Horticultural Economics & Management Newsletter

Number 9, August 2009

16th International Symposium on Horticultural Economics and Management Chiang Mai, July 2009.

The XVI[th] International Symposium on Horticultural Economics and Management and the V[th] International Symposium on Horticultural Education, Research Training and Consultancy – a Joint Symposium, was originally scheduled to be held in Chiang Mai, Thailand in December 2008. Unfortunately owing to the occupation of the Bangkok International Airport, it was necessary to postpone the event to June 2009.

Despite the need to postpone the Joint Symposium more than 60 registrants, from 21 countries, participated in a most successful and enjoyable meeting in the Lotus Pang Suan Kaew Hotel, Chiang Mai, Thailand. The symposium ran from June 28th to July 2nd, 2009 and included a one day field trip into Northern Thailand.

The keynote address was delivered in a plenary session by Professor Dr. R. Daniel Lineberger, of Texas A&M University, USA . Prof Lineberger outlined the various options which may be used to adapt web-based collaborative learning technologies to horticultural education. He placed particular emphasis on the role that such technologies might play in regional teaching, extension and distance learning programs. The plenary session also included a number of regional Thai horticultural research officers who described ongoing research projects in Northern Thailand and Myanmar. Individual symposia sessions in both Economics and Management and Education and Training then ran concurrently for the remainder of the symposium.

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The co-convenors of the Chiang Mai Symposium (left to right): **P.P. Oppenheim, D.E. Aldous, R.D. Lineberger** (Keynote Speaker), **N. Jayamangkala, E. Hewlett** and **P.J. Batt,**

16th International Symposium on Horticultural Economics and Management

Chiang Mai July 2009 (Cont. from p1)

A Business Meeting for the ISHS Commission Economics and Management was convened on the first day of the symposium. The meeting provided an opportunity for members of the Commission to discuss various options for the development of the Commission and the structure of future activities. A proposal to institute an annual ISHS Award for the best doctoral thesis in Horticultural Economics, Management or Marketing was supported. It is anticipated that the first award will be made at Lisbon in 2010. A call for nominations for "Fellows of the ISHS" was also announced. Individuals may be granted the title - Fellow of the ISHS – in recognition of outstanding contributions to the discipline. Accordingly nominations for outstanding contributors in the field of Horticultural Economics and Management are now being sought.

The next symposium, the 17th International Symposium on Horticultural Economics and Management, will be held in Alnarp, Sweden in 2012.

Orchid production in Thailand

A random sample of presentations at the Chiang Mai symposium

CONTRIBUTE TO OUR NEXT NEWSLETTER

To ensure that this newsletter is distributed each year it would be appreciated if members could send items of interest to me at regular intervals. Items of interest could include:

- Copies of papers or abstracts,
- Opportunities for collaboration,
- Requests of any nature,
- Details of work in progress,
- Photographs of interest etc. etc.
- Web sites of interest,
- News of individuals,
- Employment opportunities,
- Forthcoming conferences,

Please send all contributions to:

peter.oppenheim@deakin.edu.au as soon as possible and no later than

January 1st. 2010

ISHS HORTICULTURAL ECONOMICS AND MANAGEMENT BEST DOCTORAL DISSERTATION AWARD

The ISHS Commission Horticultural Economics and Management is pleased to announce the introduction of an annual award for the Best Doctoral Dissertation in Horticultural Economics and Management. To be eligible for the 2010 award, nominated dissertations must report a study, for which a doctoral degree was granted in the year ending 31st December, 2009. The successful nominee will be presented with the award at the International Horticultural Congress in Lisbon in August 2010.

Applications close March 1, 2010.

Details of the award may be downloaded from the ISHS web site shortly. For the benefit of members of this Commission the relevant documentation has been reproduced on pages 6 –9 of this Newsletter.

Proceedings of the 16th International Symposium on Horticultural Economics and Management

Acta Horticulturae 831 is now available.

Visit *www.ishs.org* for details.

A Request from Dick Funt

Harvey Hall and Dick Funt are in the process of editing a book on Raspberries. Anyone who has economic data and is willing to write a chapter or assist on a chapter should contact Dick.

