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Vegetables for improving livelihoods in disaster-affected areas

A socioeconomic analysis of Aceh, Indonesia

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AVRDC – The World Vegetable Center is the leading international nonprofit research organization committed to alleviating poverty and malnutrition in the developing world through the increased production and consumption of nutritious, health-promoting vegetables.

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Executive Summary

This study presents a socioeconomic analysis of the cultivation of vegetables in the 2004 tsunami-affected communities in Nanggroe Aceh Darussalam (NAD) province, Indonesia. It explains farmer-level constraints and opportunities to grow vegetables, and illustrates farming systems issues and comparative advantage in the cultivation of selected vegetables across three different locations in Aceh. This was done based on an extensive field survey carried out in 2008, which included more than 240 households from eight tsunami-affected communities spread over five districts of NAD. The overall objective of this field survey was to analyze production characteristics of vegetables and farmers' constraints and opportunities in growing vegetables in the tsunami-affected communities. In this report, we summarize results and findings of the survey and discuss policy recommendations and strategies for strengthening vegetable cultivation in disaster-hit areas of Aceh.

Farming was the main occupation for more than 95% of the households surveyed. Among the three locations surveyed, rice was cultivated more in Aceh Besar and Pidie locations than in Northeast Aceh. On average, rice harvested from the farmer's own cultivated land was sufficient to meet 8-9 months of annual consumption needs of an average household, and the rest was purchased from the local markets. Small size of farms, low rice yields, and low fertility of land due to tsunami damage were the main reasons for rice insufficiency for 3-4 months of the year.

More than 90% of the households surveyed grew vegetables, mostly on small plots and largely for home consumption. Land damage from the tsunami, inadequate extension support for vegetables, and high pest and disease incidence curtailed large-scale vegetable production. Among vegetables, chili was a very popular crop in the surveyed communities, with 78% of the farmers growing chili. After chili, other important vegetables cultivated were: tomato, cucumber, eggplant, yard-long bean, amaranth, shallot, kangkong, pak choy, and other indigenous vegetables.

In the surveyed areas, average farmers held about 0.6 ha of land for cultivation. Average vegetable growers devoted about 0.26 ha for chili cultivation in 2007/08, and produced about 2400 kg of chili, with average productivity of 9.25 t/ha. An average household consumed around 2.7 kg of vegetables in a week, valued at about Rp 19,000.

The most important reasons cited by farmers for growing vegetables were: availability of suitable land, ease of selling vegetables at the local market, past experience in growing vegetables, local availability of inputs (through NGO support in many places), shorter crop cycles, and higher returns compared with cereals. Major constraints for growing vegetables were increasing pest and disease outbreaks, high fertilizer and other major input prices, seasonal fluctuation of vegetable prices, and lack of irrigation infrastructure. The 2004 tsunami damaged most of the irrigation and physical farming infrastructure, as well as other basic social and institutional infrastructures that supported vegetable farming in the past, such as credit institutions, farmers groups, and local government extension services.

Most farmers learned vegetable cultivation from older members in the family or from their neighbors. Only 13% had participated in any formal vegetable cultivation training. About 12% of the respondents were women, and we also found very important roles for women in vegetable production and marketing. On average, about 70% of the acreage allocation-decision for vegetables was made by female members of a household.

Compared with other places in Indonesia, the use of inputs (fertilizers, pesticides and other materials) on chili is very low in Aceh, and input use varied across the three survey locations. In Aceh, vegetable cultivation is considered a low-input farming system. On

average, labor for chili cultivation was about 230 days per hectare per crop season, mostly to produce chili for home consumption. Labor use varied across the survey locations. We surveyed villages that were most damaged by the 2004 tsunami, which in part accounts for the low intensity of vegetable production, low use of inputs, and low crop productivity. By 2008, vegetable farming and other livelihoods were recovering gradually in the communities surveyed.

Shares of cost for labor and inputs out of total cost of chili production were 70% and 30%, respectively. Family members accounted for nearly 60% of total labor days. The large number of employment days generated by vegetable cultivation motivated farmers to grow vegetables to ensure availability of employment on their own farms. The profit from chili was higher in Northeast Aceh compared with Pidie and Aceh Besar. The high profit and high return on investment in Northeast Aceh indicates potential for expansion of chili production.

If land damaged by the tsunami can be quickly rehabilitated in Aceh, vegetable production and productivity levels will have significant scope for improvement. Chili farmers are more likely to expand chili acreage if they can obtain adequate technical support from extension services and Farmer Field Schools, and can access basic infrastructure such as readily available inputs (including compost and organic fertilizers), produce markets, and farm credit. Timely support from public agencies is needed in managing pests and diseases and improving soil fertility.

In Aceh, there is an urgent need to strengthen the capacity of public research, development, and extension services as well as private sector input suppliers and credit provides. The institutional base of Aceh's research and extension services has nearly collapsed; these services need to be revived, especially for the vegetable sector, which requires intensive, specialized extension services.

1. Introduction

1.1. Background

The December 2004 tsunami caused the greatest damage and loss of life in Nanggroe Aceh Darussalam (NAD) province of Indonesia. About 170,000 people perished, more than 700,000 became homeless, and about 400,000 hectares of agricultural land was completely destroyed (ADB 2006). The economic loss to Indonesia due to infrastructural damage, largely in Aceh, totalled more than US$4 billion; the full range of direct and indirect losses (e.g., employment) was much more than that (FAO 2005; FAO/WFP 2005). Although a lower percentage of vegetable-growing areas were damaged by the tsunami than cereal areas, these small-scale vegetable farming activities are more important for quick income generation, employment creation, and livelihood restoration than cereal cultivation. Therefore, with an aim to rehabilitate vegetable production and restore vegetable farmland damaged by the tsunami, AVRDC - The World Vegetable Center and its consortium of partners initiated a project on "Integrated Soil and Crop Management for Rehabilitation of Vegetable Production in the Tsunami-affected Areas of NAD Province, Indonesia" in 2007 with funding support from the Australian Centre for International Agricultural Research (ACIAR)**.** The project's main purpose was to restore soil fertility and vegetable farmland through farmer-participatory research trials and demonstrations as well as capacity building activities with farmers, local facilitators and community extension personnel. The project activities contributed to enhancing food security, nutrition, and livelihoods through rehabilitation of vegetable production.

The project activities began with a Participatory Appraisal (PA) and stakeholder consultations in selected potential locations in Aceh in early 2007. The PA documented local needs and constraints for vegetable farming as defined by farmers and other stakeholders. PA findings subsequently guided development of detailed project work plans and other activities. In early 2008, a more rigorous survey covering more than 240 households from eight tsunami-affected communities spread over five districts of NAD was carried out to document farmer-level constraints and opportunities for vegetable production, and to provide background information for implementing the project. This report summarizes major results from the baseline survey, and discusses policy strategies for strengthening vegetable farming in disaster-hit areas of Aceh. Project partners included the Assessment Institute for Agricultural Technology (AIAT or BPTP) Nanggroe Aceh Darussalam, the Indonesian Vegetables Research Institute (IVegRI), the Food Crops Agricultural Service (FCAS), Keumang, Austcare/Indonesia, and the New South Wales Department of Primary Industries (NSW DPI).

The information collected from the field survey was used by the project team for implementing project activities, including Farmer Field Schools and farmer-participatory research trials. These activities were carried out in the same communities where the socioeconomic survey was conducted. The detailed household-level socioeconomic data collected will be useful for government agencies and nongovernmental organizations in designing better targeted agricultural research and extension strategies for the region.

Due to the decades-long civil war in NAD, neither farm-level statistics nor farm household-level historical data prior to the tsunami are available. Even regular census data on farmers' livelihoods and related agricultural indicators are unavailable for the war period. Thus this survey of farmers' activities can serve as an important vegetable sector reference for local government agricultural extension and development agencies as they target their efforts in disaster-hit areas of Aceh. Some of the information on constraints and opportunities of vegetable cultivation, roles of socioeconomic institutions, and gender implications elaborated in this report would be useful outside of Indonesia.

1.2. Objectives and scope of the study

The overall objective of this study was to document production characteristics, individual farming household level constraints and prospects for vegetable cultivation in the tsunami-affected communities of Aceh, with the aim of implementing improved vegetable production activities targeted to the specific needs and requirements of the these communities in the future. The specific objectives of the study were to:

a) document general socioeconomic characteristics of farming households and status of vegetable production practices followed;

b) assess and evaluate socioeconomic and institutional factors and related constraints associated with vegetable production; and

c) evaluate cost-benefit and economic returns of growing vegetables in the selected communities.

Communities were selected for the survey where the project had planned some activities and interventions; hence the objectives and scope of the field survey and assessment were tailored as per objectives and scope of the original project (ACIAR CP/2005/075, later changed to SMCN/2005/075). Thus, the scope of the socioeconomic survey in these communities was to collect information in relation to the planned project interventions such as farmer-participatory research trials on cultivation of selected vegetables, and Farmer Field Schools for vegetables. This baseline survey was tailored as per the findings of the Participatory Appraisal (PA). The PA study documented qualitative information pertaining to farming situations and major constraints to vegetable farming at that time. This study focused more on collecting farming information pertaining to individual households in quantitative terms. It also documents information on other issues related to livelihoods and food security, including crop acreage allocation to different crops, input use, vegetable production practices, farm training, credits, and gender. Costs and benefits of production of project-targeted vegetables, and especially of chili, the most popular and widely cultivated crop, were analyzed in detail.

1.3. Chapter plan

The second section of this report describes the methodology used for the field survey and tools and techniques adopted for data collection, including a brief description of the survey locations/communities in Aceh, and the sample size of households surveyed in each location. The third section gives an overview of the farming situation and more specifically of the vegetable cultivation situation in NAD. The fourth section provides basic characteristics of vegetable growing households, and status of the cultivation of project-targeted vegetables in the surveyed locations. The fifth section summarizes findings related to market, social, institutional, and infrastructural factors of vegetable farming in the surveyed locations. The sixth section provides cost and return analysis of chili cultivation, the most widely cultivated vegetable crop in Aceh at that time. The last section provides recommendations derived from this assessment in relation to strengthening vegetable production and productivity levels for improving rural livelihoods in Aceh.

2. Study Methodology

2.1. Overall methodology and scope of assessment

This study combines information collected from qualitative and quantitative survey tools. Qualitative survey tools used included methods of Participatory Rural Appraisal, such as focus group discussions, key informant surveys, and a semi-structured checklist for key issues of vegetable farming.

The quantitative survey was carried out by individually interviewing 240 households from eight communities in five districts of Aceh province; about 30 households were interviewed in each community. The location of the surveyed area in NAD is shown in Fig. 2.1. The quantitative survey emphasized issues related to individual households' farming activities and farmers' resource allocation decisions for growing vegetables. The structured questionnaire used for the household survey is in Appendix 3.

We collected both primary and secondary data. Secondary data were collected from government statistics available at the provincial agricultural extension office and other government agency offices.

The field survey focused largely on the four project-targeted vegetables (chili, tomato, cucumber, and amaranth), which were selected as project priority crops for intervention during scoping trips to Aceh in 2006.

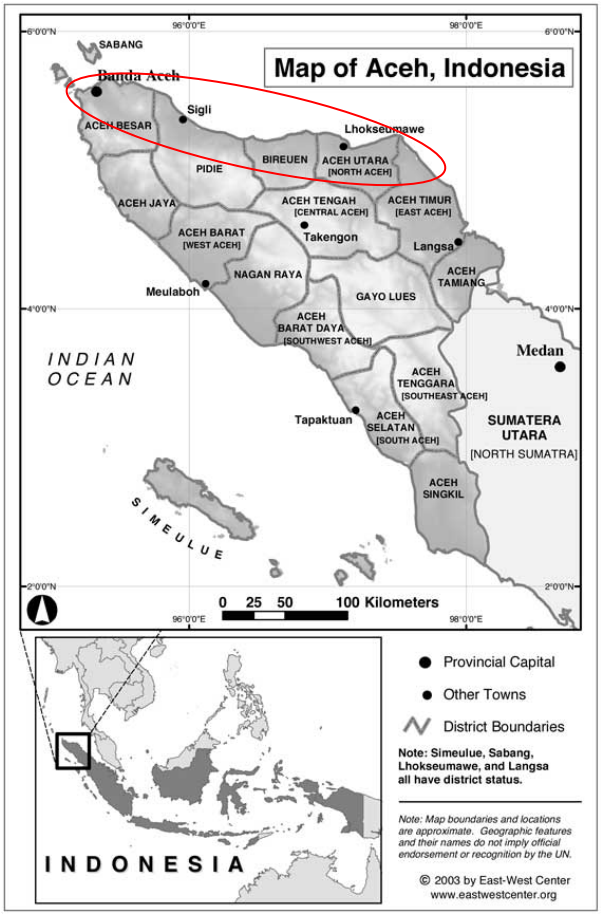


Figure 2.1 Map of Aceh showing the study area. *Source*: Huber (2004)

2.2. Training of survey teams and survey procedures

In early 2008, the survey team—six research assistants (field enumerators) and four research officers of BPTP—attended a week-long intensive training course given by the first author. A draft study methodology was presented, discussed and finalized by all key project stakeholders, including the project manager/technology dissemination specialist from AVRDC. The draft questionnaires were discussed and explained item by item, and the questions tailored per the local needs and farming context of Aceh as suggested by the project survey team. On the fifth and sixth days of the training course, the final draft questionnaires were field-tested in two villages in Aceh Besar, located just outside of the provincial capital, Banda Aceh. The training course allowed for better understanding of the questionnaires and better articulation of purpose, scope and objectives for the household survey and the baseline study. To minimize bias arising due to misinterpretation of questionnaires among enumerators themselves, the field-tested and finalized questionnaires were translated into the local dialect.

2.3. Data collection procedures and study communities

During January-July 2008, the household survey was carried out in eight communities located in five different districts of Aceh province; each of these districts were hard-hit by the 2004 tsunami. The five districts surveyed were: Aceh Besar, Pidie, Pidie Jaya, Bireuen, and Aceh Utara. The eight communities surveyed were the same villages where the initial consultation and Participatory Appraisal (PA) had been conducted early 2007; in addition, Farmer Field School activities were planned for these villages. About 30 farmers growing vegetables were surveyed in each community, totalling 240 households.

For sampling, all of the vegetable growers in the community were listed, and then about 30 households that regularly grew vegetables for market sale were selected for individual interviews with structured questionnaires. Households selected for individual interviews were from all income categories, from small- to large-scale farmers, and included those households targeted for vegetable cultivation training through Farmers Field Schools in 2009.

A “vegetable grower” was a farmer who regularly grew vegetables for home consumption and also for market sale. Thus, for this study, a vegetable grower was identified as a farmer who:

- had grown vegetables over the past two years,
- sold a part of the produce at the local market, and
- dedicated at least 50 square meters of land for vegetable cultivation.

These criteria were used to separate the regular vegetable growers from others who grew just a few vegetables in the backyard for home consumption.

Some of the vegetable farmers selected for the survey were growing vegetables mainly for market. Out of 240 households surveyed (Table 2.1), 218 households were identified as vegetable growers and the rest as non-vegetable growers. Farmers in the villages selected for the survey and project implementation used to cultivate vegetables widely before the tsunami. In addition to regular vegetable growers, we also included other farmers who could be potential candidates for subsequent FFS training; the proportion of non-vegetable growers in the sample was smaller than that of the vegetable growers.

Table 2.1 Sample for household survey in the Aceh locations

Surveyed units	Aceh Besar	Pidie	Northeast Aceh	Total sample
Number of districts	1	2	2	5
Names of districts	Aceh Besar	Pidie Pidie Jaya	Bireuen Aceh Utara	
Number of villages surveyed	4	2	2	8
Number of households surveyed	120	60	60	240

We aggregated overall results and findings for convenience in summarizing the survey data from several villages. The five surveyed districts were regrouped into three survey locations:

a. **Aceh Besar**: covering four communities in Aceh Besar district

b. **Pidie**: covering surveys in Pidie and Pidie Jaya districts

c. **Northeast Aceh:** covering survey results from one community each from Bireuen and Aceh Utara

The survey findings are compared and contrasted across the three locations in Aceh, and likewise, an average value for Aceh is derived by taking the average of these three locations. The locations were formed by taking into consideration their farming characteristics, agroecology, and geographical settings. For example, production characteristics of vegetable farming in Pidie and Pidie Jaya are almost the same, and they are adjacent districts; therefore, pooling survey data from these two districts would not create any potential bias, or reduce heterogeneity of locations in the results. In fact, until a few years ago, these two districts together formed the single district of Pidie. In the case of Aceh Besar, all of the four communities/villages surveyed were from the same district, and hence, they were kept under Aceh Besar (Table 2.1).

2.4. Analytical procedure

Data analysis

Data analyzed from the household surveys covered the following aspects of vegetable farming:

- Socioeconomics of vegetable farmers and their characteristics
- Overall farming practices followed in the community, and crop types grown
- Soil types and land types
- Types of vegetables grown and overall cropping patterns followed
- Level of vegetable consumption
- Farm management practices, irrigation types, cultural practices followed
- Cost and returns of vegetable farming
- Institutions and policies affecting vegetable farming
- Local capacity and training activities in relation to vegetable farming
- Vegetable marketing practices followed

Cost and return data were collected and analyzed only for chili, the most popular vegetable in the surveyed communities at that time.

Comparative assessment across the three production locations

This study compares the key variables of vegetable farming across three main vegetable production locations in Aceh. Also, an average parameter of key variables for Aceh was derived by taking averages of the three production locations. Selected parameters of basic statistics such as, average sample mean, frequency, and weighted rank or arithmetic average rank [1] (for farmers' opinions, preferences, etc.) were derived to interpret and compare these parameters.

2.5. Limitation of the study

The overall aim of the project was to restore rural livelihoods and soil fertility in tsunami-affected areas. These coastal areas are not located in the predominant vegetable production zones of the province, and the communities selected for assessment were not necessarily representative of typical vegetable production locations in Aceh (Fig. 2.1). Nevertheless, the results presented in this study may be useful for understanding constraints and opportunities of restoring vegetable cultivation activities in NAD and other disaster-hit communities in Indonesia, and other countries in the region.

3. Overview of Vegetable Farming in Aceh

Agriculture is important for the employment and livelihoods for a majority of Aceh's rural population. Vegetables are relatively short-duration crops compared with commonly cultivated staple crops such as rice; vegetables provide quick returns to growers, but also provide more income, employment, and nutrient per unit of area of cropland than rice or other staples. Therefore, after the tsunami, vegetable production was targeted as a rehabilitation activity by several government and nongovernmental organizations.

