vegIMPACT Report 48

August 2018

vegIMPACT

Handbook of vegetable production and economics in Indonesia

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vegIMPACT

Improved Vegetable Production and Marketing for small farmers to Increase the Food Security status and to promote Private Sector Development in Indonesia

vegIMPACT is a program financed by The Netherlands' Government promoting improved vegetable production and marketing for small farmers in Indonesia, contributing to the food security status and private sector development in Indonesia. The program builds on the results of previous joint Indonesian-Dutch horticultural development cooperation projects and aligns with recent developments in the horticultural private sector and retail in Indonesia. The program activities (2012 – 2016) include the Development of Product Market Combinations, Strengthening the Potato Sector, Development of permanent Vegetable Production Systems, Knowledge Transfer and Occupational Health.

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https://doi.org/10.18174/472935

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Table of Contents

Preface

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The vegIMPACT program, short for 'vegetable production and marketing with impact', aims to improve vegetable production and marketing of small farmers in Indonesia. VegIMPACT contributes to increased food security and private sector development in Indonesia. The program is financed by the Dutch government and is carried out by Wageningen University and Research Centre (WUR) together with local partners and national and international companies in vegetable production and marketing. VegIMPACT carries out a range of intervention strategies, many of which focus on practical training and capacity building of farmers and other stakeholders in vegetable chains.

During program implementation we learned about the high demand in Indonesia for standard and credible horticultural information. For example, information on crop diseases and pesticides as compiled in vegIMPACT's external report no. 10 with the title '*Cara kerja dan daftar pestisida serta strategi pergilirannya pada budidaya tanaman sayuran dan palawija*'. A lack of such type of standard agronomic information hampers the development of horticulture in Indonesia. Therefore, we decided to compile standard economic and agronomic information on a range of horticultural crops grown in Indonesia. It is based on information collected within vegIMPACT and its predecessor projects such as HORTIN I, HORTIN II and Train-the-Chain. The 'Handbook of vegetable production and economics in Indonesia' gives information on input prices, labour requirements, and quantified inputs and outputs of vegetable systems in terms of physical and economic units. This information is especially of interest for farmers, extension, researchers, project implementers, investors, financers, insurers and other stakeholders in horticulture. With the Handbook we contribute to making standard economic and agronomic horticultural information available and accessible to a wide range of stakeholders in Indonesia.

The Dutch Handbook *Kwantitatieve Informatie voor de Akkerbouw en Vollegrondsgroenteteelt* (Spruijt and Van der Voort, 2015) was an important source of inspiration for the present Handbook but the former is built on a long tradition of systematically collecting data on agriculture in the Netherlands that is yet lacking in Indonesia. Therefore, this Handbook only contains information on a limited number of vegetable crops and spatial and temporal information on input and output prices, crop inputs and outputs were only available to a limited extent. Therefore, this first edition of the Handbook of vegetable production and economics in Indonesia is also a call for more systematic data collection at a wider scale across the different islands of Indonesia.

The authors

1. Introduction

1.1 General introduction

This Handbook compiles data on input prices, labour requirements, and inputs and outputs of a number of vegetable crops in physical and economic terms. Most data and information has been collected in the vegIMPACT program, which aims to improve vegetable production and marketing of small farmers in Indonesia (see: www.vegimpact.com). In addition, also suitable information that was collected in predecessor projects, i.e. HORTIN I and II, and Train the Chain, have been compiled, analysed and presented in this Handbook.

The systematically collected data and information on vegetable crops grown in Indonesia is scarce. This Handbook is a first effort to realize an independent reference guide on vegetable production in Indonesia. It is acknowledged that this Handbook with both economic and agronomic data on vegetable crops in Indonesia is yet based on a limited data set. However, systematically collected economic and agronomic data are the basis for more informed-decision making related to a range of sectors and stakeholders, including banking and finance, environment, business development, agronomic research, extension and farmers.