EMAIL: funt.1@osu.edu

CALL FOR PAPERS

Consumers and Producers in the Horticultural Value Chain

Seminar 10

28th International Horticultural Congress

Lisbon, Portugal.

22-27 August, 2010.

This seminar will provide an opportunity for horticultural economists to meet and discuss the relationship between consumers and producers of horticultural products. In particular, the seminar will seek to address the following questions - How widespread is the concept of a "marketing orientation" among horticultural producers"? To what degree is market research used in horticulture? Is there any evidence that horticultural producers have adopted the principles of strategic management? Why is mathematical programming not used more widely by producers to plan their production? What are the hurdles that need to be overcome in order to achieve widespread adoption of modern economic, marketing and managerial techniques? Papers reporting empirical research that have addressed such issues are welcomed.

Submit your abstract online now at:

http://www.ihc2010.org/

Final date for Submission: 31st December 2009

Professor W. J. Florkowski,

to lead Seminar Workshop

Professor W. J. Florkowski, (University of Georgia USA,) together with an international panel, will lead a workshop discussion at the Lisbon seminar to explore the following proposition:

"That, the marketing orientation poses a challenge for horticulture, due to the variation in taste preferences for horticultural products that exists both within and between different populations. The link between horticultural product marketing and horticultural science must continue to strengthen over time, because taste is influenced by genetics, pre-harvest treatment and post-harvest handling and each of these factors enhances and in turn influences consumers' taste preferences."

This workshop aims to bring together horticultural economists and horticultural marketers to explore various issues associated with the perception of taste and flavor in relation horticultural production and variety selection.

ISHS Horticultural Economics and Management Best Dissertation Award

1.0 About the ISHS Best Dissertation Award:

The International Society for Horticultural Science Best Dissertation Award is given to foster and disseminate research in Horticultural Economics and Management. It is presented annually to the person who has submitted the best doctoral dissertation for which a doctoral degree has been granted. The committee reserves the right to not issue the award should none of the nominations be deemed worthy.

2.0 Criteria:

1. The dissertation must report a study for which a doctoral degree was awarded in the year ended December 31st 2009.
2. The study must focus on some issue of relevance to the theory or practice of Horticultural Economics and Management.
3. For the purpose of this award the discipline of Horticultural Economics and Management is taken to include business or management studies within a horticultural context. Such studies might be based on parent disciplines such as: macro-economics, micro-economics, marketing, business management, business strategy, human resource management etc.
4. The best doctoral dissertation will be judged on the basis of the contribution that it makes to the Horticultural Economics and Management discipline.
5. All research methodologies will be considered on an equal basis including for example, field surveys, laboratory experiments, quantitative, and qualitative investigations.
6. The candidate must be nominated by his or her doctoral supervisor. A supervisor may nominate more than one candidate provided the criteria listed above are met.
7. All materials submitted must be in English, in Word format and submitted as email attachments with the exception of the certification letter (see section 3 below). The original signed certification letter must be submitted, (by registered air-mail post) in addition to an electronic PDF version of the letter.
8. Nominations must adhere to the format prescribed in section 3.

3.0 Nomination Requirements:

Incomplete applications will not be processed and will not be eligible for consideration.

The nomination documents must consist of:

- A signed Nomination Form that includes an abridged (50 word maximum), abstract of the dissertation.
- Copies of all external examiners' reports together with a copy of a principal supervisor's report.
- An extended summary of the dissertation in English. This summary should not exceed eight (8) single-spaced pages in length (including abstract, figures, tables, and references; 2.5cm margins all around; 12-point font, pages numbered, with no author identification in the documentation properties, document body, header, or footer of manuscript). Submissions that exceed the page limitation or do not adhere to the required format will not be considered.

  A suitable structure for the extended summary is presented below:

  Introduction
  Summary of the problem.
  Purpose of the study and why is it important.
  Critique of relevant literature.
  Research Design
  Sample selection.
  Data collection.
  Analytical procedures.
  Results and Findings
  For quantitative studies, provide sufficient statistical detail to enable a clear understanding of the rigor of the analysis and the validity of the results.
  For qualitative studies, provide a concise outline of the analysis to demonstrate that sufficient methodological rigor was employed in the study to validate the findings.
  Discussion
  Contribution of the research.
  Limitations of the research.
  Implications of the results for theory and practice

- A signed letter containing a certification statement, on institutional letterhead, prepared by a relevant institutional representative, certifying that the final copy of the dissertation has been submitted, examined and that the doctoral degree has been awarded. The document must explicitly state the date that the degree was awarded to ensure that it falls within the relevant award period.