3.1. Vegetable production in Aceh: status and prospects

Chili is an important and widely traded crop in Aceh. A comparison of crop acreage, production and productivity of chili in Aceh with two other nearby provinces and national statistics indicates the province accounted for about 3% of Indonesia's total chili crop acreage in 2007 (Table 3.1). Average productivity of chili in Aceh was about 15% less than the national level, and almost half that of North Sumatra, the province adjacent to Aceh (Table 3.1).

Table 3.1 Crop areas, production, and productivity of chili in selected provinces of Indonesia, 2007

Province	Harvest area (ha)	Production (t)	Yield (t/ha)
Nanggroe Aceh Darussalam (Aceh)	5,616	26,422	4.70
North Sumatra	13,229	112,843	8.53
West Java	15,447	184,764	11.96
Indonesia - all	**204,048**	**1,128,790**	**5.53**

Source: "Indonesia - all" FAOSTAT (2010); others from BPS (2008).

[1] First rank value was given to the most important factor as perceived by the respondent farmers, and second and third rank values to the least important factors. For the average across three locations, lowest preferred rank value (largest number in the table) plus 1 was given to those factors where no information was provided by farmers, as we assumed them as neglected rank value.

Table 3.2 lists some of the major vegetables grown in Aceh, their crop acreage, production, and productivity (yield) levels for 2006 and 2007. During the authors' visit to the wholesale vegetable markets in Banda Aceh in June 2009, more than 60 different types of vegetables were recorded; many were indigenous types collected from nearby forest areas. Data on the collection or cultivation of most indigenous vegetables is not available. Among the vegetables with data consistently recorded by government agencies, chili had the highest crop acreage in Aceh in 2007, at about 8,000 ha, with average productivity of 4.7 t/ha (Table 3.2).

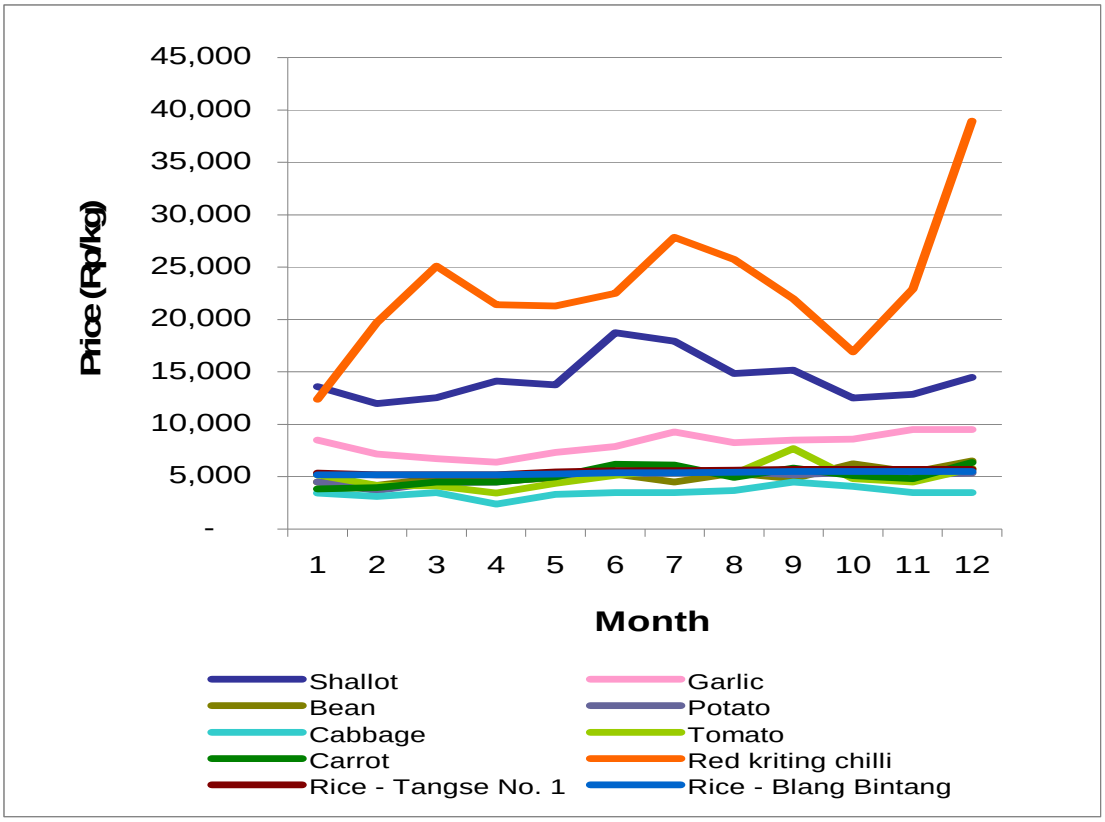
Price fluctuation patterns of selected vegetables in Banda Aceh wholesale vegetable market are reported in Figure 3.2. In any month, the price of red chili was the highest among all vegetables, but prices of chili were also the most volatile, followed by shallot and garlic. Chili prices were relatively high in December and July-August, and low in October, January and April-June (Fig. 3.1).

Table 3.2 Crop area, production, and productivity of vegetables in Aceh, 2006 and 2007

		2006			2007		
S N	**Crop**	**Crop area (ha)**	**Production (t)**	**Yield (t/ha)**	**Crop area (ha)**	**Production (t)**	**Yield (t/ha)**
Vegetables							
1	Chili (Big chili)	9,162	43,976	4.80	5,616	26,422	4.70
2	Yard-long bean	3,226	13,216	4.10	3,430	17,030	4.97
3	Small chili	2,890	14,577	5.04	2,440	11,207	4.59
4	Cucumber	2,890	23,602	8.17	2,402	16,921	7.04
5	Amaranth	1,969	3,571	1.81	1,899	4,023	2.12
6	Kangkong	1,660	1,257	0.76	1,654	10,606	6.41
7	Eggplant	1,531	9,006	5.88	1,576	10,696	6.79
8	Tomato	1,395	10,307	7.39	1,420	10,642	7.49
9	Shallot	837	7,494	8.95	933	6,222	6.67
10	Potato	827	13,410	16.22	1,181	17,646	14.94
11	Chinese cabbage	492	2,274	4.62	509	2,539	4.99
12	Red bean	411	1,640	3.99	633	1,118	1.77
13	Green bean	341	2,226	6.53	391	1,931	4.94
14	Squash	297	2,099	7.07	319	1,668	5.23
15	Spring onion	277	1,766	6.38	336	2,224	6.62
16	Cabbage	239	7,278	30.45	317	6,402	20.20
17	Carrot	186	2,857	15.36	183	2,864	15.65
18	Cauliflower	111	1,594	14.36	100	1,346	13.46
19	Radish	31	102	3.29	13	52	4.00
20	Garlic	12	45	3.75	18	69	3.83
	Sub-total	**28,784**			**25,370**		
Cereal crop							
1	Rice	320,789	1,502,748	4.68	360,717	1,533,369	4.25

Source: Provincial Agricultural Statistics, BPS, Government of Indonesia, 2008.
Note: In government published statistics in Indonesia, consistent data series for vegetables are not available for Aceh for 2005 or earlier; therefore, only two years of historical data are presented in the table.

Figure 3.1 Chili at the wholesale vegetable market in Banda Aceh, 2007



Source: Based on unpublished daily price data compiled by DINAS Pertanian (provincial agricultural extension agency), Banda Aceh, Aceh.

Figure 3.2 Monthly fluctuations of market prices across vegetables in Aceh, 2008

3.2. Districts selected for the household survey

Project activities focused on five districts: Aceh Besar, Pidie, Pidie Jaya, Bireuen, and Aceh Utara. In each district, 2-3 communities/villages were selected for the detailed survey,

project interventions, and related activities. For convenience in summarizing the data and survey results, we have merged these five districts into three broad vegetable production locations/regions. The communities and districts selected for the socioeconomic survey do not represent the main vegetable production areas of Aceh; the sites were chosen because of the urgent need to rehabilitate vegetable acreage after the disaster, and in accordance with the priorities of local government.

Aceh Besar

A total of 120 households from four communities in Aceh Besar district were selected for the in-depth household survey. Banda Aceh, the provincial capital, is located in this district; compared with other locations, farmers here supposedly have better access to market infrastructure as well as other public support and services.

Pidie

Two districts, Pidie and Pidie Jaya, were selected from the north central region of Aceh for the in-depth household study. The surveyed villages/communities were located about 10 km from the nearest market town (Sigli), about 100 km from Banda Aceh, and about 2-3 km from the national highway connecting Banda Aceh to Medan, the provincial capital of North Sumatra and the fourth largest city in Indonesia. Farmers in the Pidie locations practiced more subsistence agriculture than farmers in the other survey locations.

Northeast Aceh

Bireuen and Aceh Utara were selected from Northeast Aceh for the in-depth socioeconomic assessment, on-farm research, and Farmer Field School interventions. Results from the two districts were combined and reported under the heading of northeast Aceh. Although northeast Aceh is more than 250 km away from Banda Aceh, it is well-connected with a permanent road to Medan. Most of the vegetables produced from northeast Aceh are transported and sold in Medan; farmers and traders in northeast Aceh mostly purchased farm inputs in Medan.

4. Vegetable Production Characteristics in Aceh

4.1. Study location

The sample villages and households selected for the survey are summarized in Table 4.1.

Table 4.1 Basic characteristics of each location surveyed, Aceh

Description	Aceh Besar	Pidie	Northeast Aceh	Total
Number of households surveyed	120	60	60	240
Total number of farm households in the village surveyed	458	683	360	1,501
Percent of households surveyed in the villages	26	9	17	16
Name of villages	- Ladong - Lam Gireuek - Meunasah Baro - Meunasah Moncut	- Jaja Tunong - Meu	- Krueng Juli Barat - Kuta Krueng	
Avg. distance of villages from provincial capital, Banda Aceh (in km)	5-10	100-120	200-250	

4.2. General background

Most farmers surveyed grew vegetables in home gardens, with about 50 m^2 of land area dedicated for vegetable production. More households in Aceh Besar and Pidie were classified as vegetable growers compared with Northeast Aceh (Table 4.2). Chili and rice were grown by 78% and 84% of the households surveyed. A chili-growing household was defined as a farmer/household that cultivated chili at least once in the previous 3 years and also sold part of the chili harvest at a local market. Rice-growing households were those that had grown rice in the previous few years; some rice-growing households were also growing chili and other vegetables regularly.

Table 4.2 Characteristics of the households surveyed, Aceh

Description	Aceh Besar	Pidie	Northeast Aceh	Total
Number of vegetable growers surveyed	113	57	48	218
Number of non-vegetable growers surveyed	7	3	12	22
Total number of households surveyed	120	60	60	240
Number of households growing rice	99	49	53	201
Number of households growing chili	113	25	48	186
Percentage of households survey growing vegetable	94	95	80	91
Percentage of households surveyed growing rice	83	82	88	84
Percentage of households surveyed growing chili	94	42	80	78
Number and percentage of female respondents interviewed	8 (7%)	11 (18%)	9 (15%)	28 (12%)

On average, about 80% of surveyed households grew chili over the previous 3-4 years, ranging from 94% in Aceh Besar to 42% in Pidie. Pidie is located some distance from a wholesale vegetable market, which could be the reason for the lower percentage of households growing chili there.

About 12% of the survey respondents were women. Pidie had a higher percentage of women respondents than the other two locations.

Data on family profiles and household information such as education, vegetable growing experience, and farmers' training are reported in Table 4.3. On average, four to five family members were living in one farm household. Average age of head of households was 43 years, with an average of about five years of education. Farmers had an average of 18 years of farming experience, and vegetable farming experience of about 13 years. Farmers in Pidie were the most experienced in farming, both in growing vegetables and rice. Many farmers had previous training in vegetable cultivation practices.

Table 4.3 Household information and family profiles in survey locations, Aceh

Description	Unit	Aceh Besar		Pidie		Northeast Aceh		Average*	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
Age of household head	Years	43.03	11.25	41.00	10.31	44.00	11.3	42.68	10.95
Education level of household head	Years	5.1	2.19	4.83	2.08	4.23	1.85	4.72	2.04
Farming experience of household head	Years	15.85	11.13	19.60	12.49	18.30	12.71	17.91	12.11
Vegetable growing experience of household head	Years	12.65	10.16	14.59	11.96	10.29	10.13	12.51	10.75
Farmers' training in vegetable cultivation	Day	4.87	5.03	2.91	2.43	6.38	6.82	4.72	4.76
Total family members living in a household	No	4.17	1.78	4.4	1.87	4.77	2.01	4.44	1.89

Note: * The average value is taken as arithmetic average of the mean and SD value across the three locations. The numbers in average represent average value of the three locations surveyed instead of overall sample mean. The latter then would have been biased toward the sample mean of Aceh Besar, since 50% of the overall sample of households surveyed was from Aceh Besar.

Farming was the main occupation for more than 95% percent of households surveyed (Table 4.4). However, more than 30% of the surveyed households had secondary employment as paid labor in the urban market[2]. Other important secondary employment sources were fishing, small trading, civil service, livestock raising, and irregular jobs.

Table 4.4 Structures of household head occupation and employment in survey locations, Aceh

Description	Aceh Besar	Pidie	Northeast Aceh	Overall
Main occupation (%):				
Farming	100.0	95.0	91.7	96.7
Civil servant	-	1.7	1.7	0.8
Retail shop	-	-	-	-
Local trader	-	-	-	-
Fishing	-	1.7	-	0.4
Other	-	1.7	6.7	2.1
Secondary occupation (%):				
Farming	-	-	10	2.5
Civil servant	1.7	3.3	1.7	2.1
Retail shop	-	-	-	-
Small trading	4.2	6.7	13.3	7.1
Fishing	-	18.3	11.7	7.5
Wage labor	39.2	23.3	21.7	30.8
Big trading	1.7	-	-	0.8
Livestock rearing	1.7	1.7	1.7	1.7
Other	1.7	11.7	25.0	10.0
Total responded (number)	120	60	60	240

[2] From 2005-2008 there was a surge in construction and rehabilitation activities in the disaster-hit areas of Aceh; hence the labor market in general was very tight in Aceh during the survey time. In 2008 average labor wage for unskilled labor, including farm labor, in Aceh Besar was about US$5/day, almost double the prevailing wage in peri-urban areas of Central Java and other parts of Indonesia (authors' observation in 2007/08).

4.2.1. Characteristics and family profile of vegetable growers

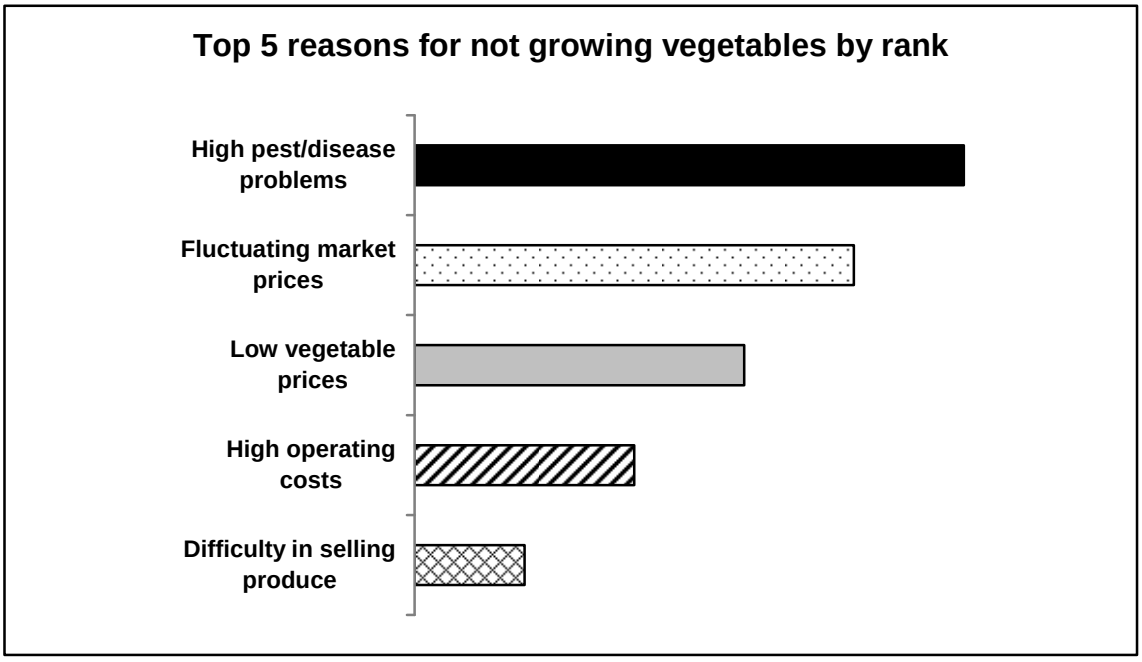
Most farmers grew vegetables in small plots. Constraints to vegetable production included the high incidence of pests and diseases, fluctuating market prices, low prices for vegetables, and high operating costs for vegetable production compared with other crops (Table 4.5, Fig. 4.1).

Table 4.5 Reasons for not growing vegetables given by an average household in the survey locations, Aceh

Description	Aceh Besar		Pidie		Northeast Aceh		Total Sample	
	Rank	Freq	Rank	Freq	Rank	Freq	Rank	Freq
High pest/disease problems	1	112	1	51	1	52	1	215
Fluctuating market prices	2	44	3	30	2	24	2	98
Low vegetable prices	3	40	2	33	3	19	3	92
High operating costs	4	37	5	14	4	16	4	67
Difficult in selling produce	5	25	4	19	5	12	5	56
Land destroyed by tsunami	6	24	6	10	6	10	6	44
No vegetable growing experience	7	20	8	7	7	8	7	35
Not having suitable land for vegetable cultivation	8	15	7	8	8	6	8	29

Note: Rank of 1 = highest important factor, and 8 = lowest important factor;

Freq => Frequency = number of households that reported this particular reason with the corresponding rank.



Note: The length of the bar reflects the relative importance of a factor as ranked by farmers (the longer the more important).

Figure 4.1 Top five reasons for an average farmer not wanting to cultivate vegetables

4.2.2. Vegetable areas and farming characteristics

Some of the important vegetables grown in the survey locations were chili, tomato, cucumber, eggplant, yard-long bean, amaranth, shallot, kangkong, pak choy, and cabbage. (AVRDC 2007). Chili was the most commonly grown vegetable; crop area per household was small for other vegetables such as tomato and cucumber. Many of the farmers could not recall details on cultivation practices followed, land areas by crop types, or inputs used for different vegetables cultivated in a year. Therefore, in Table 4.6, we have summarized specific details only of chili cultivation practices.