Indonesia with its many islands covers a huge land mass with different agro-ecological and socio-economic conditions characterising local vegetable production. The total area with major vegetables (potato, chili, shallot, cabbage, carrot and onion) in Indonesia was about 570.000 ha in 2013 (PBS, 2014). More than 60% of this vegetable area was on Java. The vegIMPACT program and also its predecessor project mainly focused on Java. Therefore, most data and information presented in this Handbook refer to Java. But even Java is large and conditions are not the same across the island. In this Handbook information of highland and lowland vegetable crops is presented, and to further account for spatial and temporal variation in data, price series of variable inputs (fertilizers and crop protection agents) are presented when available, and for some vegetables the gross margins under wet season and dry season conditions are presented.

1.2 Data and methods

This handbook presents key agronomic and economic data on vegetable production in Indonesia. Use of these data requires understanding how they have been collected and calculated. The economic and agronomic data presented is collected by farmers, and therefore, the shown data do not represent a ‘best practice’, i.e. the minimum of each production resource that is needed to allow maximum utilization of all other resources (De Wit, 1992).

During the course of the vegIMPACT program agronomic data on potatoes and other vegetables was made available through the multi-season monitoring study, which focused on improving potato and vegetable production in Indonesia (Van den Brink et.al., 2015, Pronk et.al., 2017). This agronomic data was analysed to identify options for improvements in crop performance and resource use efficiencies. In addition to the agronomic assessment, an economic assessment was included. This assessment was carried out per individual crop/farmer. The economic assessment per crop/farmer was the starting point of this handbook. The regions, crops, seasons and other relevant data and detailed information are available in vegIMPACT reports (Van den Brink et.al., 2015, Pronk et.al., 2017, De Putter et.al., 2013, De Putter et.al., 2014).

KWIN was a reference source for this Handbook (Spruijt and Van der Voort, 2015). The KWIN is made up out of two main parts, first general economic data and second crop gross margins. In this Handbook, Chapter 2 presents average economic data, such as prices of fertilizer, crop protection, labour requirements and land prices. The prices of most used fertilizers and crop protection agents in vegetables are available from above mentioned studies of the vegIMPACT program. Because the use of fertilizers and crop protection agents differs among farmers only the fertilizers and crop protection products used by farmers in multiple years are presented in Chapter 2. The used crop protection products are alphabetically ordered according to their active ingredient name. The prices are expressed per unit commercial product (gram, ml, l, etc.) in which they are sold at retail shops.

The labour requirements in crop production depend among others on the agro-ecological conditions (e.g. soil type, terrain characteristics, crop type and variety, planting density), skills and attitude of farmers and labourers, and on the local production situation (i.e. level of mechanization, input use) and associated yield level, which is not specified as the data are averages from different farmers. Hence, the presented data on labour requirements need to be used with care. The labour requirements of crops are specified per major field operation, i.e. land preparation, sowing/planting, fertilization, crop protection, crop maintenance, irrigation, weeding and harvest. Furthermore, we distinguish labour requirement as recorded by farmers according to gender because labour wages usually differ between men and women, which affects the financial cost-benefit calculations. Some operations are predominantly carried out by women, while others more by men.

The second part of this handbook are the gross margins of different crops for Indonesia. Chapter 3 presents the calculated gross margins of a number of crops. A gross margin of a crop is defined as the total average financial output minus the variable input costs, including the costs for hired labour. The output comprises the market value of the crop including the production retained at the farm. The inputs and outputs of the gross margin calculations are further discussed and described in Chapter 3. The inputs, outputs and gross margins of crops are expressed per hectare. The gross margin is not the same as profit, because no fixed costs and overhead costs are taken in account. The given average gross margins can be considered as a reference value, and do not represent the economic performance of an actual individual farmer.

2. Variable costs

2.1 Introduction

To generate reference data for economic modelling and calculation on vegetable production in Indonesia the prices, characteristics and nutrient content of different fertilizer types, prices of crop protection agents and the labour requirements for different field operations are presented in this Chapter. The use of these inputs varies significantly among farmer and crop. These price data have also been used in the calculation of the gross margins. All prices are expressed in Indonesian Rupiah (IDR). These general data on variable costs is a starting point for the ex-ante economic evaluation of alternative production methods.