4.0 The winner of the award in 2010 will receive:

- A commemorative certificate presented at an awards ceremony during the 28th International Horticultural Congress to be held in Lisbon, Portugal in August 2010. In the event that the winner is unable to be present at the award ceremony the presentation will be made *in absentia*.

- A designated place in the Horticultural Economics Seminar at the 28th International Horticultural Congress, Lisbon, Portugal in August 2010 to present the results of the dissertation research.
- An announcement naming the winner of the award together with a summary of the major findings of the dissertation in (a) *Chronica Horticulturae* and (b) on the ISHS Web site.
- Complementary membership as an Individual Member of the ISHS for the year ended December 31st 2011.

5.0 The Selection Process:

The winner of the Award will be chosen by a selection panel comprising at least three members of the ISHS Commission for Horticultural Economics and Management. The selection panel will make their decision in terms of the criteria for this award. The decision of the selection panel will be final and no subsequent correspondence concerning the decision will be entered into. In assessing the strength of nominations the selection panel will pay particular attention to the quality of the dissertations as judged by the external examiners' and principal supervisor's reports, and/or the acceptance or publication of papers arising from the dissertation in scholarly refereed journals. Candidates will be notified of the outcome of their application by June 30th 2010.

6.0 The Nomination Process:

All nomination materials must be in English and submitted in electronic form. Nominees should submit an electronic copy of:

- A completed nomination form.
- Original reports of external examiners and principal supervisor.
- An eight page extended summary of the dissertation.
- A signed statement, on institutional letterhead, prepared by a relevant institutional representative, certifying that the final copy of the dissertation has been submitted, examined and that the doctoral degree was awarded. The *original* signed letter must also be sent by air mail post to the address listed below.

All nomination materials must be received no later than the close of business on Monday March 1, 2010 to be considered in the current competition. Nomination materials, and/or queries regarding nominations, should be directed to:

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ISHS Horticultural Economics and Management
Best Dissertation Award

2010

Nomination Form

Nominee:_____

Signature:_____**Date:**_____

Institution:_____

Address:_____

_____

Email: _____

Nominating Supervisor:_____

Signature:_____**Date:**_____

Abridged Summary of Dissertation: (max 50 words)

_____

_____

The Ethiopian fruit and vegetable sector

Within four years the floriculture sector in Ethiopia has developed from almost nothing to a sector with 1,000ha and more than 80 farms. This can be attributed to the favourable climate, an attractive investment package and a pro-active and supportive government.

The export of fruit and vegetables is, compared to flowers, still small. However, the good growing conditions and the strong support of the government makes investing in fruit and vegetables in Ethiopia an option more than worthwhile to look at.

Report 2008-075 Business opportunities in the Ethiopian fruit and vegetable sector

SOURCE: LEI Newsflash, April 2009

Delegates Enjoying a Thai Banquet in Chiang Mai

Socioeconomic Analysis and Participatory Risk Assessment of Chilli Cultivation in Central Java, Indonesia

Madhusudan Bhattarai and Joko Mariyono
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Key words: *chilli pepper production, constraints analysis of vegetable farming, Participatory Risk and Return Trade-Off analysis; farmers' perception analysis, Central Java, Indonesia*

Abstract

This study provides an overview of socioeconomic factors affecting farmers' decisions to grow chilli and allocate acreage to the crop. Chilli is very popular and widely cultivated throughout Indonesia, even though most of the chilli growers surveyed reported chilli cultivation is a very risky enterprise compared with growing other vegetables and paddy. Nevertheless, the relatively high price chilli fetches at the market provides a positive incentive to millions of small-scale farmers to grow chilli. Using a Participatory Risk and Return Trade-off analysis, we assessed farmers' perceived risk associated with cultivation of chilli and other vegetables. The results suggest farmers consider chilli cultivation to be about four times more profitable but also four times more risky than paddy cultivation. An index value was assigned on relative risk, return, and working capital requirements for each of the crops selected, and these indexes vary across 11 crops. This analytical technique also can be included in participatory appraisals and stakeholder analyses of rural development projects.