Chili cultivation

On average, chili-growing households cultivated chili on about 0.26 ha, with average production of about 2400 kg per household (Table 4.6). Only a few of the surveyed farmers who were market-oriented were able to report detailed quantitative information on production practices and input use by crop types; their average productivity tended to be higher than the average productivity of Aceh as a whole. Among the three locations, the vegetable crop acreage was higher in Aceh Besar but the productivity of chili was higher in Northeast Aceh. About 95% of the chili produced was sold in the market (Fig. 4.2). The average price received by farmers in Northeast Aceh was about 33% higher than in Aceh Besar (Table 4.6). The total value of chili sold by an average farmer who had cultivated chili in 2007/08 was about Rp 28 million (equivalent to US$2800/household). The average gross return from chili cultivation per household was higher in Aceh Besar than in Northeast Aceh, due to its higher crop acreage per household.

Table 4.6 Production and income from chili cultivation in Aceh, 2007

Description	Unit	Aceh Besar (mean)	Pidie (mean)	Northeast Aceh (mean)	Average of three locations
a. Avg. crop area	m^2	3,872	3,007	1,003	2,625
b. Total production	kg	3,717	2,400	1,040	2,386
c. Average productivity	kg/ha	9,600	8,000	10,400	9,333*
d. Production distribution					
- Home consumption	%	5	5	5	5
- Sold	%	95	95	95	95
e. Market sale					
- Quantity sold	kg	3,531	2,280	988	2,266
- Average price	Rp/kg	12,000	11,000	16,000	12,246
- Value of market sale	Rp 000	42,375	25,080	15,808	27,754

1. m^2 = square meter; Rp = Indonesian Rupiah; * = average of the yield from the three survey locations

2. Number of chili farmers who reported these data in Aceh Besar, Pidie, and Northeast Aceh were 19, 5, and 9, respectively. Farmers who provided details information on farm inputs were relatively better-off financially, and they also had adopted improved cultivation practices.

3. The location-specific mean is derived taking only the number of households that reported growing chili (frequency) in the survey location. The same procedure was followed while deriving sample mean reported later on, unless mentioned otherwise.

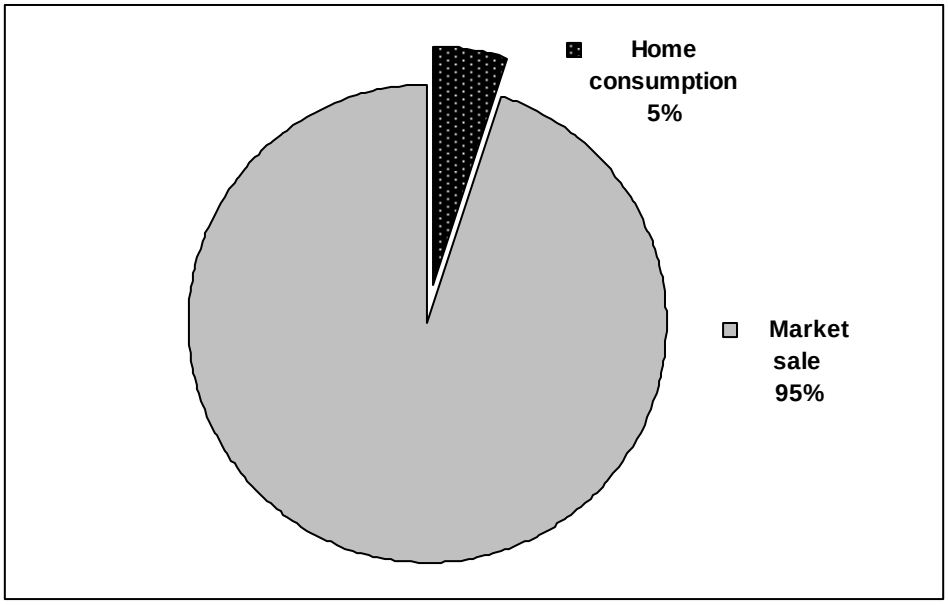


Figure 4.2 Distribution of home consumption and market sale of chili among surveyed households

4.2.3. Land holding, crops grown, and major livelihood characteristics

Land holding statistics widely varied across the three locations and also across the farmers within a survey location, leading to very high standard deviations. An average farmer owned 0.6 ha of land and rented another 0.3 ha from neighbors (Table 4.7). Due to the labor shortage at the time many farmers rented out land or kept land fallow after rice cultivation. About 50% of the crop land per household basis was considered lowland (for rice cultivation), and the remaining 50% as upland, or slightly elevated land more suitable for vegetable cultivation (Table 4.7).

Table 4.7 Agricultural land holdings in the survey locations, Aceh

Description	Unit	Aceh Besar		Pidie		Northeast Aceh		Overall	
		Avg	SD	Avg	SD	Avg	SD	Avg	SD
Own crop area	m^2	6,577	12,148	4,876	3,555	5,749	10,915	5,945	8,873
Rented in/shared crop area	m^2	3,013	2,373	2,710	2,075	3,073	2,820	2,952	2,422
Uncultivated land area	m^2	5,888	5,958	2,500	-	3,520	4,041	4,449	3,333
Cultivated area	m^2	6,355	12,097	4,308	3,494	3,534	3,064	5,138	6,218
Number of parcels	No.	1.61	0.68	1.69	1.16	2.25	1.16	1.79	1.00
Lowland area	m^2	3,613	2,210	3,689	2,644	3,726	6,844	3,660	3,899
Dry land/upland area	m^2	4,803	11,895	2,704	2,913	2,326	3,594	3,659	6,134

Note: SD = Standard Deviation. Compared to sample mean, standard deviation of land holding related factors were very high due to very high variation across the farmers and across the survey locations. Due to the higher level of SD for many of these variables, the difference of mean across the sample may not be statistically significant.

Rice was cultivated more in Aceh Besar and Pidie than in Northeast Aceh; food security obtained from rice cultivated on own land was also higher in those districts.(Table 4.8). Food security during a year was not met solely by rice, but by rice and other sources (i.e. income

from labor, fishing, etc.). On average, rice harvested from own land was sufficient to meet only 8-9 months of annual consumption need.

Table 4.8 Household food security level in the survey locations, Aceh

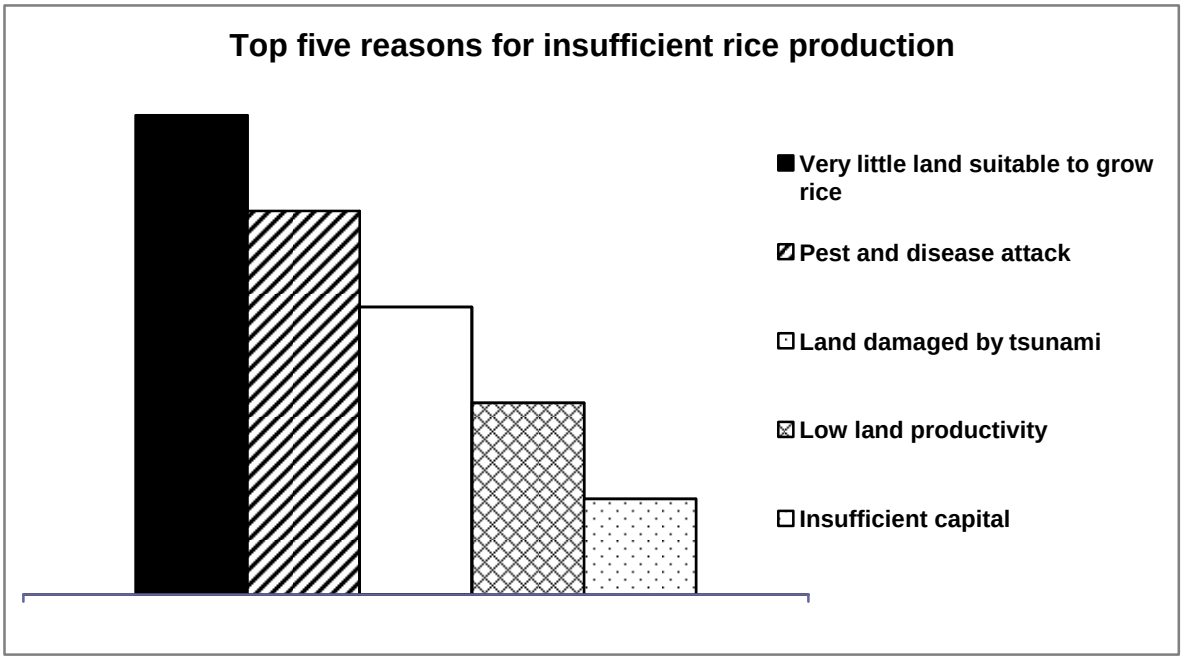
Description	Aceh Besar	Pidie	Northeast Aceh	Overall
Rice production sufficiency for whole year (%)				
Yes	73	75	43	66
No	27	25	57	34
Number of months of food insufficient from own production	4	4	3	3.7

The main factors leading to rice insufficiency were small size of farm, pest and disease outbreaks, and infertile land due to tsunami damage (Table 4.9, Fig. 4.3). Low productivity of land was the main factor for increased food insecurity after the tsunami. Soil salinity levels increased in many of the locations damaged by the tsunami. Farmers met the additional demand for rice by purchasing rice from local markets, or by growing high-value crops including vegetables. Efforts to restore or improve soil fertility are expected to increase agricultural productivity and eventually improve food security and rural livelihoods in Aceh.

Table 4.9 Reasons for insufficient rice production in the survey locations, Aceh

Reasons	Ranking by importance			
	Aceh Besar	Pidie	Northeast Aceh	Overall
Very little land suitable to grow rice	1	1	1	1
Pest and disease attack	3	2	2	2
Land damaged by tsunami	2	3	3	3
Low land productivity	4	4	5	4
Insufficient capital	5	5	4	5
High salinity due to the tsunami	6	6	6	6
Engaging in fishing activity	7	7	7	7
Large family size	8	8	8	8
Engaging in wage labor	9	9	9	9

Note: 1 = highest importance rank, and 9 = lowest importance rank.



Note: The height of the bar reflects the relative importance of a factor as ranked by farmers (the higher the more important).

Figure 4.3 Top five reasons for insufficient rice production in Aceh

An average household consumed about 2.7 kg vegetables per week in the dry season and spent about Rp 19,000/week to buy vegetables (Table 4.10). The level of vegetable consumption in the wet season was almost the same as in the dry season. Vegetable consumption per household was higher in Northeast Aceh than in the other two locations. High vegetable consumption does not necessarily mean a wealthier household; in some parts of Indonesia, particularly in rural areas, vegetables are considered inferior foods. Wealthier households consumed less vegetables and more meat, eggs and fish than middle- or low-income consumers.

Table 4.10 Weekly consumption of vegetables by an average family and by season in the survey locations, Aceh

Description	Unit	Aceh Besar	Pidie	Northeast Aceh	Average
Dry season (April-July)					
Total quantity of vegetable consumed	kg/week	1.56	2.79	3.89	2.74
Amount of money spent for vegetable purchase	Rp/week	11,213	22,717	24,842	19,591
Wet season (August-December)					
Total quantity of vegetable consumed	kg/week	1.51	2.76	3.83	2.70
Amount of money spent for vegetable purchase	Rp/week	11,600	22,633	24,633	19,622

4.2.4. Farm land and farm assets holding

Cultivation of vegetables and rice were the most common land use types in the surveyed locations, with about 0.37 and 0.32 ha per household respectively (Table 4.11 and Fig. 4.4). Crop acreages per household for rice and vegetables were highest in Aceh Besar. After the tsunami, a large area of agricultural land in the survey region could not be cultivated due to

the deposition of sand and debris. Aceh Besar has more uncultivated land than the other two locations, indicating greater severity of the tsunami.

Table 4.11 Per family land holdings by land use types in the survey locations, Aceh

Description	Aceh Besar			Pidie			Northeast Aceh			Overall		
	Avg	Freq	SD	Avg	Freq	SD	Avg	Freq	SD	Avg	Freq	SD
Home garden	248	70	329	162	25	209	1,062	13	3,094	578	108	1,211
Rice field	3,327	102	3,330	3,707	53	2,450	2,513	55	1,986	3,209	210	2,589
Vegetable crop land	4,891	95	13,201	3,878	50	3,556	1,003	47	1,213	3,676	192	5,990
Perennial crop land	3,004	11	5,725	1,983	9	1,015	2,278	12	4,098	2,444	32	3,612
Barren/uncultivated land	3,673	15	5,330	430	6	1,014	1,145	13	2,909	2,134	34	3,084

Note: The land area is in square meters (m^2); Avg = average; Freq = frequency; SD = standard deviation.

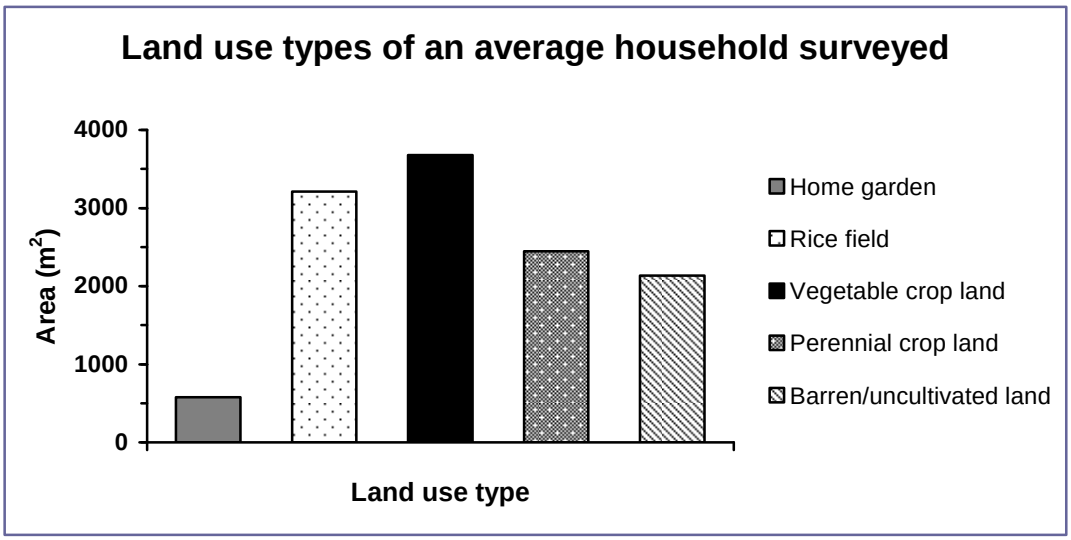


Figure 4.4 Major land use types followed in the survey locations, Aceh

On average, the distance of a rice plot from the nearest water source was 38 meters (Table 4.12), but an average vegetable plot was only about 15 meters from a water source. Although vegetables need less water (in terms of water quantity) than rice, they require more frequent irrigation than rice; hence a majority of farmers prefer to grow vegetables close to water sources for convenience.

Table 4.12 Distance of farm plots from water source (in meters) in the survey locations, Aceh

Description	Aceh Besar			Pidie			Northeast Aceh			Overall		
	Avg	Freq	SD	Avg	Freq	SD	Avg	Freq	SD	Avg	Freq	SD
Rice plot	0.4	102	1.47	28.1	53	98.26	120.4	53	556.33	38.1	208	218.69
Vegetable plot	28.7	67	75.54	3.0	50	2.51	9.1	47	11.18	15.2	164	29.74
Perennial cropland	20.8	11	43.7	11.1	9	15.6	9.0	12	9.1	13.7	32	22.78
Barren/ uncultivated land	0.3	15	0.7	0.2	6	0.41	0.8	13	1.86	0.5	34	0.99

Note: Avg = average; Freq = frequency; SD = standard deviation

In Northeast Aceh and Pidie, rice plots are irrigated by canals. About one-third of the sample households had cultivated rice on canal-irrigated plots (Table 4.13). In Aceh Besar, canals and other farm irrigation infrastructure were severely damaged by the tsunami; the majority of farmers there practiced rain-fed rice farming (Figure 4.5).

Table 4.13 Irrigation sources and soil types of rice fields in the survey locations, Aceh

Description	Aceh Besar	Pidie	Northeast Aceh	Overall
	Freq (n=120)	Freq (n=60)	Freq (n=60)	Freq (n=240)
Source of irrigation				
Rain-fed	89	20	4	113
Canal	7	32	36	75
Well	-	1	3	4
Small pump	-	-	11	11
River	6	-	1	7
Major soil types				
Clay	49	33	2	84
Sandy	6	9	3	18
Sandy clay	39	11	27	77
Loam	2	-	3	5
River bed	6	-	1	7

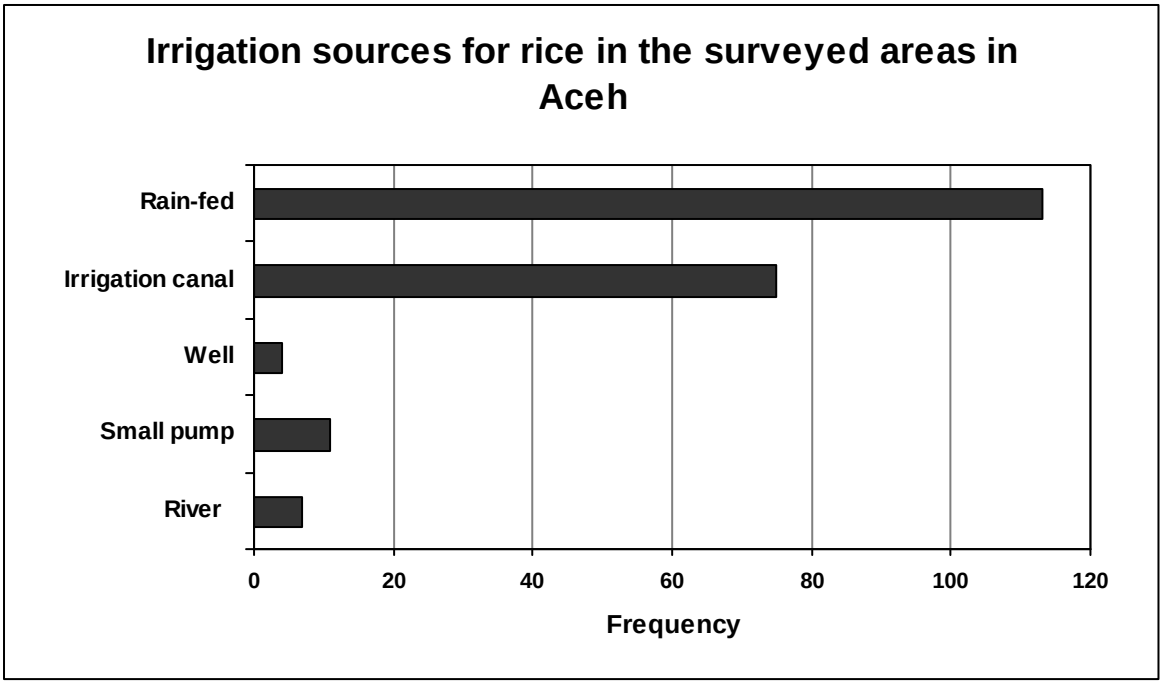


Figure 4.5 Major irrigation sources for rice by frequency (number of farmers), Aceh

4.2.5. Production practices for the project targeted crops

Chili, tomato, cucumber and shallot were cultivated in the surveyed communities (Table 4.14, Fig. 4.6). Hand wells (tubewells) were the main source of water for irrigating vegetable plots in Aceh.

