing scarcity (and so increasing cost) of temporary hired labour in the villages.

However labour force is also the main bottleneck for extension of asparagus planted area. On the 8 surveyed A.P.S. where asparagus production was already well installed, this crop was employing 100% of the family labour force available. The maximum area per worker is approximately 1.5 rai but is reduced to 1 rai per worker during harvesting periods: 7 of the 10 surveyed farms have to hire labourers. This is underlining the very labour intensive characteristic of such cropping system, linked to the very low level of mechanized cultivation practices (transplantation, spear harvest are fundamentally manual operations). No economy of scale being foreseeable in a near future, green asparagus production is playing like a protection for the competitiveness of these small farmers.

2.3 - **Competition for land with the dominating sugar cane production is minimal:**

In 1990, asparagus plantations in Thung Kwang area of Kamphaengsaen District were occupying 4 to 100% (1 to 15 rais) of the farmed land on the various A.P.S. surveyed which size varied from 1 to 100 rais (see Table 1). However, adoption of green asparagus by the small farmers has not significantly reduced the farm land planted in sugar cane. This is because of the high labour intensivity required by asparagus production. As a farm worker is fully occupied by 1.5 rai of asparagus, the remaining farmed area of the A. P. S . has to be planted with a rather labour extensive crop like sugar cane to avoid peaks of labour demand. Asparagus being the main source of agricultural income (it provides between 60 and 100% of the total value added of the A.P.S.), it is managed as a priority one among the other crops regarding technical choices, investments as well as work calendar. Thus, labour peaks on other crops like sugar cane harvest are usually faced by employing temporary hired workers supplied by middlemen.

Finally, because of the various roles played by this production according to the specificity of each farm, the building-up of adapted technical references has to take into account a typology of those A.P.S..

3 - A TYPOLOGY OF GREEN ASPARAGUS PRODUCERS

Several quantitative criteria have been selected in order to create a limited number of A.P.S. types based on their main strategies, potentialities and constraints for green asparagus production. It was assumed from the previous knowledge on labour force requirement for

green asparagus production (1 labour per rai) that the plantation size was a key indicator of the A.P.S. type, the level of mechanization being very low. In fact, this criterion depend not only on the labour force, but also on the land suitability and capital availability, and then implies the type of possible crop management. The three A.P.S. classes defined in this way are displayed in Table 2:

Type I farmers can be divided into two sub-classes differing through the importance given to asparagus in the cropping system.

- The first class (I-A) includes the very small A.P.S. which have planted all their available land in Green Asparagus. Their main objective is to get the maximal income per land unit, by using only family labour. The low level of available savings and cash flow limits the first necessary investments at transplantation (no fixed costs for equipment, low input use). Such small farmers cannot afford to mobilize large amount of money during the non-productive phase of the young plantation. A solution to get a relay early cash income is to plant one or two cycles of short term intercrops (baby corn or other vegetables). Finally, the technical choices occurring during the first six months of the plantation, which are determining the future potentiality of the crop are generally inferior to those made by type II and III farms. In fact, cash flow available is the main limiting factor for the choice of genetic material, land preparation technique or irrigation system.

- In the second one (I-B), asparagus is considered as a way to diversify farm productions. However, one of the surveyed A.P.S., which was just starting with this new activity should be classed somewhere on an evolutionary path between I-B and II-B type because of the increasing specialization in green asparagus production.

Type II A.P.S. have a strategy of saturating available family labour or the suitable land for asparagus located close to the house. Both options are depending on characteristics of the A.P.S.:

+ If family labour force is enough (II-A), the objective is to maximize the labour productivity per family worker. Because of their better economic situation, these farmers can afford technical choices superior to type I. However, fixed costs are very high because of investments in equipment aiming at saving labour force (sprinkler irrigation).

+ When family labour force available is low regarding the size of the planted area (planted area > 1 rai per family worker), hired temporary or permanent workers enable to increase the plantation area, and thus to maximize the value added produced per family worker. This second type can be distinguished from the type III only by limitation of asparagus planted area because of the small suitable available area (100 % of suitable land is planted with asparagus).

TYPE OF APS	I		II	III
LAND Asparagus area (rai)	1-5		6-10	11-15
Asparagus area/Farmed area	4-10 +90-100		25-100	<15
	way of diversifying productions or just start to grow	cannot increase asparagus cultivated area	difficult to increase area - no land available - distance to the house	
LABOUR FORCE CHARACTERISTICS: Asp. area/Family worker	0.5-1		1-3.5	1.5-3
Total number of worker	2-5		6-9	>9
CONSTRAINTS:	-Saturation of family laborforce -Cannot hire labour		difficult to find hired labour during harvesting periods	
CAPITAL First year investment (Bahts/rai)	5,000		8,000	7,000
	+		+	-
Intercrop	get a cash income before the first green asparagus harvest (1 year after sowing)			No problem with cash flow
TECHNIQUES % seed price in total seedling cost	< 60%		70- 80%	
	reduced input costs by choosing lower seed quality		priority to high genetic potential: hybrid seeds	
Sprinkler irrigation	25%		75%	0%
	save family labour force low level of adoption because of high price			risks of diseases

Table 2: Typology of Agricultural Production Systems growing green asparagus in Tambon Thung Kwang of Kamphaengsaen District.