INTRODUCTION

Chilli pepper (*Capsicum* spp.) is grown throughout Indonesia. In 2007, chilli was cultivated on more than 190,000 ha in Indonesia, with production of more than 1 million t, accounting for about five percent of the world's total market share (BPS 2008; FAOSTAT 2009). In 2007, chilli was cultivated on more than 18,225 ha in Central Java province, which has the country's largest share of chilli acreage. This study is based on a survey carried out at the community and individual farm household level during March–August 2008 in three communities in the Central Java districts of Magelang, Brebes, and Rembang. In 2007, these three districts accounted for about 50 percent of the total chilli crop acreage in Central Java. Assessing the chilli farming constraints in these three districts of Central Java has value for Indonesia and other parts of Asia where chilli is cultivated intensively.

Compared to other countries in Asia, Indonesia's chilli productivity level (about 5 t/ha) is still very low (Mustafa et al. 2006). Major problems and constraints include poor crop management techniques, widespread use of low quality seed, high production costs, inadequate marketing infrastructure, and farmers' lack of knowledge of improved production practices or of integrated technology packages (Vos 1994; Basuki et al. 2009).

Analyzing factors affecting farmers' crop-choice decisions, assessing their constraints and opportunities, and their perceptions of risk and return toward different crops provide information for effective agricultural policy planning and decision making. The fact that vegetable sector produces more income and employment than cereal and staple crops sectors has been well documented (Weinberger and Lumpkin 2007; Ali 2008; Johnson et al. 2009). Likewise, in a five-country case study in tropical Asia, Everaats and de Putter (2009) emphasized the importance of public policy, credit, infrastructure, and innovative extension methods for the effective diffusion of vegetable sector technologies, especially those related to seed.

Compared to cereals, vegetable cultivation requires a high level of working capital, and it is also a risky enterprise due to its intensive farming practices, the highly perishable nature of produce, and volatility of market prices. However, risk and return related trade-off issues of vegetable farming are addressed inadequately in the literature. Past studies on farmers' risk largely focused on cereals, livestock, and other commercial farm practices (Michele et al. 2003; Hardaker et al. 2004). For a pragmatic policy analysis, we need to know factors affecting farmers' crop-choice decisions and risk and return related trade-off issues. Ali (2006) has shown that chilli is a profitable crop, but the capital requirement for chilli is also four times more than that of paddy, with more incidences of pests and diseases, and with more fluctuation of market prices than cereals. All of these facts clearly suggest that risk-related factors are also critical in farmers' decisions on chilli acreage and level of intensification. While discussing broader socioeconomic and technical constraints on chilli cultivation, we also briefly summarize the level of perceived risk and return associated with chilli farming in Central Java.

The major purpose of this paper is to assess farmers' concerns and socioeconomic factors related to chilli production in the selected communities in Indonesia. The specific objectives are: a) to assess socioeconomic factors of

chilli production; b) to evaluate farm-level constraints of chilli cultivation; and c) to analyse risk and return trade-offs in chilli cultivation.

The scope of this paper is limited to documentation of selected information and findings on socioeconomic concerns and farmers' subjective perceptions on risk and return related trade-off issues for chilli and other vegetables cultivated in the three communities surveyed. Only an overview is provided here. Details on methodologies used and findings of the household survey will be presented in two forthcoming AVRDC reports.

METHODOLOGY

We adopted integrated qualitative and quantitative survey tools to assess range of issues on chilli farming, and farmers' constraints and opportunities for chilli production in Central Java.

Participatory Rural Appraisal (PRA) tools and techniques (Martin and Sherington 1997; Chambers and Mayoux 2003) were used to collect farmers' concerns and to identify factors affecting chilli cultivation. These tools were a key informant survey, focus group discussions, and participatory risk assessment. Using focus group discussions with 8 to 10 chilli growers in each community, we collected information on chilli production practices and growers' major concerns and constraints. In addition, with a structured questionnaire, we interviewed 222 households (160 chilli growers and 62 non-chilli growers) individually across the three districts. Related to the results presented in this paper, three separate tools of socioeconomic analysis were used. Information on community level factors (Table 1) and individual chilli growers' constraints (Table 2) was obtained from focus group discussions and household surveys. Farmers' perceived risk associated with chilli cultivation is assessed using participatory risk assessment. Details are in Bhattarai and Mariyono (forthcoming).