Table 4.14 Major crops planted, irrigation sources and soil types of vegetable land at the Aceh survey locations

Description	Aceh Besar	Pidie	Northeast Aceh	Overall
	(no. of farmers)	(no. of farmers)	(no. of farmers)	(no. of farmers)
Crop planted				
Chili	64	21	18	103
Tomato	13	5	5	23
Cucumber	6	7	4	17
Yard-long bean	-	3	4	7
Amaranth	3	1	3	7
Shallot	1	11	4	16
Kangkong	-	1	1	2
Pak Choy	1	-	3	4
Cabbage	-	1	-	1
Other	1	-	-	1
Source of irrigation				
Rain-fed	6	1	2	9
Irrigation canal	1	4	1	6
Well	63	45	38	146
Pump	12	-	3	15
River	7	-	3	10
Major soil types				
Clay	17	7	6	30
Sandy	11	21	19	51
Sandy clay	56	22	21	99
Loam	3	-	1	4
River bed	2	-	-	2

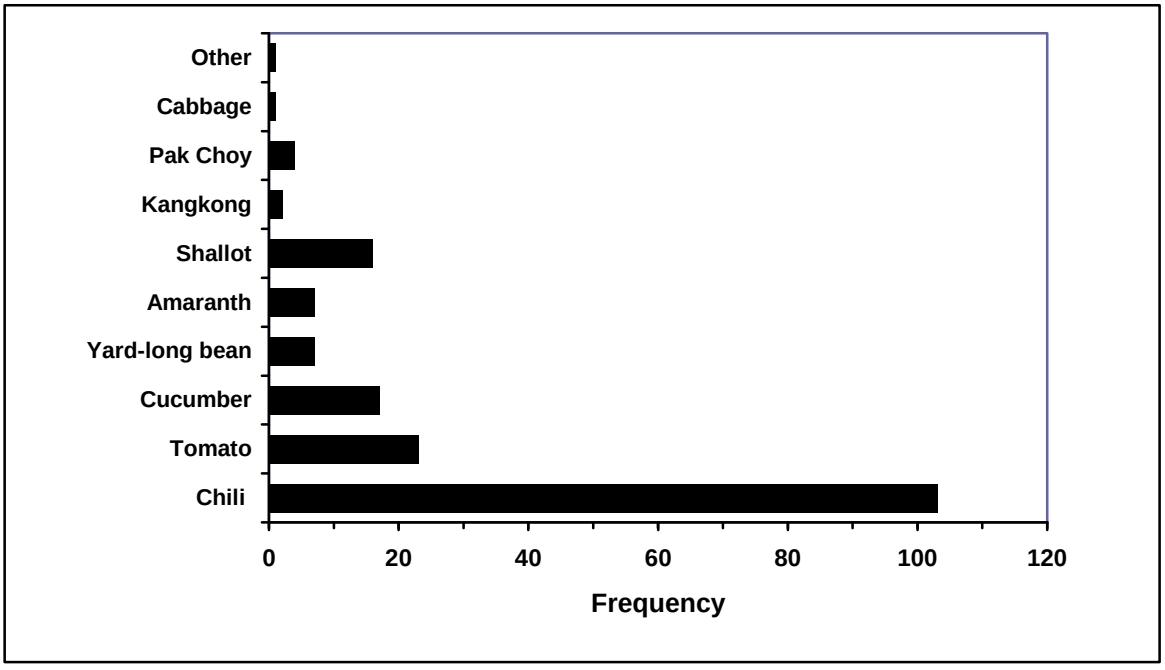


Figure 4.6 Major vegetables grown by the surveyed households by frequency (number of respondents)

5. Infrastructure and Institutional Issues

Availability of and access to markets, roads, and irrigation are critical factors in a farmer's decision to grow vegetables. Institutional and policy factors conducive to vegetable production are equally important motivating factors. The 2004 tsunami destroyed not only physical infrastructure but also the basic institutional infrastructure and public support systems in several coastal communities in Aceh. This study evaluated the roles of infrastructure and institutional factors on vegetable farming in Aceh.

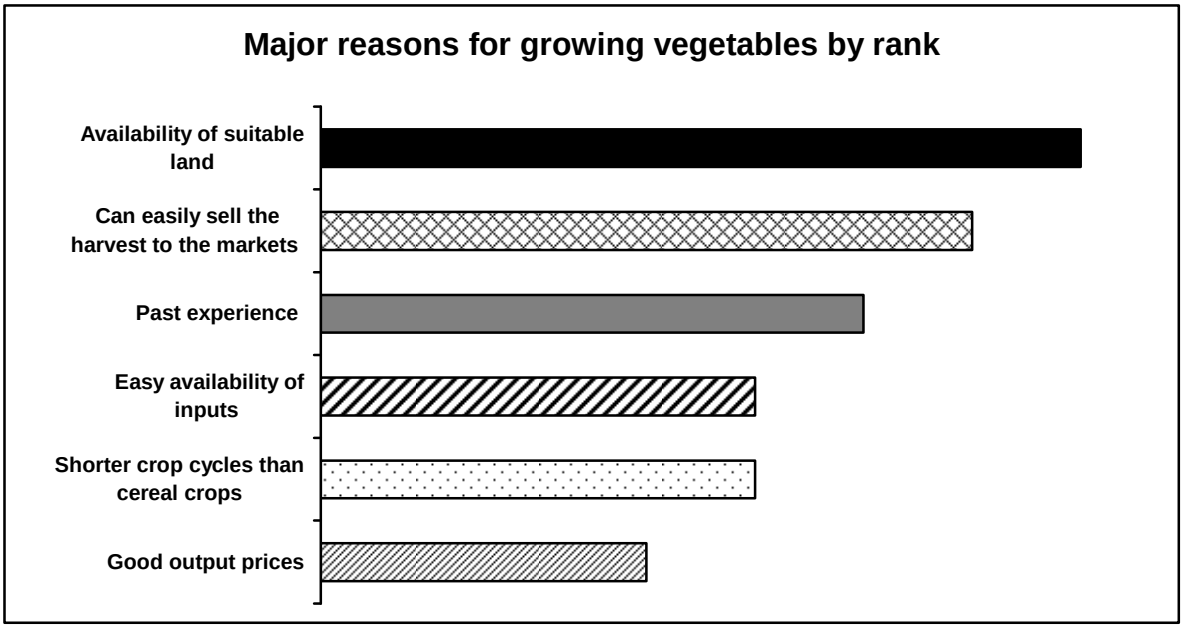
5.1. Major constraints in vegetable farming

Reasons affecting farmers' decision to grow vegetables in Aceh are summarized in Table 5.1 and Figure 5.1. In Aceh Besar and Pidie, farmers ranked suitability and availability of land as the most critical factor for growing vegetables. In Northeast Aceh, the most important factor for farmers' decision to grow vegetables was ease and local availability of inputs; this could be due to the more input-intensive farming practices followed in Northeast Aceh.

Table 5.1 Major reasons for growing vegetables by the surveyed households in Aceh, 2008

Factors\ranking order	Importance by rank value				
	Aceh Besar	Pidie	Northeast Aceh	Average	(Overall)
Availability of suitable land	1	1	4	2.0	1
Past experience	2	5	3	3.3	3
Can easily sell the harvest to markets	3	2	3	2.7	2
Good output prices	4	-	2	4.7	5
Short crop cycles than cereal crops	5	3	5	4.3	4
Ease in crop management	6	-	-	7.3	7
Low-cost protection/operation	7	7	-	7.3	7
Availability of inputs	-	4	1	4.3	4
Availability of water	-	6	-	7.3	7
Less land and want more income	-	-	6	7.3	7
Good extension services	-	-	7	7.7	7

Note: Rank of 1 = highest importance; 7 = lowest importance. Overall ranking is derived from average ranking across the three locations. The rank value of 8 was given to the missing information considering as least important (or neglected) rank value in calculating the average rank value. Overall ranking order was recalculated based on the average rank value.



Note: The length of the bar reflects the relative importance of a factor as ranked by farmers **(**the longer the more important).

Figure 5.1 Major reasons for growing vegetables

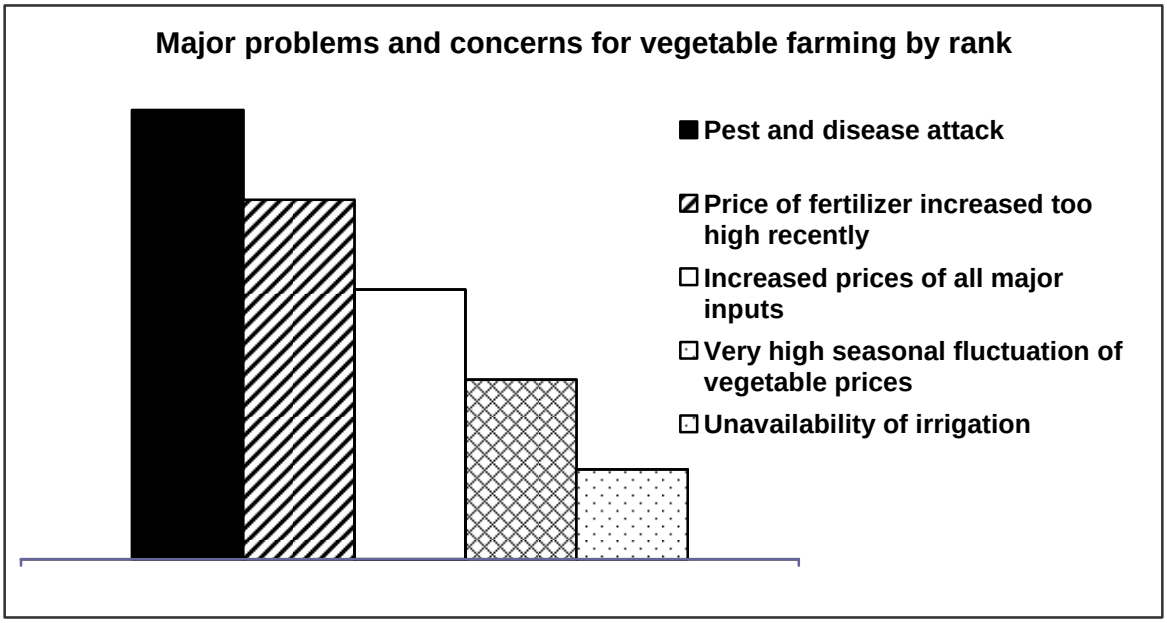
The increase in pest and disease outbreaks was the most critical problem faced by vegetable farmers, followed by high price of fertilizers[3] and other inputs, high fluctuation of produce prices, and unavailability of irrigation (Table 5.2, Fig. 5.2). The first three problems are related; severity of pests and diseases outbreaks could be linked with the high price of inputs, including pesticides, as farmers may not have been able to apply the needed quantity of pesticides on time, leading to higher infestations. In general, vegetable prices during the survey period were relatively higher in Aceh than in other parts of Indonesia.

Table 5.2 Major problems and concerns of households for vegetable farming in the survey locations, Aceh

Major problems/concern/factors	Aceh Besar	Pidie	Northeast Aceh	Average
Pest and disease attack	1	1	1	1
Increased prices of all major inputs, in general	3	3	3	3
Price of fertilizer increased too much recently	2	2	2	2
Very high seasonal fluctuation of vegetable prices	4	4	4	4
Unavailability of irrigation	5	5	5	5

Note: 1= highest rank; 5 = lowest rank.

[3] In 2008 due to high global fuel prices, the cost of fertilizers and pesticides doubled within a year in many places in Indonesia.



Note: The height of the bar represents the relative importance of a factor as ranked by farmers (the higher the more important).

Figure 5.2 Major problems and concerns in vegetable farming in Aceh

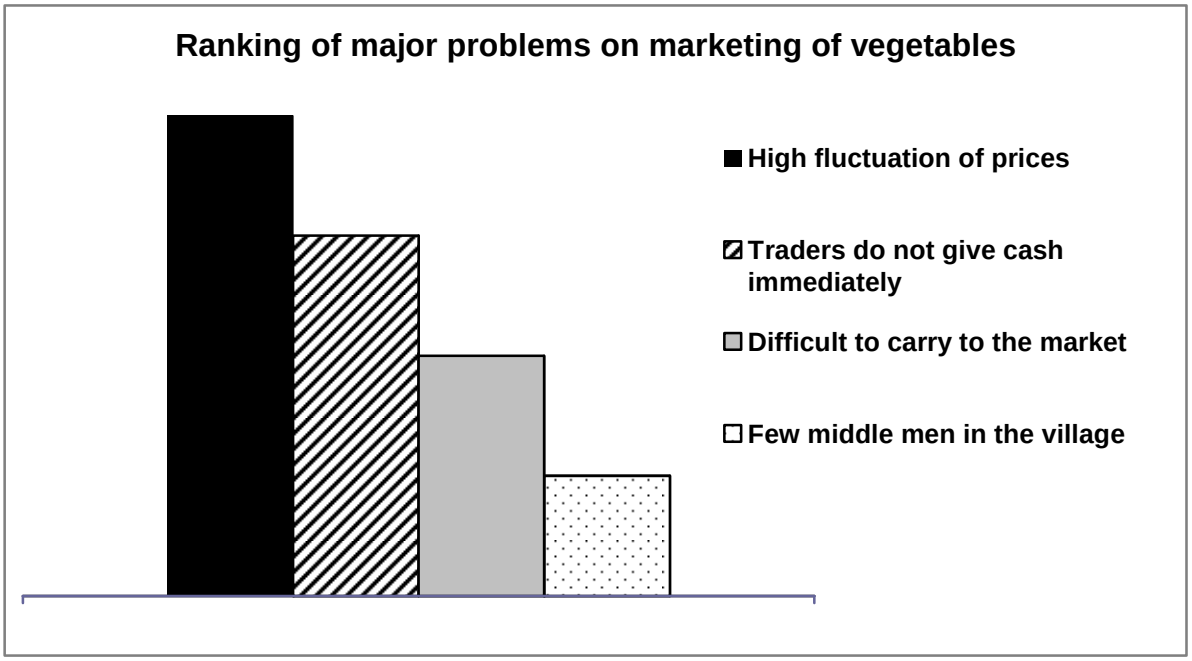
5.2. Vegetable marketing at the village level

Fluctuating vegetable prices ranked as the main concern for vegetable farmers, except in Pidie, where farmers' inability to obtain cash from traders immediately after the sale was more important than other issues (Table 5.3, Fig. 5.3). The number of middlemen in the village was not an important issue, as farmers could easily sell vegetables directly to nearby wholesale vegetable markets. At the time of survey, many of these commonly grown vegetables in Indonesia were in short supply in Aceh; this was reflected by higher prices in the survey locations than in other places in Indonesia.

Table 5.3 Major vegetable marketing related problems in the survey locations, Aceh

Type of problems/concern	Aceh Besar	Pidie	Northeast Aceh	Average
High fluctuation of produce prices	1	2	1	1
Few middlemen in the village	4	4	4	4
Difficult to carry produce to the market	3	3	3	3
Traders do not give cash immediately	2	1	2	2

Note: 1 = highest rank value; 4 = lowest rank value.



Note: The height of the bar reflects the relative importance of a factor as ranked by farmers (the higher the more important).

Figure 5.3 Major problems related to vegetable marketing in the survey locations, Aceh

Traders were the most important source of market information (Table 5.4), followed by neighbor-farmers and newspapers. Government extension, radio, and village cooperatives were not as important a source for market information. Farmers did not rely much on government sources of information while negotiating produce prices with traders.

Table 5.4 Source of market information and prices of vegetables in the survey locations, Aceh

Source of information	Aceh Besar	Pidie	Northeast Aceh	Average of all
Local traders/vegetable collectors	1	1	1	1
Neighbor farmers	2	2	2	2
Newspaper	3	3	4	3
Government/Extension personnel	4	4	3	4
Radio news	5	5	5	5
Cooperative organization	6	6	6	6

Note: 1 = highest rank (highest importance) ; 6 = lowest rank value (lowest importance).

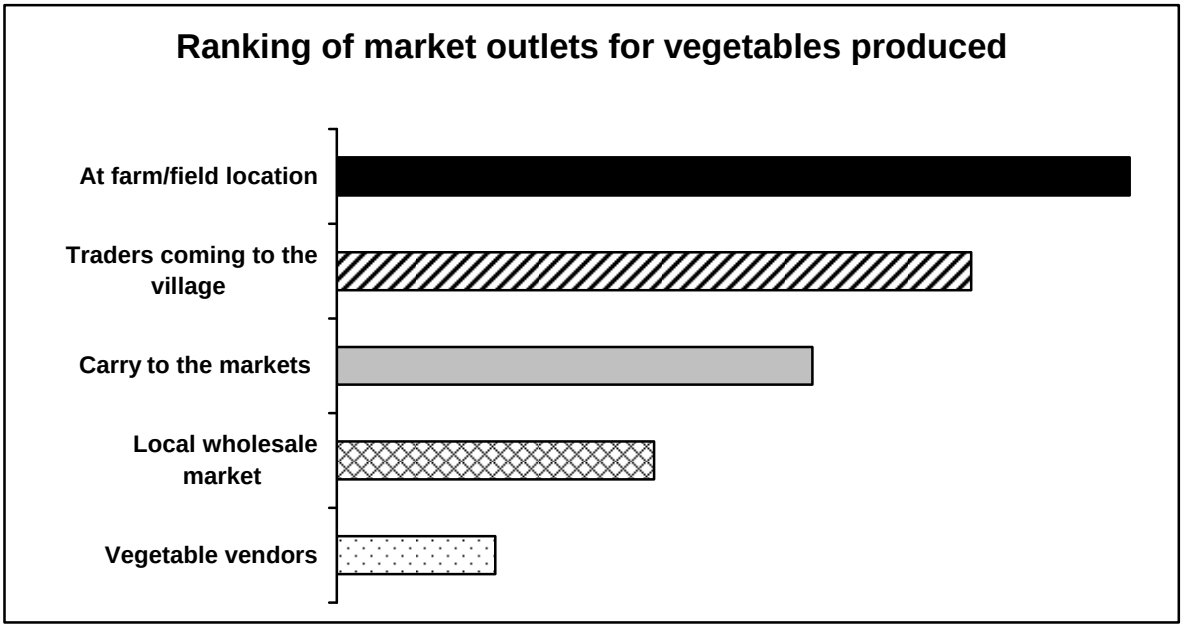
Many farmers sold their produce right at the farm. Traders visited the village and purchased the produce from farmers immediately after harvest (Table 5.5, Fig. 5.4). Agricultural marketing is not well-developed in Aceh; vegetable vendors and local wholesale markets are not common. The concept of wholesale vegetable marketing is gradually evolving in the surveyed communities[4].