TYPE I	1 < Asparagus area < 5 rais
	IA - Maximize annual net income per land unit
	Means of production - Farmed area per family worker < 5 rais. - Specialization in green asparagus production: 100% of value added produced on the A. P. S . - Family labour force only (2 labour units). - Low availability of cash.
	I B - Maximize agricultural income on total farmed area. - Diversify the productions of the A.P.S. - Occupy all family labour.
	Means of Production - Farmed area per family worker: 5 - 10 rais. - Family labour force only. - Low investments. - Other labour extensive activities (cassava, sugar cane, animal rearing...) on the A. P. S .
TYPE II	6 < Asparagus area < 10 rais
	- Maximize the labour productivity per family worker. - Reduce peak of labour demand for family active members.
	Means of Production - Farmed area per family worker < 5 rais. - Family labour force only. - Specialization in intensive vegetable crops. - High fixed costs (sprinkler irrigation system, high quality seedlings...) - Intercropping to get an income before the first spear harvest.
	- Maximize the labour productivity per worker. - Maximize the farmed area planted in green asparagus.
	Means of Production - Farmed area per family worker > 5 rais. - Permanent hired workers for asparagus production (Hired Labour/Total Labour: 25 - 50%). - High fixed costs (land development works, irrigation system....). - Other labour extensive productions (sugar cane, rice,...) managed by temporary hired labour.
TYPE III	11 < Asparagus area < 15 rais
	-Maximise rate of profit.
	Means of Production - Farmed area per family worker > 10 rais - Hired Labour/Total Labour > 35% - Best technical choices.

Type III A. P. S. are capitalist oriented farms using a majority of wage earning labour in order to extend asparagus planted area on all the suitable plots located near the house. The available capital and labour force allows to make the best technical choices as, for example, furrow irrigation which reduces the risks of canopy diseases caused by sprinkler irrigation. Their main constraint is now to find hired workers, asparagus production tending to occupy most of the local available labour force. The agricultural wage is increasing and hired workers are bargaining for long term duration employment contracts.

Though conditions of production are varying to a large extend inside each defined type (environmental conditions, family labour force availability, technical options, objectives...), one can establish a general functioning diagram summing up their main strategies.

On the basis of this grouping, the results obtained were verified by checking whether a new sample of farms can fit into the classification. This control is necessary in order to test the extrapolation of the typology.

Once the study is completed, one can place any given going through the lengthy process of farm survey. By using the key indicators consisting of simple criteria, such as green asparagus planted area, farm available labour force... any given A.P.S. can be classified in its correct type.

Thus, asparagus growers of the surveyed area have been gathered according to the three defined classes (see Figure 5).

Finally, this study leads to the design of technical references adapted to each of these three A.P.S. types presenting similar advantages and constraints for green asparagus production. The design of the on-farm experiments carried out 1990 was based on this typology in order to fit with farmers' needs and possibilities in the region (SAYAMPOL and CASTELLA, 1991).

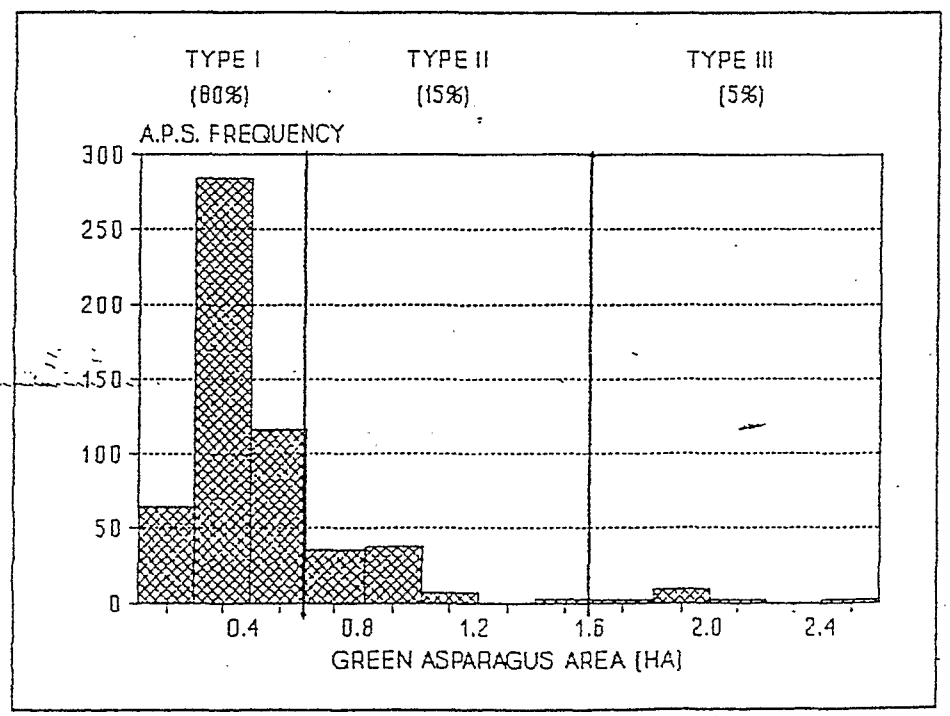


Figure 5: Distribution of the 560 members of the Thung Kwang green asparagus producer group in 1991 according to plantation acreage.

In fact, a good understanding of A.P.S. diversity is a necessary pre-requisite to extension programs. Thus, the technical results of the surveyed farms, presented in the second part of this paper are taking into account the previous typology of the green asparagus growers.

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