Risk in farming is the possibility of adversity or loss from uncertain events, and it refers to "uncertainty that negatively affects an individual's welfare"; it may be due to production, marketing, financial, or institutional factors (Harwood et al. 1999). In economics, risk is defined and differentiated from events that are purely uncertain. When the probability of loss associated with an event is known (or can be guessed), then such occurrence in economics is referred to as risk—but when the probability of an event is not known, then it is deemed as an uncertainty, or uncertain event (Hardaker et al. 2004). In this study, our aim is not to define risk beforehand but rather to assess farmers' subjective perceptions of overall risk (a combination of production, market, financial, institutional risks, etc.) associated with cultivation of chilli and other vegetables and paddy. Using a participatory framework of assessment, the risk estimated in this study the perceived and relative risk at the farmers' group level, not the individual farmer's absolute risk factor. In reality, each farmer may have a different degree of risk aversion, the assessment of which would require a large-scale risk-focused study. Hence, risk for a crop mentioned in this paper should be considered as "perceived risk" of a group of farmers for cultivation of the particular crop.

Using a methodology of participatory risk assessment, and a framework of risk and return trade-off of financial economics, we have developed a tool for evaluating risk and return trade-off on crop choice decisions of farmers. In disaster assessment, the participatory risk assessment approach is used to acquire information rapidly so that decisions can be made as quickly as possible. Smith et al. (2000) used participatory tools for risk mapping by assigning a risk index of 1 to 7 to uncertain events in pastoral livelihoods in Africa.

By adapting this risk assessment methodology, combining it with ranking tools of participatory assessment, and setting it in a framework of risk and return trade-off analysis from financial economics, we developed a tool specifically suited to assess farmers' subjective perceptions towards risk associated with the cultivation of a range of crops in a location. Average perceptions of a group of 8–10 farmers on overall risk, expected profit, and need of working capital for cultivation of a range of crops was obtained in a matrix, which we call Participatory Risk and Return Trade-off (PRATO) analysis. Using a relative scale (1 to 10; 1 = minimum value, 10 = maximum value), farmers' groups assigned a specific number (index) value for risk, return, and working capital for 11 crops (Table 3, Figure 2). We carried out PRATO analysis in each of the three communities surveyed, but due to space constraints, we present results here only from the Magelang site.

RESULTS AND FINDINGS

Chilli cultivation in Central Java

In Indonesia, the price of chilli is more volatile than that of paddy or other crops. Seasonal prices fluctuate significantly in response to market supply. It was noticed that even within the same day the price of chilli could change from morning to afternoon, driven by external news such as reports of flooding in major chilli production areas, changes in world market prices, etc. The monthly average farm-gate prices of three crops (chilli, paddy, and shallot) in 2007, as reported by a farmers' group in Brebes, are reported in Figure 1. Coefficient of Variation (a measure of volatility of price,

and also a measure of risk) of chilli prices was 43 percent, almost four times higher than that of paddy. Because prices fluctuate widely for chilli, farmers in Indonesia consider chilli to be a very risky crop, even though farmers there can cultivate chilli year-round. During the field survey, several farmers reported that the fluctuating price for chilli is a key source of risk and a major concern.