[4] With support from the government of Japan, a wholesale market for vegetables and fruits was established in 2006 in Banda Aceh.

Table 5.5 Major market outlets for vegetables produced in the survey locations, Aceh

Type of market outlets	Aceh Besar	Pidie	Northeast Aceh	Average of all
At farm/field location	2	2	1	1
Traders coming to the village	1	1	4	2
Carry to the markets	3	3	3	3
Local wholesale market	4	4	4	4
Vegetable vendors	5	5	5	5

Note: 1 = highest rank; 5 = lowest rank.



Note: The length of the bar reflects the relative importance of a factor as ranked by farmers (the longer the more important).

Figure 5.4 Major market outlets of the vegetables produced in the survey locations, Aceh

Farmers were aware of the prevailing prices of vegetables in nearby wholesale vegetable markets, especially for chili (Table 5.6). On average, farmers contacted more than one trader for prices before deciding to sell vegetables to a particular trader. Nevertheless, most farmers usually sold their produce to the same one or two traders. Despite high operating costs required for growing vegetables, only a few farmers we surveyed had taken loans from traders to grow vegetables; however, in Pidie, about 60% of the farmers had borrowed money (mostly in-kind) for vegetable cultivation.

Table 5.6 Price information and marketing characteristics in survey locations, Aceh

Type of market information	Aceh Besar	Pidie	Northeast Aceh	Overall
Knowledge about prices (%)				
Very well	80	80	75	78
Not very well	15	15	20	17
Little	5	5	5	5
Whether existence of a fixed trader (%)				
Yes	90	80	75	82
No	10	20	25	18
Borrow money/inputs from traders (%)				
Yes	30	60	30	40
No	70	40	70	60
Number of traders contacted for sale	3	2	2	2.3

5.3. Irrigation practices followed

Water management and irrigation practices are closely linked to land rehabilitation, and soil fertility management of areas destroyed by the tsunami. About 40% of the households surveyed had cultivated chili in the recent past, which was about 50% in Aceh Besar, but only 37% and 32% in Pidie and Northeast Aceh, respectively (Table 5.7). About 80% of the farmers surveyed had cultivated both chili and other vegetables, and they mostly relied on dug wells as a source of water for irrigating these crops (Table 5.7).

Table 5.7 Irrigation sources and types for vegetable production in the survey locations, Aceh

	Aceh Besar (N=120)		**Pidie (N=60)**		**Northeast Aceh (N=60)**		**Overall sample (N=240)**	
	Chili grower	Other vegetables grower	Chili grower	Other vegetables grower	Chili grower	Other vegetables grower	Chili grower	Other vegetables grower
Number of growers (no.)	60	23	22	28	19	30	101	81
Percentage of growers	50	19	37	47	32	50	39.6	38.6
Irrigation source (%)								
Well	76	78	100	82	83	77	86.3	79.0
Pumps	14	9	0	0	6	7	6.7	5.3
Tank	0	0	0	0	0	0	0	0
Lake	0	0	0	0	0	0	0	0
Rain-fed or others	9	13	0	18	11	17	6.7	16.0
Irrigation type (%)								
Flooding w/o ridges	0	0	0	0	0	0	0	0
Flooding w/ridges	17	22	18	21	32	7	22.3	16.6
Manual water lifting from well	77	78	82	79	53	77	70.6	78.0
Manual water lifting from tank/pond	7	0	0	0	16	17	7.7	5.7

Farmers relied more on wells for irrigating chili and other vegetables, and more on canals for irrigating rice. About 7% of the surveyed households also used pumps for irrigating chili. Only a few of the vegetable farmers surveyed grew rainfed vegetables. If there was any uncertainty on access to irrigation, then farmers chose not to grow vegetables at all.

Most farmers used manual lifting type of irrigation for vegetables, including for chili; this was more common in Aceh Besar and Pidie than in Northeast Aceh. Flooding method of irrigation was more predominant in Northeast Aceh due to better access to water from canals. Access to water determines the method of irrigation followed and the duration of irrigation. In a place where water was readily available, farmers adopted flooding with ridge irrigation practices. Where water was scarce, manual lifting (or pump based tubewells) irrigation was more widely followed.

Overall, 50% of the surveyed households reported irrigation as a major problem for growing vegetables, but the severity of the issue was highest in Aceh Besar (Table 5.8, Fig. 5.5). This was also the case for drainage-related problems.

Table 5.8 Severity of problems in irrigation and drainage in the survey locations, Aceh

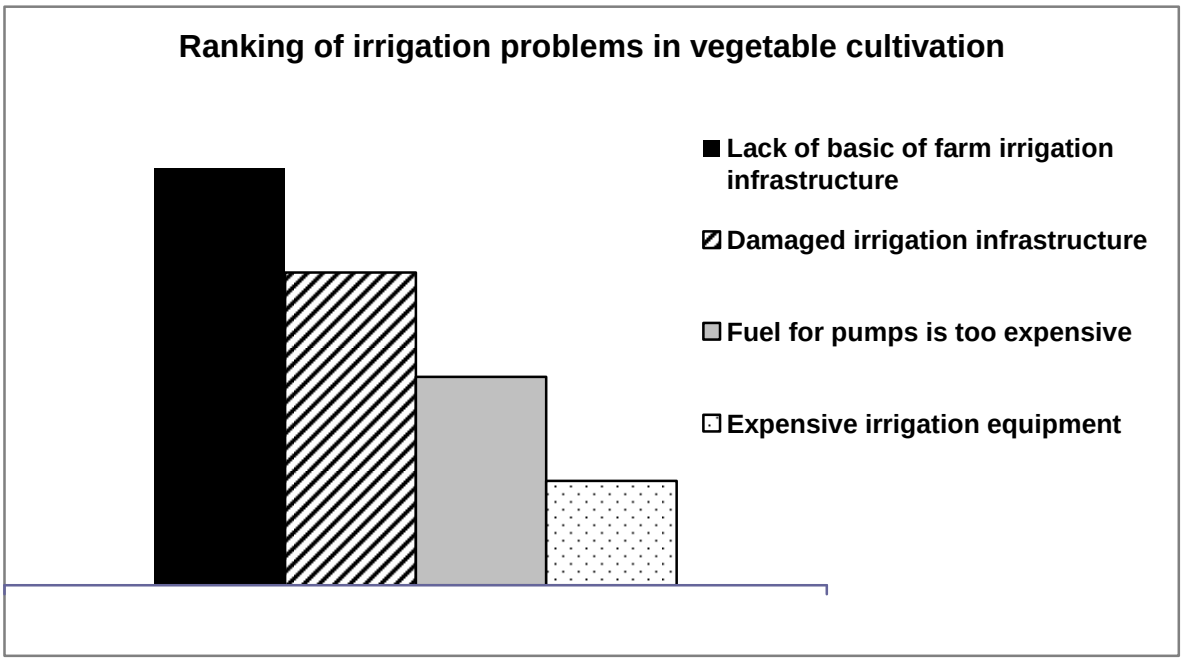
Type of problems	Aceh Besar	Pidie	Northeast Aceh	Overall
General irrigation problem (%)				
Major problem	72.3	38.0	24.5	50.0
Minor problem	24.1	50.0	61.2	41.2
No problem	3.6	12.0	14.3	8.8
Sample size in irrigation problem (no.)	83	50	49	182
Drainage problem (%)				
Very serious	44.2	25.0	26.7	35.0
Serious	33.3	41.7	48.3	39.2
Moderate	9.2	23.3	13.3	13.8
Minimal	8.3	8.3	11.7	9.2
No problem	5.0	1.7	0.0	2.9
Total number of responding households for drainage problem	120	60	60	240

Among different types of irrigation problems, farmers considered unavailability of irrigation as the most critical problem (Table 5.9, Fig. 5.5); this was also due to damage of on-farm irrigation structures by tsunami. Lack of drainage, high cost for running fuel pumps, and increased costs for irrigation tools were other problems noted.

Table 5.9 Ranking of irrigation problems on vegetable production in the survey locations, Aceh

Type of problems/concerns	**Aceh Besar**	**Pidie**	**Northeast Aceh**	**Overall**
Lack of basic of farm irrigation infrastructure	1	1	2	1
Damaged irrigation infrastructure	2	2	1	2
Fuel for pumps is too expensive	3	3	3	3
Expensive irrigation equipment	4	4	4	4

Note: 1= highest rank; 4 = lowest rank.



Note: The height of the bar reflects the relative importance of a factor as ranked by farmers (the higher the more important).

Figure 5.5 Major problems in relation to getting water to vegetable fields in the survey locations, Aceh

5.4. Access to credit for vegetable growers

Vegetable cultivation requires 3-4 times more working capital for purchasing inputs than growing rice and other cereal crops. Out of the total of 218 vegetable growers surveyed, only 42 households (19%) reported borrowing capital from outside for cultivation of vegetables (Table 5.10); other farmers wanted to borrow but formal farm credit institutions were absent in many places surveyed. The major sources of credit for farmers were friends and relatives, vegetable traders/collectors, and occasionally farm cooperatives. As vegetable farming intensifies in Aceh the need for farm credit from formal institutions will likely increase. The low availability of formal credit in Aceh, where Islam is the predominant religion, also could be due to Islamic practices that forbid the collection of interest on loans.

Table 5.10 Credit and related financial issues for vegetable farming in the survey locations, Aceh

Description	Aceh Besar	Pidie	Northeast Aceh	Overall
Households borrowing loans for vegetable cultivation (in 2006/07) (in number)	20	11	11	42
Households borrowing for vegetables (%)	17	18	18	18
Level of difficulties in getting credit for vegetables cultivation (%):				
Most severe constraint	0	0	0	0
Difficult	0	0	0	0
Little difficult	15	18	18	18
Little problem	75	36	64	58
No problem	10	45	18	24
Source of credit for farming	- Friend - Collector	- Friend	- Friend - Cooperation organization	- Friend - Collector - Cooperation organization

Difficulty in obtaining credit is related to the time taken to search for loans outside family sources. Lack of timely credit is more critical in Pidie and Northeast Aceh than in Aceh Besar. On average, 61% of the surveyed households reported not getting credit when it was needed—one reason for not seeking credit outside family/friend sources (Table 5.11).

Table 5.11 Problems in obtaining credit for vegetable farming in the survey locations, Aceh

Type of problems/concern	Aceh Besar	Pidie	Northeast Aceh	Average of three locations
Problem in obtaining credit (%)				
Not getting credit when one needs it	50	71	62	61
High interest rate	7	2	18	9
Long processing time for bank loan (bureaucracy related problems)	43	27	20	30
Total no. of respondents	120	60	60	240

The amount borrowed by an average farmer varied from 1 million Rp to 10 million Rp per year, depending on the type of credit provider. The interest rate charged by public banks and other financial institutions was low compared with rates collected by friends or relatives, but securing a loan from banks involved extensive paper work and complicated regulatory procedures.

5.5. Training and extension services

Few farmers in the surveyed locations had attended formal training or workshops in vegetable cultivation. Out of 240 sample households surveyed, only 34 farmers had attended a vegetable-related training event (Table 5.12). These farmer trainings and workshops were organized by local government and international agencies working on recovery and rehabilitation of the tsunami disaster areas. Male and female participants were equally distributed in Aceh Besar and Pidie, whereas a greater proportion of women attended training in Northeast Aceh (Table 5.12).

Table 5.12 Training and extension services in vegetable farming in the Aceh survey locations

Description	Aceh Besar	Pidie	Northeast Aceh	Total sample
Farmers attending training, workshop for vegetable production (no.)	20	6	8	34
Farmers attending training, workshop for vegetable production (%)	17	10	13	13
Name of organizers providing trainings on vegetable farming in the surveyed locations	Oxfam Lamrine Canada Red Cross Distan Prov.Nad	Distan Prov.Nad BPTP Nad Dafed	Distan Prov.Nad ADB IOM BRR	
Average duration of training (days)	4.87	2.91	6.38	4.72
Who attended training (%):				
Male	50	50	37.5	46
Female	50	50	62.5	54
Farmers/family request first (%):				
Yes	35	33	12.5	27
No	65	67	87.5	73
Perceived benefits from training (%):				
Skill improved	95	100	75	90
Family health improved	5	0	0	2
Increased cash income	0	0	0	0
Employment generated	0	0	25	8
For whom training and extension activities were targeted (%):				
For both better-off and poor	100	100	100	100
Mainly for well-to-do farmers	0	0	0	0
Mainly for poor households	0	0	0	0

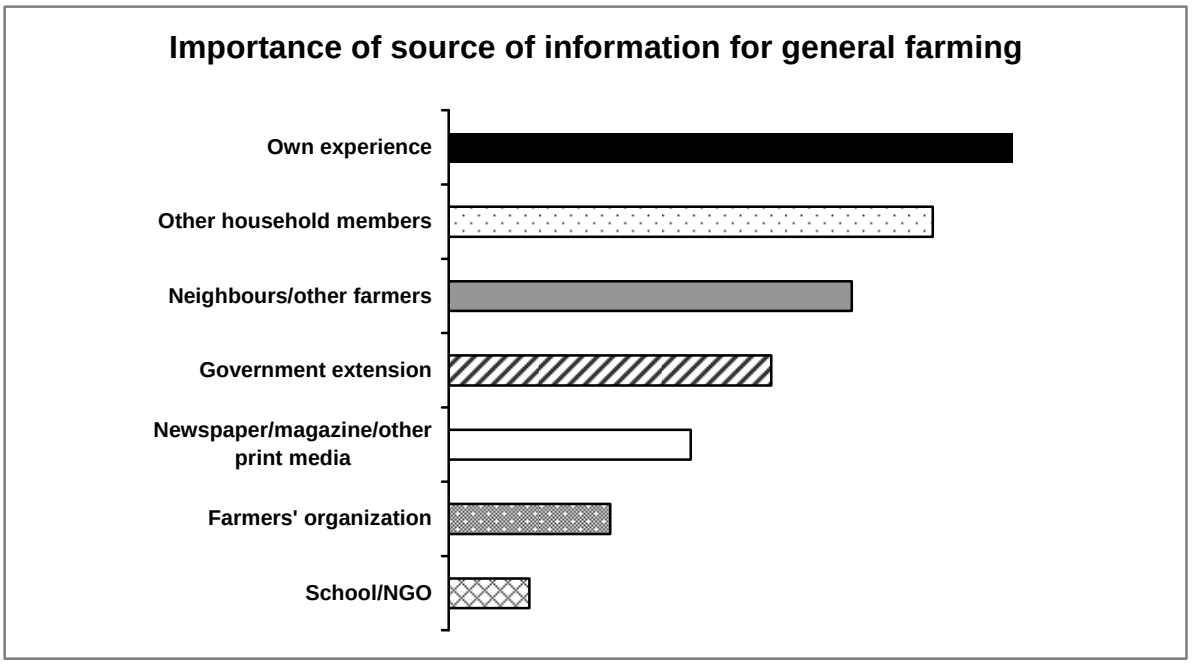
Note: ADB: Asian Development Bank; BPTP: Assessment Institute for Agricultural Technology; BRR: Rehabilitation and Reconstruction Agency, Aceh; Distan: Dinas Pertanian (Agricultural Extension, Nanggroe Aceh Darussalam); IOM: International Organization for Migration.

General farming (cultivation of cereals and other crops), vegetable production, soil fertility management, pest and disease control, market information, fertilizer application, agronomical practices, and livestock raising were the main topics covered in training (Table 5.13, Figs. 5.6, 5.7). Most farmers considered that their own experience was the most important source for farming information and knowledge, followed by information from family members in the household and from neighboring farmers. Formal institutions like government agencies, extension services, farmers' organizations, and newspapers were not important for getting information about vegetable cultivation.

Table 5.13 Importance of source of information for agricultural practices in the survey locations, Aceh

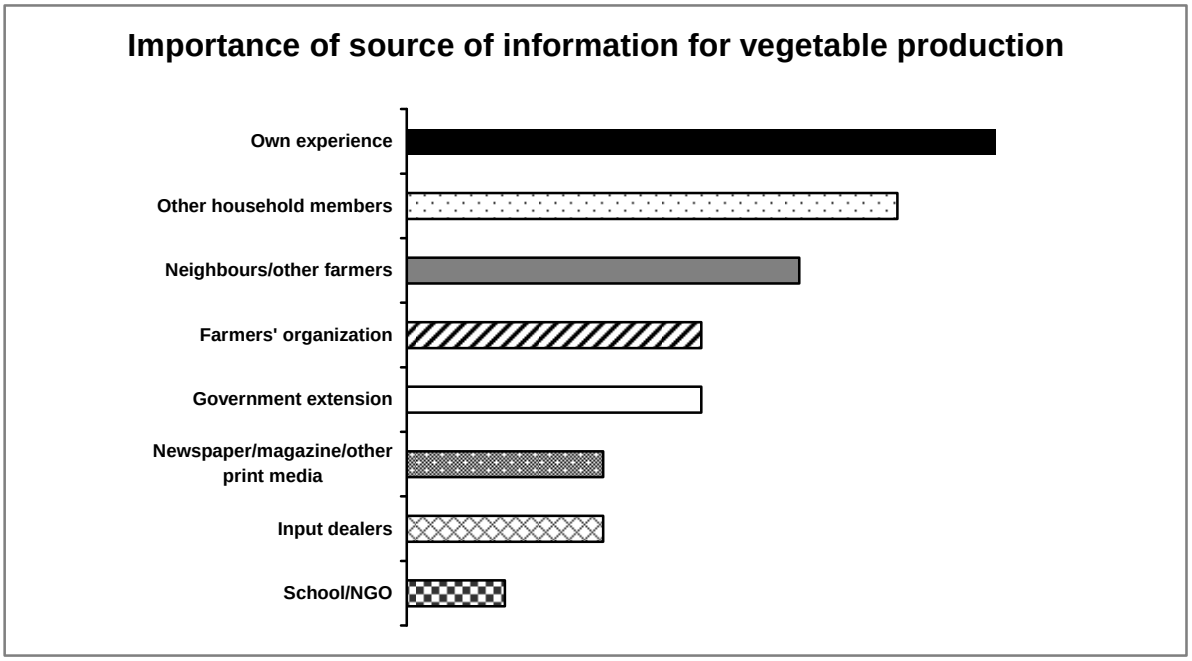
Source of information	Importance by rank value				
	Aceh Besar	Pidie	Northeast Aceh	Average	(Overall)
General farming					
Own experience	1	2	1	1.3	1
Other household members	2	1	2	1.7	2
Neighbors/other farmers	4	3	2	3.0	3
School/NGO	6			6.7	7
Government extension	6	4	3	4.3	4
Farmers' organization	3			5.7	6
Newspaper/magazine/other print media	5		4	5.3	5
Vegetable production					
Own experience	1	2	1	1.3	1
Other household members	3	1	2	2.0	2
Neighbors/other farmers	2	3	3	2.7	3
School/NGO	6			6.7	6
Government extension	5		5	5.7	4
Input dealers			4	6.0	5
Farmers' organization		4	6	5.7	4
Newspaper/magazine/other print media	4			6.0	5

Note: 1= highest rank; 6 = lowest rank. Overall ranking is derived from average ranking across the three locations. The rank value of 7 was given to the missing information considered as neglected rank in calculating the average rank value. Overall ranking order was recalculated based on the average rank value.