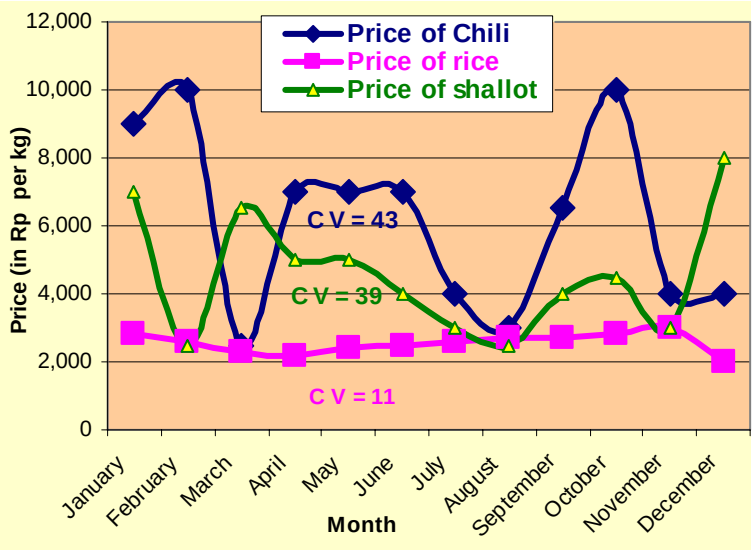

Figure 1. Monthly farm-gate prices of chilli, rice, and shallot in Brebes, Central Java, Indonesia, 2007

Factors affecting chilli production

Specific factors affecting farmers' crop production decisions may vary by crop type, production location, and season. Based on group discussions in each of the three communities, we have summarized factors that affect farmers' decisions to grow chilli in the region (Table 1). Some factors are common across the locations, but there are some important differences as well.

Table 1. Technological and institutional factors affecting adoption of chilli in Central Java, 2008

No	Magelang	Brebes	Rembang
A. Factors that encourage adoption of chilli			
1	Availability of water	Easy to sell	Availability of water
2	Availability of pesticides	Availability of pesticides	Availability of pesticides
3	Availability of new high yielding varieties of chilli	Availability of new high yielding varieties of chill	Availability of new high yielding varieties of chill
4		Support from extension office	Support from agricultural office
5	Proximity to vegetable market	Proximity to vegetable market	
B. Factors that discourage adoption of chilli			
1	Pests and diseases attack	Pests and diseases attack	Pests and diseases attack
2	High price fluctuation	High price fluctuation	High price fluctuation
3		Lack of water for irrigation	Cost of pumping water
4	More profitability from competing crops (tobacco and paddy)	More profitability from competing crops (shallot and paddy)	More profitability from competing crops (melon and paddy)

Note: Farmers listed these factors during the focus group discussions in each of the three communities surveyed.

Chilli farmers' constraints and concerns

During our individual household survey, more than 97 percent of chilli growers reported viral diseases (geminiviruses) as their top concern in chilli farming, as indicated by its lowest rank number (Table 2). Fungal disease and bacterial disease also were reported as major problems by 96 percent and 92 percent of the households, respectively. The high fluctuation of price was reported as the highest ranking factor (1.03) by 66 percent of households. The information from the participatory rural assessment (in Table 1) was consistent with that of the household survey.

Table 2. Major chilli production constraints expressed by farmers' problem ranking index

Major concerns and constraints of production	Average rank value for each of the major concerns											
	Magelang (N=49)			Brebes (N=60)			Rembang (N=51)			Overall Sample (N=160)		
	n	Mean rank	S D	n	Mean rank	S D	n	Mean rank	S D	n	Mean rank	S D
1. Virus diseases	44	1.61^{BR}	.54	60	1.03	.18	51	1.12	.43	155	1.23	.46
2. Fungal diseases	44	1.43^{B}	.50	60	1.17	.56	49	2.59^{MB}	.54	153	1.70	.82
3. Bacterial diseases	36	2.94^{BR}	.33	60	1.10	.40	51	2.31^{B}	.62	147	1.97	.90
4. Lack of information on pest management	10	2.10	.32	4	3.00^{M}	.00	45	2.93^{M}	.50	59	2.80	.55
5. High price fluctuation	40	1.03	.16	15	1.07	.26	50	1.02	.14	105	1.03	.17
6. Exploitation by traders	13	1.92	.64	6	1.67	.52	46	2.15	.42	65	2.06	.50
7. Other diseases	4	3.75^{B}	.50	17	1.06	.24	1	2.00	.	22	1.59	1.10

N = total sample of household survey in each communities/districts; n = Number of responded for each factors.

Mean Rank = Weightage Average Rank. In index: 1 = most important concern. SD = Standard Deviation value.

Significant different of mean across sites is indicated by superscript M, B and R; wherein, ^{M} = Magelang, ^{B} = Brebes, and ^{R} = Rembang. Mean comparison is tested at 95 % of confidence interval.