Note: The length of the bar reflects the relative importance of a factor as ranked by farmers (the longer the more important).

Figure 5.6 Relative importance of source of informaton for general farming in the survey locations, Aceh



Note: The length of the bar reflects the relative importance of a factor as ranked by farmers (the longer the more important).

Figure 5.7 Relative importance of source of information for vegetable production in the survey locations, Aceh

We conducted a separate analysis on how farmers in each location perceived training providers in relation to soil salinity and fertility management, and fertilizer application (Table 5.14). This information guided the project team in implementing the 2007 project interventions. Most farmers perceived their own experience as the most important source of knowledge, followed by information sharing from family members, and information obtained from neighboring farmers and government extension personnel. The importance of sources of information for pest and disease management, dissemination of new technology, marketing of agricultural produce, irrigation and water management, and livestock raising also were evaluated (Appendices 1 and 2).

Farmers' perceptions toward agricultural training were analyzed (Table 5.15). About 40% reported that they had not attended any farming-related formal training in the past. Nevertheless, about 28% also reported that they were satisfied with the training they had received in the past. Extension services in Pidie and Northeast Aceh were ranked higher than in Aceh Besar (Table 5.15, Fig. 5.8), despite the fact that the communities surveyed in Aceh Besar are located near the provincial capital, Banda Aceh.

Table 5.14 The importance of source of information for soil salinity, fertility and fertilizer application in the survey locations, Aceh

Source of information	Rank of information			
	Aceh Besar	Pidie	Northeast Aceh	Overall
Soil salinity management				
Own experience	1	2	1	1
Other household members	3	1	3	2
Neighbors/other farmers	4	3	2	3
School/NGO	6			6
Government extension	2	4	5	4
Farmers' organization	5		4	5
Soil fertility management				
Own experience	1	1	1	1
Other household members	3	2	3	2
Neighbors/other farmers	4	3	2	3
School/NGO	5			6
Government extension	4		4	5
Farmers' organization	2	4	3	4
Newspaper/magazine/other print media			5	7
Fertilizer application				
Own experience	1	1	1	1
Other household members	3	2	2	2
Neighbors/other farmers	4	3	2	3
School/NGO	5			5
Government extension	2		4	4
Input dealers			5	6
Farmers' organization	3		3	4

Note: 1= highest rank; 7 = lowest rank. Overall ranking is derived based on the ranking across the locations and also as per number of reporting in each location.

Table 5.15 Farmers' perceptions on adequacy of technical services provided for vegetable farming in the survey locations, Aceh

Particulars	Aceh Besar (N= 120)		Pidie (N= 60)		Northeast Aceh (N= 60)		Overall (N=240)	
	Freq	%	Freq	%	Freq	%	Freq	%
Not obtained any training	43	35.8	28	46.7	22	36.7	93	38.8
Not good quality	2	1.7	-	-	2	3.3	4	1.7
Moderate/OK	34	28.3	3	5	7	11.7	44	18.3
Adequate	8	6.7	2	3.3	2	3.3	12	5.0
Very adequate	23	19.2	22	36.7	22	36.7	67	27.9
No data/Not filled	10	8.3	5	8.3	5	8.3	20	8.3
Total	120	100	60	100	60	100	240	100

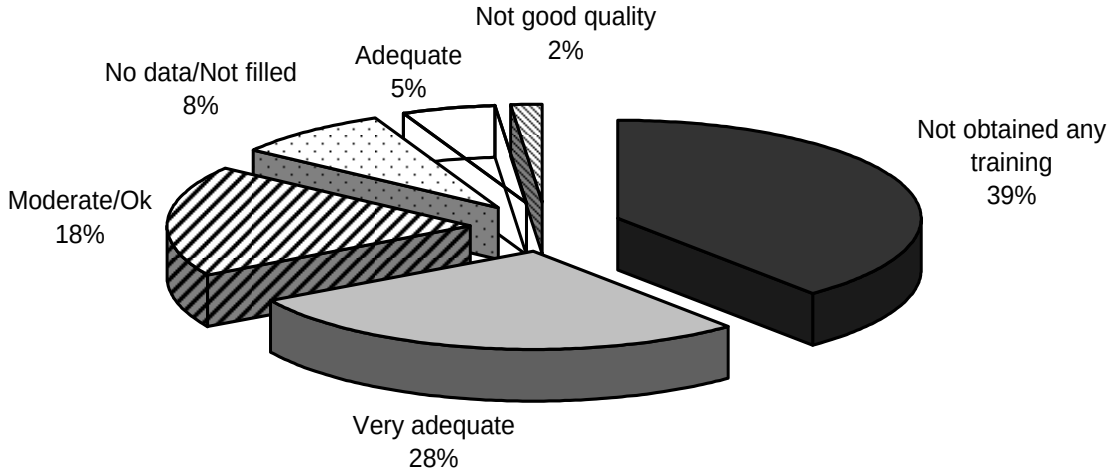


Figure 5.8 Farmers' perception on quality of technical services (training) that they have received for vegetable farming in Aceh

5.6. Gender issues

Gender differences on specific activities of vegetable cultivation and farming decisions were analyzed (Table 5.16). Roles of women and men vary by specific vegetable production operation or component. About 70% of time, the decision to allocate acreage to vegetables was made by female members (Fig. 5.9). Women members of a household also had a major stake in vegetable harvesting decisions. Female household members in Aceh Besar played a very active role in vegetable production and marketing than in the other survey locations (Table 5.16). Female members contributed more on activities such as pest and disease control, purchasing agricultural inputs, marketing produce, and accessing agricultural credit than men (Fig. 5.9, 5.10).

Training and extension related to agricultural practices in the surveyed communities were equally targeted to men and women (Table 5.17). About 42% of households reported that men and women equally participated in local training for farmers in the recent past.

Table 5.16 Gender roles in vegetable production in the survey locations, Aceh

Activities and decision in vegetable farming	Aceh Besar		Pidie		Northeast Aceh		Average	
	Male (%)	Fe-male (%)	Male (%)	Fe-male (%)	Male (%)	Fe-male (%)	Male (%)	Fe-male (%)
Area of crops to be grown	14	86	44	56	28	72	26	74
Seedling preparation	16	84	44	56	26	74	26	74
Intercultural operation (weeding, etc.)	11	89	43	57	28	72	25	75
Fertilizer purchase/application	5	95	43	57	27	73	23	77
Pesticide purchase/application	5	95	34	66	12	88	14	86
Harvesting decision	15	85	43	57	28	72	26	74
Drying, cleaning, grading of vegetables	15	85	45	55	25	75	26	74
Purchasing farm inputs	8	92	42	58	14	86	18	82
Selling vegetables	13	87	36	64	17	83	19	81
Working in home garden	59	41	70	30	56	44	60	40
Taking a major farming decision	14	86	46	54	29	71	27	73
Credit attainment for farming	4	96	39	61	24	76	19	81
Participation in village meetings	18	82	47	53	33	67	31	69
Participation in agricultural training & extension	25	75	44	56	34	66	34	66
Other spending in household needs	30	70	57	43	42	58	41	59

Note: Only about 25% of the households in each location reported the activities by gender, hence this table is based on the average of the information provided by those households. In addition, for cross-examination, the gender related information was collected and evaluated at focus group discussions in each community surveyed. The information from both approaches was consistent.

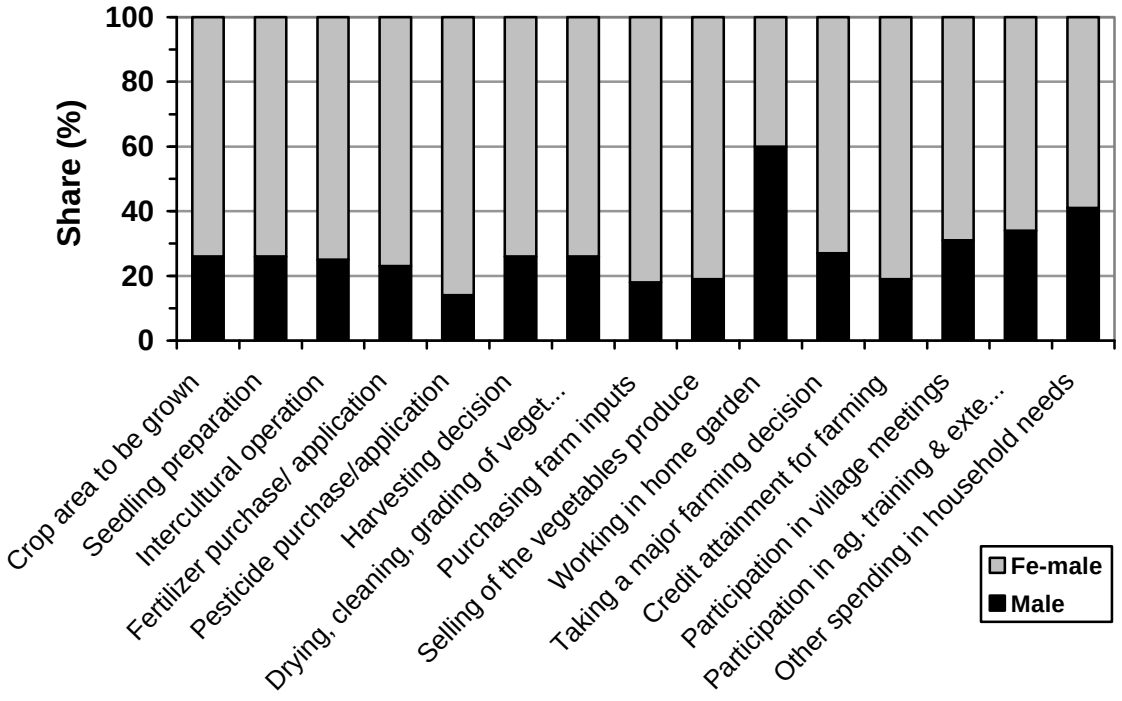


Figure 5.9 Gender dimension of vegetable production in the survey locations, Aceh

Table 5.17 Gender implications of training and extension activities in the survey locations, Aceh

Support of training and extension work	Aceh Besar		Pidie		Northeast Aceh		Average	
	Freq	%	Freq	%	Freq	%	Freq	%
Equal for men and women	47	39.2	26	43.3	28	46.7	101	42.1
More for men	19	15.8	1	1.7	5	8.3	25	10.4
More for women	1	0.8	-	-	-	-	1	0.4
No data/Not filled in	53	44.2	33	55	27	45	113	47.1
Total	120	100	60	100	60	100	240	100

Large numbers of women were involved in vegetable trading and marketing in Aceh. At Pasar Induk Lambaro, the wholesale vegetable market in Banda Aceh, the authors observed in January 2008 and June 2009 that nearly 50% of the traders were women. Most women conducted small-volume business; they also brought indigenous vegetables from outlying communities to the wholesale market in Banda Aceh (Fig. 5.10). In contrast, a higher proportion of men traded exotic vegetables such as chili, tomato, potato, and onion.

Figure 5.10 Women farmers selling vegetables in Banda Aceh wholesale market, Aceh, 2009

6. Cost and Return of Chili Cultivation in Aceh

A cost and benefit analysis for chili cultivation was carried out by averaging information from farmers who provided relatively accurate data. Although almost all of the farmers we surveyed grew at least a few chili plants at home, we targeted those farmers who were growing chili on relatively larger plots for market sale as well as home consumption.

6.1. Cost and return of chili cultivation

Out of the 186 chili-growing households, only 33 were able to provide detailed information on costs and benefits of crop production activities and included information on inputs and labor. For comparison across the sites, the data across the locations was standardized per 0.1 ha basis (1000 m^2) of crop acreage. The cost and return for chili cultivation was evaluated first

on the level of inputs used, and then on labor, as illustrated in the following sections and in Table 6.1.

6.1.1. Inputs used

Use of urea and other chemical fertilizers in Northeast Aceh is relatively higher than in Aceh Besar and Pidie. Thus, in relative terms, the chili production practices followed in Northeast Aceh were more intensive than in Pidie and Aceh Besar. Many farmers in Aceh also used organic matter as a substitution for inorganic fertilizers, particularly in Aceh Besar. Market price of chemical fertilizers was prohibitively high during the survey season in 2008, which could be the reason farmers switched to compost and organic fertilizers.

For nursery production, cost for seed was the highest, followed by organic matter (Table 6.1). Some farmers did not consider the value of many of these materials in the information they provided, as some of the items were not purchased every year. This led to underestimation on the use of these inputs for chili in Aceh compared with other parts of Indonesia (White et al. 2007; Mariyono and Bhattarai 2009). In total, the value of material inputs was about Rp 78,000 for growing nursery plants sufficient for 0.1 ha.

Organic and inorganic fertilizers were the most costly inputs for chili cultivation, accounting for Rp 297,000 for 0.1 ha or about 80% of the total input cost. The cost for fertilizer in chili was highest in Northeast Aceh. The value of insecticides applied ranged from Rp 31,000 to Rp 52,000, with highest costs at Pidie. On average, about Rp 440,000 worth of material inputs were used for chili cultivation at the three locations. Farmers in Northeast Aceh spent more for inputs than those in other two regions, and the level of chili productivity was higher in Northeast Aceh.

Table 6.1 Cost of inputs used per 0.1 ha of chili cultivation (unit: Rp/0.1 ha) in the survey locations, Aceh

	Particulars	Aceh Besar (N=19)	Pidie (N=5)	Northeast Aceh (N=9)	Average
A	***Nursery field***				
A.1	Seed application	48,753	26,628	58,356	44,579
A.2	Organic fertilizers	17,693	0	0	5,897
A.3	Inorganic fertilizers	3,680	1,838	0	1,839
A.4	Pesticides	1,595	1,547	1,299	1,480
A.5	Others	23,151	13,230	35,475	23,952
A	Sub-total	94,872	43,243	95,129	77,748
B	***Main field***				
B.1	Organic material	132,129	90,671	207,220	143,340
B.2	Inorganic material (sub-total)	120,612	130,525	208,525	153,220
B.2.1	Urea	32,461	16,616	98,790	49,289
B.2.2	SP36	28,645	17,640	35,975	27,420
B.2.3	KCl	30,082	37,091	35,295	34,156
B.2.4	NPK	29,424	59,178	38,465	42,355
B.3	Insecticides	47,105	52,494	30,915	43,504
B.4	Fungicides	9,729	0	13,839	7,856
B.5	Surfactant	0	0	0	0
B.6	Others pesticides	89	673	0	254
B.7	Irrigation	2,131	0	18,405	6,845
B.8	Harvesting and packing	364	11,605	897	4,288
B.9	Others	11,078	0	0	3,692
B	Sub-total	323,236	285,968	479,801	363,000
	Total cost (A+B)	**418,108**	**329,211**	**574,930**	**440,750**

Chili cultivation in Aceh is considered a low-input system. Compared with Central Java (Mariyono and Bhattarai 2009), total inputs used on chili were much lower in Aceh and varied considerably across the three locations.

6.1.2. Labor employed for chili farming

Based on estimates from the household survey, on average about 23 labor days were used for growing chili on 0.1 ha. This actually underestimates the extent of labor days required for chili cultivation for market sale. The intensity of chili farming varied among the surveyed households. Many of the farmers followed low-input chili farming. More labor days were devoted (per unit basis) for chili cultivation in Northeast Aceh (Table 6.2). Most labor days were devoted to land preparation, transplanting, weeding and harvesting. Harvesting alone consumed 5.3 person-days (Table 6.2). In Northeast Aceh, about 34 person-days of employment per 0.1 ha of land were generated from chili cultivation; in Pidie, only 17 person-days/0.1 ha. The variation in labor days is due to crop intensification in a location, crop season, and average productivity targeted.

Table 6.2 Labor use in chili cultivation in Aceh survey locations, by activities, 2007-08

Activities	Level of use (person-day/0.1 ha)			
	Aceh Besar (N=19)	Pidie (N=5)	Northeast Aceh (N=9)	Average
Labor uses in nursery	3.80	3.77	7.02	4.86
Land preparation	4.01	1.55	7.11	4.22
Transplanting	1.98	1.16	4.78	2.64
Fertilizer application	0.77	1.62	1.72	1.37
Pesticide application	0.67	2.09	0.86	1.21
Weeding	1.34	2.48	2.95	2.26
Irrigation	0.55	0.00	0.86	0.47
Harvesting	4.70	3.71	7.50	5.30
On-farm transportation	0.19	0.23	0.73	0.38
Total labor	18.01	16.61	33.53	22.71

Note: The labor-days reported by activities as derived from the information obtained from individual household surveys are much lower than the labor days reported from the participatory survey using focus group discussions. This is a methodological issue to be addressed in future studies on economic analysis of farm household data.

On average, family members accounted for about 60% of the total labor uses on chili farming, except in Aceh Besar, where the share of family members was only about 45% of total labor uses (Table 6.3). Aceh Besar is close to urban Banda Aceh, where family members could earn higher wages than working in the chili fields.

Table 6.3 Total labor use for chili cultivation in the survey locations, Aceh

Descriptions	Level of use (person-day/0.1 ha)			
	Aceh Besar (N=19)	Pidie (N=5)	Northeast Aceh (N=9)	Average
(Nursery + main field)				
Family labor	8.24	12.82	18.66	13.21
Hired labor	9.77	3.79	14.87	9.50
Total labor	18.01	16.61	33.53	22.71

The average labor cost for nursery production was about Rp 80,000 (Table 6.4). The labor cost for nursery production in Northeast Aceh was double than that in Aceh Besar and ten fold that of Pidie. This indicates Northeast Aceh follows more intensive farming practices.

Labor costs were higher for land preparation, harvesting, transplanting, and weeding. The total labor cost (per 0.1 ha basis) ranged from Rp 200,000 in Pidie to Rp 790,000 in Northeast Aceh.