During the survey, we also noticed that to minimize yield loss farmers try to adopt a variety of chilli that is resistant to a particular pest and disease. In Magelang, farmers usually grow hybrids. In Brebes, farmers usually grow open-pollinated or local varieties. In Rembang, 50 percent of chilli varieties cultivated are hybrids, and also large number of open pollinated varieties. Chilli farming practice in Rembang is also less intensive than that of the other two sites.

Risks and return related trade-off from chilli cultivation

The negative factors of chilli farming listed in Table 1, and the constraints summarized in Table 2, are closely related to risk associated with chilli cultivation. The increasing incidence of diseases and pests, high fluctuation of market prices, and inadequate access to water in the dry season are some of the major factors farmers worry about most when deciding how much acreage to allocate for chilli. During our survey, almost all farmers noted that growing chilli is a risky (*risiko* in Bahasa Indonesia) compared to cultivation of other vegetables and paddy. But many of them also said that they would like to grow chilli, at least on a small plot area (around 0.1 ha) largely because of high profits from chilli, if they were lucky to get good market prices and good yield. This suggests that different farmers perceive different levels of risk across the vegetables (and paddy), and that the perceived risk level varies across the farmers. We also observed that a typical farmer allocates only a modest amount of land to chilli cultivation (0.1 to 0.2 ha per household). Over two-thirds of chilli cultivation is an intensive farming practice with high levels of inputs (Ali 2006). Therefore, in this study, we have tried to assess farmers' perceived risk as an index value and in relative terms.

Using PRATO analysis, we estimated an overall farmers' group (or proxy to a community) perceived risk associated with cultivation of chilli and a range of other vegetables and paddy crops. The results from the study in Magelang are in Table 3.

Table 3. Expected returns and risk on vegetable cultivation, Magelang, Indonesia, 2008.

S. N.	Crops	Profit obtained	Risk level	Working capital need	Remarks (underlined factors (reasons) for risk)
1	Chilli	6	9-10	9	Price and diseases (Anthracnose)
2	Rice	3	2-4	2-3	(Tungro virus; rat, plant hoppers)
3	Tobacco	8	9-10	8	Bad weather causing low quality
4	Watermelon	6	9-10	7-8	Price and diseases, cannot grow
5	Tomato	4	9-10	3-4	Price and fruit borer, wilt
6	Cucumber	5	1-2	3-4	Lower price and pest (caterpillars)
7	Bitter gourd	7	5	1-2	Pests (fruit fly)
8	Chinese Cabbage	2-3	2-3	1	
9	Peanut	2-3	2-3	1	
10	Cabbage	3-4	5-6	4-5	Price and pest: caterpillar
11	Yard-long bean	7	2-4	1-2	Price and pests: aphids, fruit borer

Index: 1 = lowest value; 10 = highest value

For some crops, the farmers' group could not come to a consensus for an exact number, but preferred to use a range.

The results in Table 3 show farmers perceive that the relative profitability of chilli cultivation is on average four times higher than that of paddy cultivation, but the overall perceived risk (i.e., subjective risk and also relative risk) associated with chilli cultivation is also four times higher than that of paddy cultivation (Figure 2). The high level of farmers' perceived risk factor for chilli cultivation is due to probability of loss associated with Anthracnose attack (which can lead to 100 percent crop failure), as well as high fluctuation of chilli prices at local markets. The results from PRATO analysis are consistent with the survey results reported in Tables 1 and 2. A working capital requirement for chilli cultivation, in relative terms, was 4 to 5 times higher than that of paddy cultivation, consistent with previous findings (Ali 2006). We also noticed that those farmers who already have enough disposable capital on hand (or who have better access to low-cost credit locally) prefer to grow chilli on larger areas (0.2 ha or more), and others would decide crop acreage as per the availability of disposal capital.