Table 6.4 Total labor cost on chili production by major activities in the survey locations, Aceh (unit: Rp/0.1 ha)

	Labor use by activities	Aceh Besar (N=19)	Pidie (N=5)	Northeast Aceh (N=9)	Average
A	Nursery preparation	74,599	15,474	146,870	78,980
B	*Main field*				
B.1	Land preparation	153,772	15,474	196,563	121,936
B.2	Transplanting	58,994	15,474	147,423	73,963
B.3	Fertilizer application	8,124	4,008	30,192	14,108
B.4	Pesticide application	28,046	5,171	6,074	13,097
B.5	Weeding	35,590	77,369	36,994	49,984
B.6	Irrigation	14,313	0	0	4,771
B.7	Harvesting	124,565	61,896	198,220	128,227
B.8	On-farm transportation	6,190	3,868	12,147	7,401
B.9	Others	23,822	0	12,270	12,030
	Sub-total	453,415	183,259	639,883	425,519
C	**Total (A+B)**	**528,015**	**198,733**	**786,753**	**504,500**

Note: Exchange rate in 2007: 1 USD = Indonesian Rp 10,000.

Compared with other vegetable production areas in Indonesia, chili production in Aceh is not a labor-intensive (and input-intensive) activity. Chili farming is still at a subsistence level in the communities selected for the survey.

6.1.3. Total cost of cultivation, return and profitability of chili production

Among the three locations, the average productivity of chili was about 540 kg per 0.1 ha, ranging from 284 kg per 0.1 ha in Aceh Besar to 933 kg per 0.1 ha in Northeast Aceh – almost three times higher (Table 6.5). The total value[5] of chili production (per 0.1 ha) was around Rp 5 million (Rp 2,721,000, Rp 2,400,000 and Rp 10,160,000, in Aceh Besar, Pidie and Northeast Aceh, respectively). The total operational cost consisting of material and hired labor costs was about Rp 945,000. Average net return obtained from 0.1 ha of chili was Rp 4,148,000 but it varied substantially by locations; from Rp 1,775,000 in Aceh Besar to 8,799,000 in Northeast Aceh. When the cost for family labor is imputed at the existing wage rate in these localities, then the average real net return from chili cultivation, on per 0.1 ha basis, was Rp 3,650,000, which was about Rp 1,440,000 in Pidie and Aceh Besar, but Rp 8,070,000 in Northeast Aceh. Thus, the profit from chili was nearly six times higher in Northeast Aceh.

The costs and returns of chili farming varied across the three survey locations (Table 6.5), due to different amounts of inputs and labor used. Differences in crop productivity also indicate the intensity of vegetable farming across the locations. When cultivation is more intensive with higher use of external inputs, the land productivity is also expected to be higher. When family labor is imputed at the value of the normal wage rate prevailing locally, the real net return from chili is still positive (Table 6.5), but much lower considering the five-month-long crop duration of chili. In the survey period (late 2007), an average farmer realized Rp 5,784 from production/sale of a kg of chili in Aceh, ranging from Rp 8,649/kg of profit in Northeast Aceh to Rp 3,510/kg in Pidie. Likewise, the ratio of real return to the total

[5] In this context, total value means gross return, which is derived by multiplying price and crop productivity.

production cost, a more realistic measure of profit from a crop production activity, was highest in Northeast Aceh (3.86) followed by Pidie (1.41) and Aceh Besar (1.18).

Table 6.5 Total cost and returns from chili farming in the Aceh survey locations, 2007 (per 0.1 ha basis)

	Cost Items	*Aceh Besar (N=19)*	*Pidie (N=5)*	*Northeast Aceh(N=9)*	*Average*
1	Production (kg)	284	400	933	539
2	Average price (Rp/kg)	9,580	6,000	10,890	8,823
3	Total gross return (Rp)	2,720,720	2,400,000	10,160,370	5,093,697
4.1	Family labor day (person-day)	8.24	12.82	18.66	13.21
4.2	Hired labor day (person-day)	9.77	3.79	14.87	9.50
4.3	Total labor day (person-day)	18.01	16.61	33.53	22.71
5	Total material input cost (Rp)	418,108	329,211	574,930	440,750
6.1	Total hired labor cost (Rp)	528,015	198,733	786,753	504,501
6.2	Total labor cost* (Rp)	827,519	666,818	1,515,829	1,003,389
7.1	Total operational capital cost (Rp)	946,123	527,944	1,361,683	945,250
7.2	Total production cost (Rp)	1,245,627	996,029	2,090,759	1,444,138
8.1	Net return (Rp) (3 - 7.1)	1,774,597	1,872,056	8,798,687	4,148,446
8.2	Real net return (Rp) (3 - 7.2)	1,475,093	1,403,971	8,069,611	3,649,558
9	Total production cost/kg of output (Rp)	4,386	2,490	2,241	3,039
10	Profit per kg of output produce (Rp)	5,194	3,510	8,649	5,784
11	Ratio of real net return to total operational cost	1.56	2.66	5.93	3.38
12	Ratio of real net return to total production cost	1.18	1.41	3.86	2.15

Note: N = Number of farmers surveyed in each location for the analysis.

* This includes cost for hired labor days plus value of family labor employed in production activities. The later is derived by multiplying number of family labor used by average labor wage rate prevailing in those communities.

6.1.4. Factor share of chili production

Analysis on factor shares on chili farming was done by the methods suggested by Kikuchi (1991); results are summarized in Table 6.6 and Figure 6.1. Among the inputs used, on average, share of labor on total return from chili production was the highest. It was an average of 20% across the three locations, but varied from around 15% in Northeast Aceh to 30% in Aceh Besar. The high value of factor share of labor in chili cultivation suggests it is quite labor-intensive in Aceh. Total labor cost in Table 6.6 also includes opportunity cost for family labor uses (imputed at the prevailing wage rate in the village), which is additional income for households growing chili in those communities.

The share of land rent was 6% out of total gross return of chili, ranging from 3% in Northeast Aceh to 13% in Pidie (Table 6.6). Return to management was very high in Northeast Aceh (77%), almost double than Aceh Besar. Across the three locations, average farmers would get about 66% out of total revenue (value) generated from chili cultivation. The total factor share of material inputs (combining fertilizers, pesticides and other materials) was less than 10% of the total value generated, clearly suggesting that chili farming in the surveyed communities was a low-input based system.

Table 6.6 Factor share in chili farming in Aceh survey locations, 2007

Factors	Share (%)			
	Aceh Besar (N=19)	Pidie (N=5)	Northeast Aceh (N=9)	Average
Land	11.0	12.5	3.0	5.9
Labor (total labor)	30.4	27.8	14.9	19.7
Fertilizers	10.1	9.3	4.1	6.0
Pesticides	2.2	2.3	0.5	1.0
Other materials	3.1	2.1	1.1	1.6
Return to management	43.2	46.0	76.5	65.8
Total	100	100	100	100

Note: Land rent is assumed Rp 300,000/0.1 ha of land for a crop season.

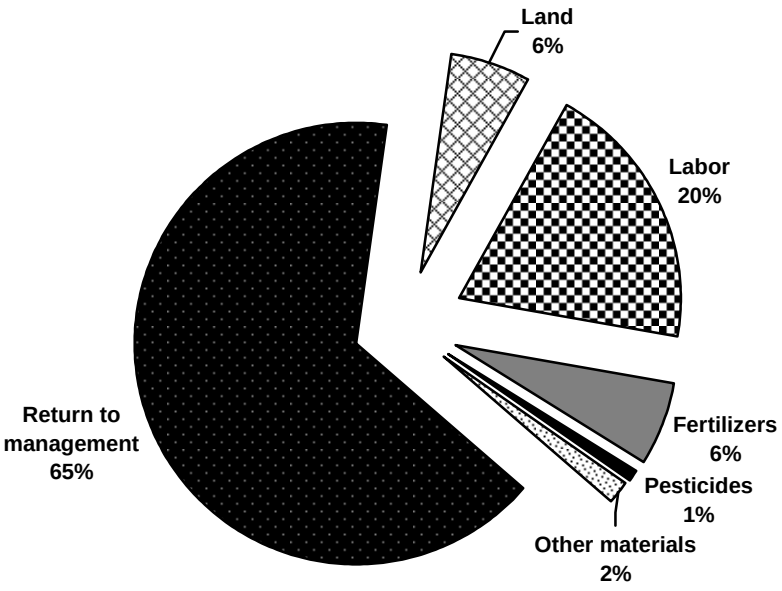


Figure 6.1 Factor share in chili cultivation in Aceh, 2007

7. Recommendations and Implications

Among the wide range of agricultural sector activities, vegetables yield quickly and provide more income and nutrients per unit of area than cereal crops. Thus, vegetable sector interventions have a high potential to be an effective tool for fast-paced recovery of rural livelihoods in disaster-hit areas such as Aceh. Most vegetable cultivation practices in the surveyed communities in Aceh are low-input farming systems; crop productivity in Aceh is still at a very low level compared with more developed parts of Indonesia. Hence, there are many opportunities to improve vegetable productivity through introduction of improved crop varieties and crop management practices, even from other parts of Indonesia. Specific recommendations for strengthening vegetable production and productivity in Aceh are noted below.

- *Need to improve our understanding on the constraints to diversification.*
  The tsunami destroyed most of the prime vegetable lands along Aceh's coastal areas and lowland areas as well as the local institutions supporting vegetable production. Due to the complete destruction of land and physical assets, and absence of local institutions and support systems for credit, inputs, markets,and extension at the time of the survey, vegetable farmers in the tsunami-affected areas faced a host of constraints and difficulties. In addition to rebuilding the physical infrastructure, an external project intervention is needed to strengthen development of local institutions and build community-level capacity to enable production of high-value and market oriented vegetables like chili, tomato, and cucumber.

- *Expansion of vegetable production as per the local market demands.*
  At present, vegetable productivity is very low in Aceh compared with more developed provinces of Indonesia. However, due to its strategic location and better access to major urban centers and markets in Indonesia and other countries in Southeast Asia, Aceh is well-positioned to benefit from vegetable production. Proximity to the major uban center of Medan, from which vegetables from Indonesia are being exported to Singapore, Malaysia and other countries in Southeast Asia, is an asset.

- *Greater focus on chili and high-value vegetable farming.*
  Incomes and employment from vegetables are higher than cereals and other crops. This is the case even in tsunami-affected communities, and with low-input production systems. Among vegetables, the income and employment from some crops are higher than others, and have higher impact potential in rural communities. Because of good market prices and widespread adaptation, chili popularity has been growing rapidly in Aceh. Thus, there is a need for a special project on chili and other vegetables that suit the specific requirements of low-input, semi-subsistence farming systems in Aceh.

- *Need to strengthen public services and extension to reduce risks in vegetable production*
  Vegetable production is profitable but risky for farmers due to excessive exposure of farmers to market-related factors, extreme volatility of produce prices, high seasonal fluctuation of yield, high incidence of pest and disease outbreaks, and marketing bottlenecks. Public sector support to local communities in the development of market infrastructure for vegetables would ensure better market access to smallholding farmers in the tsunami-affected communities. Pest and disease infestations, seasonal water shortages, and inadequate or damaged irrigation infrastructure are other factors limiting the yield potential of vegetables. Taken together, all these factors tend to lower farmers' incentive to grow vegetables. Government support in these sectors can help bring about a healthy and vibrant vegetable industry and reducing farmers' risk associated with vegetable production.

- *Need to develop low-input vegetable systems in Aceh*.
  With properly managed risk through improved crop management practices, chili and other vegetable cultivation may become widespread in Aceh. This will ultimately benefit large numbers of smallholding and marginal vegetable growers, and a wider section of consumers in Aceh.

- *Need to strengthen vegetable-specific extension services*.
  Due to limited extension services for vegetable farming in Aceh, additional public interventions are needed to disseminate improved technology packages for chili and other high-value vegetables, especially for smallholders and low-input production systems. Institutional extension support is targeted largely to cereals and other major food crops (rice, soybean, maize, etc.). Considering constraints to expanding public

extension services for vegetable farming—of which there are many crops, each with specific requirements—it is suggested to explore the usefulness of private extension services or NGO-led extension services.

- *Farmer Field Schools (FFS) institutionalization for vegetable-specific issues.*
  Considering the inadequate training opportunities and minimal extension support for vegetable growers in Aceh, a FFS-type of farmers' training package could be an effective tool for tailoring capacity building to the local needs of a community. FFS-based public interventions are needed to disseminate improved technology packages for chili and other high-value crops for small-scale growers across wider areas. These improved packages should be affordable for average smallholder farmers.

- *Need to strengthen the access to composts in the rural areas.*
  Compost is an effective, low-cost option to rehabilitate and restore tsunami-damaged lands for normal agricultural production. Several farmers in the survey communities have attained knowledge regarding the usefulness of compost to restore soil fertility and its benefits for vegetable production. Nevertheless, the existing need for compost in Aceh cannot be so easily met, as there is no readily available compost source in Aceh or nearby provinces. Local entrepreneurs should be encouraged to develop businesses to make and supply compost to local communities in and around Aceh.

- *Development of rural market infrastructures*.
  Local market forces and market access issues are important factors determining farmers' crop choices and the specific farming practices they follow. Aceh farmers sell nearly all of their produce at local markets, thus, access to markets and marketing-related factors are critical to a farmer's crop acreage allocation and adoption of technology practices. As the tsunami-affected areas recover, the ability to sell a particular vegetable will become a major concern in farmers' crop selection. Efforts are needed to strengthen market information systems (MIS) for agricultural commodities, especially as some markets are far from the major towns and cities.

- *Better understanding of local institutions supporting vegetable cultivation.*
  Any project intervention to improve vegetable cultivation, including encouraging the adoption of soil management practices should adapt to and address local market and social-institutional factors of the farming community, such as credit in vegetable farming, access to training for specific technologies, extension services, and local access to agricultural inputs at fair prices. Strengthening the capacity of institutions to deliver services to specifically support the needs of smallholder vegetable growers is a critical step in further expansion of vegetable production and productivity in Aceh.

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Appendices

Appendix 1. The importance of source of information for plant protection and new technology in the Aceh survey locations

Source of information	Rank of information			
	Aceh Besar	Pidie	Northeast Aceh	Overall
Pest and diseases management				
Own experience	6	2	1	1
Other household members	3	1	2	2
Neighbors/other farmers	2	3	3	3
School/NGO	7			7
Government extension	1		4	4
Input dealers	5			6
Farmers' organization	4	4	5	5
New seed and varietals types				
Own experience	2	2	1	1
Other household members	5	1	5	4
Neighbors/other farmers	3	3	3	3
School/NGO	6			7
Government extension	1	4	3	2
Input dealers	4	5	2	5
Farmers' organization	7	5	4	6
Newspaper/magazine/other print media			5	8
New crop cultivation techniques				
Own experience	2	2	2	1
Other household members	4	1	4	4
Neighbors/other farmers	3	3	1	3
School/NGO	5			6
Government extension	1	4	3	2
Input dealers	7	5		7
Farmers' organization	6		4	5

Note: 1= highest rank; 7 = lowest rank. Overall ranking is derived as average ranking across the three locations, and also considers frequency (number of reporting) to each of the sources of information and by sites.

Appendix 2. The importance of source of information for marketing, irrigation and livestock in the Aceh survey locations

Source of information	Rank of information			
	Aceh Besar	Pidie	Northeast Aceh	Overall
Vegetable prices / Market information				
Own experience	1	2	2	1
Other household members	4	1	4	4
Neighbors/other farmers	3	3	1	2
School/NGO	5			5
Government extension	6		6	6
Input dealers	2	4	3	3
Newspaper/magazine/other print media	7		5	7
Irrigation and water application techniques				
Own experience	1	2	1	1
Other household members	2	1	2	2
Neighbors/other farmers	3	3	3	3
School/NGO	5			6
Government extension	3		4	5
Farmers' organization	4	4	5	4
Newspaper/magazine/other print media			5	7
Animal husbandry and livestock raising				
Own experience	1	2	1	1
Other household members	2	1	2	2
Neighbors/other farmers	3	3	3	3
School/NGO	4			5
Government extension	4		4	4
Farmers' organization	5			6

Note: 1= highest rank; 5 = lowest rank. Overall ranking is derived as average ranking across the three locations, and also considers frequency (number of reporting) to each of the sources of information and by sites.

Appendix 3. Questionnaires used for Individual Household Level Survey

1. Vegetable growing HH recently (2007/06/05) 1.Yes [….] 2. No [….]

Baseline Survey: Production and Supply of Vegetables in Aceh, 2008[6]

Date: ……../ … ……./2008
Questionnaire code #:… ……
Name of the Enumerator:…….

HH No ……..

Note:

1. First, enumerator should introduce himself/herself and explain to the respondent the purpose of this field survey.
2. **Project purpose**: To enable rehabilitation of vegetable production to help restore and enhance food security, nutrition, and livelihoods in the project area. (**Farmers Field School** and **Field Trials**)
3. The personal identities/information of the responding HH will not be shared with any other agencies in Indonesia, but will be used by the surveying institutes and only for research purposes.

Section I. General Information

A. General background

1. Name of the Farmer/HH head: [ ] 2. Age of HH Head: [ ] Years

3. Gender of Household head: Male[ ] Female[ ] 3.1 Name respondent: [ ]

4. Province/State: Nanggroe Aceh Darussalam

5. District: [ ]

6. Sub-district: [ ]

7. Village: [ ]

B. Household (HH) Information and Family Profile:

S.N.	Description	Unit	Data	Remarks
1	HH head education level	Years		
2	HH head farming experience	Years		
3	HH head vegetable growing experience[a]	Years		
4	HH head Training in vegetable farming	Months		
5	Main occupation of the HH head	Code		
6	Secondary occupation of the HH head[b]	Code		
7	Total family members living in the house	No.		Adults: [ ], Children[c]: [ ]

[a] No. of years growing vegetables, including before the Tsunami disaster.
[b] Occupation code: 1 = Farming; 2 = Civil servant; 3 = Retail shop; 4 = Local trader; 5 = Fishermen; 6 = Others.
[c] Children = Less than 15 years of age.

[6] This is the baseline survey carried out by AIAT-NAD in partnership with KEUMANG, FHCAS-NAD, UNSYIAH, Austcare, IVEGRI, NSW DPI (Australia), and under the technical supervision of AVRDC- The World Vegetable Center, with its HQ based in Taiwan. This baseline survey is part of the project, "Integrated Soil and Crop Management for Rehabilitation of Vegetable Production in the Tsunami-affected Areas of NAD Province, Indonesia" (ACIAR project CP/2005/075).