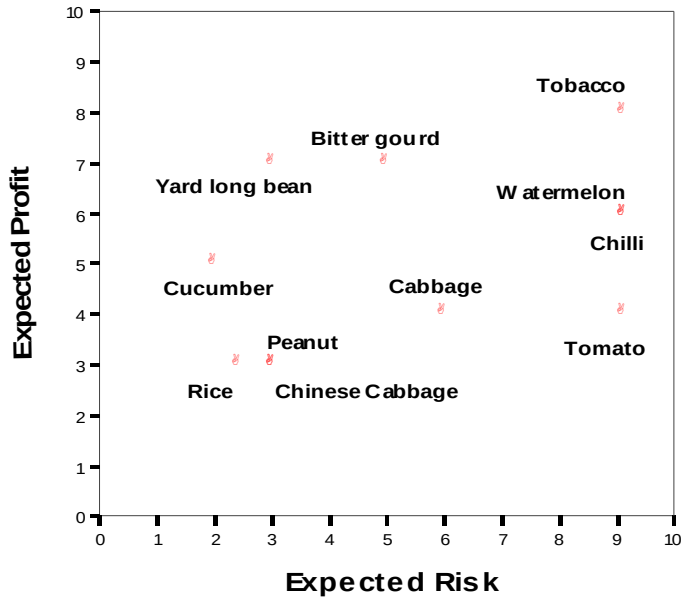

Figure 2. Trade-off on risk and return, selected vegetables in Magelang, Indonesia, 2008 (Plotted from the data in Table 3).

Most farmers do not borrow capital from credit institutions to grow chilli; in fact, formal credit institutions (banks and cooperatives) do not easily provide loans for chilli cultivation. Chilli collectors provide a modest level of credit, and they later purchase chilli from the farmers who had borrowed capital earlier (sometimes at a slightly lower crop price). All of these arrangements are due to variations in return from chilli farming in the region, and from the perceived risk level of an average farmer. Among 11 commonly cultivated vegetables and cereals selected for PRATO analysis in Magelang (Table 3), farmers noted yard-long bean required a relatively moderate level of operating capital but had the potential for almost the same return as chilli. The low expected risk and high expected profit from yard-long bean could also account for the recent rapid expansion of yard-long bean acreage in Central Java. The results on risk-return trade-off of vegetables in Figure 2 are conceptually same as the risk-return trade-off of financial stocks. One of the reasons a typical farmer diversifies acreage among different crops is to reduce perceived risk, or to minimize the probability of loss from a particular crop. The results suggest there is an advantage to growing several different crops instead of a single crop, due to the wide variation on return (and risk) across the range of crops.

CONCLUSIONS AND IMPLICATIONS

Many factors affect the crop choice decisions of an average farmer. Better access to marketing, easy-to-apply crop protection and management technology, and ready access and support from local agricultural extension agencies are factors that positively affect chilli acreage in all three communities surveyed. The high incidence of pest and diseases and the high fluctuation of market prices are the two most important factors that contribute to high risk in chilli farming. The factors causing a high fluctuation of return from chilli discourage farmers from expanding chilli acreage. Adverse effects of these factors on chilli farmers' welfare loss (profit loss) can be minimized by the adoption of appropriate technology packages, including new resistant varieties, improved crop management practices, more effective pest and disease control methods, and setting up a better market information system so that farmers get up-to-date information on prices.

Using PRATO analysis, we can better understand the relative risk factors associated with cultivation of chilli and several other high value vegetables, and we can compare these factors with paddy. As shown by our analysis, chilli growers in Magelang (and in Central Java) consider that their relative profit as well as the relative risk (perceived risk) associated with chilli cultivation is about four times higher than that of paddy.

The information on constraints and opportunities of chilli cultivation at the farmers' level, and their perceived relative risk factors across the crops, is useful for understanding of socioeconomic, institutional, and crop management factors affecting farmers' crop choice decisions in Central Java. The study findings can be useful for designing targeted vegetable sector policies in Indonesia and other tropical countries.

The major shortcoming of PRATO analysis is that the results (index number) on perceived risk, return, and working capital vary by the structure of the farmers' group involved in the focus group discussions. This is a general concern for all field survey and participatory assessment approaches. To address this issue, we included different categories of farmers (rich, middle income, poor, younger, older) in the group. Results also may vary by production systems.

The PRATO analysis, as developed and illustrated here, can be applied to other cases involving stakeholders with alternate choices. PRATO analysis can be adapted in participatory rural appraisals when designing any vegetable or agricultural sector development intervention.

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