C. Agricultural Land Holding, Crop Production and its Characteristics

C.1. Land status: (in meter squared or in ha)

1. Total own crop area: …….. (ha)	2. Rented in/Shared cropped area: ……..... (ha)	3. Rented out area: …….. (ha)
4. Uncultivated land: ……..... (ha)	5. Total cultivated area: …….. (ha)	6. Number (#) of cultivated parcel land (no. of plots): …….
7. Total low land area: …….. (ha)	8. Total dry land (upland): …….. (ha)	9. Remarks:

Note: ha = 1 hectare (if the farmers can answer the question in square meter (or Meter x meter) then that should be recorded directly instead of this ha).

C.2. Major Land use types:

Land use type	Total area (ha)	Names of crop(s) planted[1]	Source of irrigation[2]	Distance to water source (meters)	Major soil types[3]	Remarks
1. Home garden (house not included)						
2. Paddy field						
3. Land for vegetable crops						
4. Land for other annual crops						
5. Land for perennial crops						
6. Barren land/ uncultivated land						
7. Other use (specify): _____						

[1] Code for the crops (grown in the areas): 1 = Rice; 2 = Soybean; 3 = Groundnut; 4 = Chili pepper; 5 = Tomato; 6 = Cucumber; 7 = Amaranth; 8 = Shallot; 9 = Kangkong; 10 = Pak choy (*sawi*); 11 = Yardlong bean; 12 = Eggplant; 13 = Cauliflower; 14 = Other (specify).

[2] Code for irrigation source: 1 = Rain-fed; 2 = Irrigation canal; 3 = Well; 4 = Small pump; 5 = River; 6 = Other (specify).

[3] Code for soil types: Local language: 1 = Clay soil; 2= Sandy ; 3 = Sandy clay; 4 = River bed; 5 = Other (specify).

D. Vegetable Production Types and Level

D.1. Are you currently growing vegetables? Yes [ ] No [ ] *(if No, go to D.2.; If Yes, go to next page)*

D.2. *(If NO in* D.1*)* Did you ever grow vegetables, even before Tsunami disaster? Yes [ ] No [ ]

If YES, go to D**.3** below If NO, go to D.7 (non-Adopter category)

D.3 In what year did you plant vegetables?
Year: [ ]

D.4 Purpose: Only for home consumption [ ]
For market & home [ ]

D.5 Have you stopped growing vegetables recently, but used to grow before Tsunami)?
1) Yes [ ]; 2) No [ ]

D.6 Any other reasons that you stopped growing vegetables recently? Rank

__ Our land is not suitable
__ Vegetable land damaged by tsunami
__ No experience with vegetables
__ Vegetables are difficult to market
__ High pest/disease problems
__ Too risky a crop
__ Fertilizer is too costly
__ Cannot obtain credit
__ Better to do something else
__ Not enough labor
__ Not enough land
__ Vegetables prices are too low
__ Vegetables prices are fluctuating
__ Other reason:_____ ____

D.7 Why did you decide not to plant vegetables on farm land? *(What are the constraints for your growing vegetables?)* Rank

__ Our land (soil) is not suitable
__ No irrigation access to land
__ No experience with vegetables
__ Vegetable prices are too low
__ Vegetable prices are fluctuating
__ Vegetables are difficult to market
__ Pest/disease problems
__ Too risky a crop
__ Fertilizer is too costly
__ Cannot obtain credit
__ Better to do something else
__ Not enough labor
__ Not enough land
__ Other reason: _____

Note: Need to make code for each factor (& possibly rank these issues after listing the important ones).
Vegetable grower = those who are growing vegetable on 50 sq. meter or more land.

Section II. Farm Income Structures, Livelihood, and Food Security

A.1. Cropping pattern, production level, and farm income in 2007 crop year (Cereal and other non-vegetable and non-fruit crops)

Please provide details on crops grown in last one year cycle and related activities

Code	Crop types	Crop	Area (ha)	Total Produc-tion (kg)	Production distribution		Market sale			Any Remarks
					Home cons. (%)	Sold (%)	Quantity sold (kg)	Avg. price /kg	Value MKT sale) (x 1000 Rp)	
a1	Cereal	Paddy (Rainy season								
		Paddy (Dry season)								
		Maize								
		Others								
a2	Cash & others	Oilseeds								
		Sugarcane (Tabu)								
		Groundnut								
		Cassava								
		Others								
a3	Pulses	Soybean								
		Mung bean								
		Pigeon pea								
		Others								

A.2. Cropping patterns, production level, and farm income in 2007 crop year (Vegetables, Fruits)

Code	Crop types	Crop	Variety	Area (MxM)	Total Produ-ction (kg)	Production distribution		Market sale			Any Remarks
						Home cons. (%)	Sold (%)	Quan-tity sold (kg)	Avg. price /kg	Value of MKT sale) (x 1000 Rp)	
	Veget -ables	Chili pepper									
		Tomato									
		Cucumber									
		Amaranth									
		Shallot									
		Long bean									

Code	Crop types	Crop	Variety	Area (MxM)	Total Produ-ction (kg)	Production distribution		Market sale			Any Remarks
						Home cons. (%)	Sold (%)	Quan-tity sold (kg)	Avg. price /kg	Value of MKT sale) (x 1000 Rp)	
		Others									
	Fruits	Coconut									
		Mango									
	Other crops	(Specify)									

Note: Need to specify crops as per the local conditions now. (Variety: only with the major/dominant variety if apply here).

Other Vegetables: 1= Kangkong; 2 =Yardlong bean; 3=Eggplant; 4=Cauliflower; 5=Chinese cabbage/ pak choy (*sawi*); 6=other (specify).

Fruit tree code: 1 = Coconut; 2 = Jack fruit; 3 = Melinjo (*Gnetum gnemon*) ; 4 = Petai (*Parkia speciosa*); 5 = Rambutan; 6 = Durian; 7 = Mangosteen; 8 = Other (specify).

B. Household Level Food Security

B.1. Is the paddy production in your own farm sufficient for needs of your family for the whole year?

1. Yes [ ] 2. No [ ]

B.2. If no, how many months are insufficient from your own farm's production? _____ (months)

What are the rice insecure months (list the months)? _____

B.3. What are the possible reasons for the insufficiency of rice production?

1. Very little land [ ]
2. Low land productivity [ ]
3. Big family size [ ]
4. Not intending to produce food [ ]
5 Land damaged by Tsunami [ ]
6. Doing other labor wage [ ]
7. High salinity due to Tsunami [ ]
8. Doing fishing activities [ ]
9. In sufficient capital [ ]
10. Others specify: _____

B.4. How do you manage to meet your food needs during insufficient months?

1. Buy from local market [ ]
2. Grow vegetables and high value crops [ ]
2. Borrow money to buy food [ ]
3. Borrow grain [ ]
4. Fish catch from the sea [ ]
5. Wild catch or gathering from forest [ ]
6. Earnings from the labor wage in the village [ ]
7. Migration to outside (certain months) [ ]
8. Others: _____

B.5. On average, how much vegetable does your family consume per weekly and per season?

Vegetable consumption by your family (in the HH)		No. of people in HH	Unit	Dry Season (April-July)	Early Wet (Aug-Dec)	Late Wet Season (Jan-March)	Remarks
Vegetables	Total quantity of vegetables consumed per week		kg/ week				
	Out of this, the % of vegetables grown in your farm & home garden		%				
	Out of this, the % collected from ocean/wetlands/rivers		%				
	% of vegetables purchased at local market		%				
	Amount of money spent for vegetable purchases		Rp./ week				

Section III. Vegetable Production: Specific Issues

(This is the questionnaire for HH growing vegetable recently during 2005, 2006, or 2007). If not grower, go to Section V).

A. Reasons for growing vegetables

Why do you cultivate these vegetables (chili, tomato, cucumber, amaranth) and not other crops? (First list the farmers' reasons and rank them at the end).

S.N.	Reasons for cultivating the vegetables by the respondent HH	Rank	Code	Remarks
A1				
A2				
A3				
A4				
A5				

Note: First the enumerator should list any reasons the farmers would recall; then rank these reasons later on, asking farmers then to rank and prioritize the most important and then 2nd, 3rd, and so on.

B. On-Farm marketing of vegetables

B.1. What is your source(s) of market (price) information? (5 = the highest)

Media/Sources of information	Rank	Media/Sources of information	Rank
a. TV		f. Radio	
b. Newspaper		g. Government department	
c. Internet		h. Co-operative organization/association	
d. Trader/collector		i. Any other (Please specify)	
e. Neighbor farmers			

Note: Code for ranking the items: 5 = highest rank; 1 = lowest rank

B.2. Where do you usually sell your vegetable (tick mark where appropriate)?

S.N.	Type of middle men	% of the veg. sale	Remarks
2.1	At farm/field		
2.2	Local wholesale market		
2.3	Traders coming to the village to buy the produces		
2.4	Vegetable vender		
2.5	Carry to the urban market center		
2.6	Others (please specify)		

B.3. How well do you know about prices prevailing in the market?

Very well [ ] Not very well [ ] Very little [ ]

B.4. Do you have a fixed trader whom you sale your produces to? Yes [ ] No [ ]

B.5. If yes, do you also borrow money/inputs from the collectors? Yes [ ] No [ ]

B.6. If no fixed traders, how many traders did you contact before deciding to sell the vegetables?

(No.) ……

B.7. Major marketing of vegetable related concerns/problems that you are facing now:

S.N.	Major factors /concerns/limitations	Rank	Remarks
A1	Traders cheating on weight		
A2	Low market prices		
A3	Few traders to the village		
A4	At pick time very few traders		
A5	Transportation to the market		

Note: First list down the concerns and then rank each of them later on. (5 = most important)

C. Vegetable production and irrigation (water management) specific Issues

C.1. Irrigation types and costs involved for irrigating the crops

S.N.	Vegetable	Irrigation			
		Source (£)	Type of watering (¥)	Number of times irrigation applied in a crop season#	Remarks
	Chili pepper				
	Tomato				
	Cucumber				
	Amaranth				
	Shallot				
	Others				

Note: Codes for this table

£ Source of irrigation: 1 = Canal, 2 = Pump from (TW) or well, 3 = Tank, 4 = Lake, 5 = Rain-fed, 6 = Any other (pls specify)

¥ Type of irrigation: 1 = Flooding (w/o ridges), 2 = Flooding (w/ ridges), 3 = Manual from TW or other well, 4 = Manual from tank/lake, 5 = Trickle (Gumber), 6 = Any Other (pls specify)

C.2. Are you facing any irrigation related problems on vegetable production decision/activities; if so what is its severity on vegetable production?

1. Major problem [….] 2. Minor problem [….] 3. In fact, no Problem [….]

C.3. What is the scale of drainage and flooding (water stagnated) problem in your vegetable crops (Chili in specific)? Circle the appropriate one:

5. Very serious 4. Serious 3. Moderate 2. Very minimal 1. No problem at all

C.4. If problem is mentioned in number C.2, what are the major irrigation related problems on vegetable production to your field that you have faced recently?

S.N.	Types of irrigation related major problems in vegetable field(s)	Code	Problem Ranking	Remarks
A1				
A2	Several times flooding			
A3	Low vegetable land			
A4	Bund damaged by Tsunami			
A5	Irrigation canal damaged by tsunami			

Note: First list the problems randomly whatever the farmers can recall, and then later on rank each of them: 5 = most significant problem; 4 = less severe, and so on as 1 = least problematic one

D. Major problems and concerns of the household for Vegetable Farming

D.1. Major constraints of the household for production of vegetables, in general

S.N.	Major factors /concerns/limitations	Rank them (5 to 1)	Remarks
A1	Very high fluctuation of prices		
A2	Good quality seed is not available		
A3	High pest and disease attach		
A4	Flooding of the vegetable field and crop damage		
A5			
A6			

Note: First list the problems randomly whatever the farmers can recall, and then later on rank each of them:
5 = most significant problem; 4 = less severe, and so on as 1 = least problematic one

Section IV. Vegetable Production Related Issues

A. Credits and Related Financial Issues

A.1. Did you borrow loan/credit for farming during 2006 & 2007? Yes [ ] No [ ]

A.2. What are your most important sources of credit (for farming)?

Most important: _____

Second most important: _____

Third most important: _____

A.3. If yes in 1, then what are the level and kind of loan/credit (borrowed fund) during 2006 and 2007?

Source of loan	Amount			Interest rate per year basis		Other costs	Purpose of loan ++	Remarks
	Cash	Kind		Cash	Kind			
		Item	Value					
Govt. bank								
Private bank								
Co-operative/ Micro credit								
Private money lender in village								
Friends\Relatives								
Vegetable collectors/merchant								
Commission agents								
Any other …….								

Note: Purpose of loan ++: 1 = Vegetable farming; 2 = Other cereal cultivation; 3 = Off-farm business, micro-enterprise, etc; 4 = Health; 5 = Housing; 6 = Festivals; 7 = Education; 8 = Consumption; 9 = Others (specify).

A.4. Did you receive loan from the vegetable collector recently? Yes [ ] No [ ]

If yes Remarks: _____

A.5. Are you facing difficulties in getting loan for farming?

5. Most sever constraint 4. Difficulty 3. Little difficult 2. Little problem 1. No problem

[____]

A.6. What are your problems on obtaining credit for vegetable farming?

Not getting credit when I need it [ ]

High interest rate [ ]

In bang long bureaucracy [ ]

B. Training and Extension Services in Vegetables Farming

Training and extension:

B.1a. Did you or any member of your family attend any training/workshop over the last 3 years in relation to vegetable production? Yes [ ] No [ ]

B.1b. If yes, please specify the following information:

Name of the training/ workshop	Organizer	Duration (days)	Who attended 1= Male 2= Female	Do you/your family request first Yes = 1; No = 2	Benefit from the training**	Remarks
1.						
2.						
3.						
4.						
5.						

** 1 = Skill improved; 2 = Increased cash income; 3 = Family health improved;
4 = Employment generated; 5 = Soil erosion prevented; 6 = other (specify): _____

Please provide your opinion about the followings:

B.2. In general, how supportive are training and extension activities in the village for the well-to-do and poor households?

For both better-off and poor households [ ]

Mainly for well-to-do households [ ]

Mainly for poor households [ ]

Any further comments/feed backs: _____

B.3. Access to information: What are your sources of information now on the following issues of vegetable farming?

S.N.	Types of issues	Sources of Information (*)	
		Most important source	Other sources
1	General farming and paddy cultivation		
2	Vegetable production		
3	Soil salinity management (reclaiming the Tsunami damaged soil)		
	Soil fertility management		
	Pest and diseases management (control)		
	Vegetable (agri.) prices/Market information		
	Fertilizer application		
	Irrigation and water application techniques		
	New crop cultivation techniques		
	New seed and varietal types		
	Animal husbandry and livestock raising		
	Others (specify): ……		

(*) Access to information: 1 = own experience; 2 = other household members; 3 = neighbors/other farmers; 4 = school/NGO; 5 = government extension workers; 6 = private company extension workers; 7 = input dealers; 8 = radio/television; 9 = farmers' organization; 10 = newspaper/magazine/other print media

B.4. How do you rate on the technical services (training) provided for vegetable farming in the village (circle the one rating below)_____

5. Very Adequate; 4. Adequate; 3. Okay; 2. Not good; 1. No such training at all

B.5. In general, how supportive are training and extension activities in the village for men and women members of the community?

Equal for men and women [ ] More for men [ ] More for women [ ]

Please explain: _____

***C. Gender and Vegetable Production* (on farming in general, in case of non-vegetable grower)**

C.1. What activities performed, and/or decisions of vegetable farming, are made by men and women in the household?

Activities and decisions in Vegetable farming	**Male[a] (in %)**	**Female (in %)**	**Remarks**
Vegetable production training (NGO, Gvt.)			
Area of crops to be grown			
Seedling preparation			
Intercultural operation (weeding, etc)			
Fertilizer purchase/ application			
Pesticide purchase/application			
Harvesting decision			
Drying, cleaning, grading of vegetables			
Purchasing farm inputs			
Selling of the vegetables			
Working in home garden			
Making major farming decisions			
Credit attainment for farming			
Participation in village meetings			
Participation in Ag. training & extension			
Other spending in household needs			

[a] The total % of male and female number must be 100.

Section V. Other Sources of Income and Livelihood

A. Fishing and maritime livelihoods

A.1. Do you go for fishing in the ocean or in the river nearby?
Yes [ ] No [ ]

A.2. If yes, on an average how many hours in a day you go for fishing and by seasons:

S.N.	Particular	Dry season (April-Oct)	Wet season (Nov-March)			Remarks
	Avg. number of hours going to fishing (also other catches)					
	Avg. catch/day (kg/day)					
	(or in Rp/day)					
	Market sale of the total fish catch (in Rp/day)					

A.3. What percentage of your HH income (or time) comes from fishing activities (%) _____

A.4. Are you member of any fishing community in the village: Yes [ ] No [ ]

A.5. What are your major problems/concerns in marine fishing activities?

B. Other means of livelihoods and income sources

B.1. Number of livestock owned by the household now

Cattle(Cow and Ox): ___ Buffalo: ___ Poultry: ___ Goat: ___ Others: ___

Total income from livestock animal and livestock products sale in 2007: _____ million Rp.

B.2. Other sources of annual income of household in 2007:

a) Job/salary : _____ million Rp

b) Village shop: _____

c) Other business (specify): _____ million Rp

d) Wage labor earning: _____

e) Agriculture trading: _____

f) Other household income in annual term (specify): _____ million Rp

B.3. If wage labor earning income

Number of days worked as wage labour /year: _____ days; Avg. wage rate:_____ Rp

Remarks: (Code required for kind of labor):

C. HH appliances, equipment, items, and living conditions.

C.1. Farmers Living conditions and other important assets:

C.1a. Farm machinery and equipment owned by the family household:

Kind	#	Kind	#	Kind	#	Kind	#	Kind	#	Kind	#	Kind	#	Kind	#
Tractor …. HP		Tractor trolley		Truck		Power tiller		Water pump		Thre-sher		Power sprayer		Manual sprayer	
Drill		Rice trans-planter		Rota-vator		Culti-vator		Disc plow		Mold board plow		Any other			

C.1b. Transportation vehicle and other means got by the household:

Kind	#	Kind	#	Kind	#	Kind	#	Kind	#	Kind	#	Kind	#	Kind	Yes	No
Pickup		Jeep		Motor-bike		Tricy-cle		cycle		other				Cell phone		

C.2. House condition (use your own judgment):

Poor [ ] Below average [ ] Average [ ] Above Average [ ] Very well [ ]

Note: The enumerator should use own judgment to group this HH into one of the categories above and not to ask this particular question to the respondent HH.

D. Any remarks and/or additional useful information of the household in terms of vegetable production/marketing

1.

2.

3.

THANK YOU VERY MUCH
(TERIMA KASIH)

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