2.2 Fertilization

Following fertilizers are the most used fertilizer types in potato and other vegetables at Java, Indonesia. The shown price data are average prices based on observed prices in 2013 and 2014.

Sort of		Price			Contents			
Fertilizer	**Name/Brand**	**IDR/unit**	**unit**	**Type**	**N**	**P**	**K**	**Other**
inorganic	NPK 15:15:15	3,200	kg	granular	15	15	15	Zn: 0.1%
inorganic	KCL	6,303	kg	granular				
inorganic	NPK 16:16:16	8,621	kg	granular	16	16	16	
inorganic	Urea	2,644	kg	granular	46	0	0	
inorganic	SP 36	2,291	kg	granular	0	36	0	
inorganic	ZA	2,142	kg		21			
inorganic	Gandasil	159,500	kg	foliar	6	15	15	MgSO4: 1%
inorganic	Grand k (13:0:46)	26,183	kg	combi gran./fol.	13	0	46	
inorganic	Kalsium	16,500	kg	lime/soil improvement				
inorganic	DAP	8,333	kg	granular	18	46	0	
inorganic	Dolomit	413	kg	lime/soil improvement				CaO: ± 30%; MgO: 18 -22%
inorganic	Grower 15:9:20	9,370	kg	granular	15	9	20	
inorganic	KNO	10,011	gram	granular	13	0	46	
organic	Pupuk kandang	482	kg	organic				
organic	Pupuk kandang ayam	475	kg	organic				
inorganic	Saprodap	7,478	kg	granular	16	20	0	
inorganic	Ammonium sulphate	3,773	kg	granular	21	0	0	SO4: 24%
inorganic	Atonik	330	ml	foliar				
inorganic	Buril	125	gram					
inorganic	Fertiphos 0:20:0	2,600	kg	granular	0	20	0	MgO: 3%; S: 1%; B2O3: 0.2% ; CaO: 20%

inorganic	Kapur	460	kg	lime/soil improvement				
inorganic	Karate	6,650	kg					
inorganic	KNO Putih	20,375	kg					
inorganic	Mitrabor	6,700	kg	foliar	16			CaO: 25.2%; B: 0.3%
inorganic	N-Balancer	115,500	l					
inorganic	Pertipos	2,300	kg					
inorganic	Saprodap 16:20:0	5,595	kg	granular				
inorganic	Sondawa 13:0:46	15,017	kg	granular	13	0	46	
inorganic	Super grow	35	ml					
inorganic	Trubus	34,919	ml	foliar				

2.3 Crop protection

The price per crop protection agent is given in Indonesian Rupiah (IDR) per unit (ml or grams). The data are not listed according brand names of crop production products but instead by the active ingredient of the products. However, aid materials are listed by their brand names.

Active substance	Type[1]	IDR/unit	unit
azoxystrobin	F	666	ml
azoxystrobin + difenoconazole	F	650	ml
chlorothalonil	F	211	gram
cymoxanil	F	411	gram
cymoxanil + famoxadone	F	848	gram
difenoconazole	F	519	ml
dimethomorph	F	867	gram
iprodion	F	459	gram
mancozeb	F	88	gram
mancozeb + carbendazim	F	146	ml
mancozeb + cymoxanil	F	149	gram
mandipropamid	F	713	ml
maneb	F	60	gram
metalaxyl	F	305	ml
metiram + pyraclostrobin	F	177	ml
propamocarb hydrochloride	F	269	ml
propiconazole	F	170	ml
propineb	F	119	gram
propineb + fluopicolide	F	1,771	gram
pyraclostrobin	F	888	ml
tebuconazole	F	395	ml
thiophanate-methyl	F	179	ml
trifloxystrobin + tebuconazole	F	1,210	gram
glyphosate	H	75	ml
isopropylamine glyphosate	H	65	ml

[1] *F – fungicide, H – herbicide, I – Insecticide, S – aid material*

oxyfluorfen	H	198	ml
paraquat	H	887	ml
Paraquat dichloride	H	99	ml
pendimethalin	H	147	ml
abamectin	I	797	ml
acetamiprid	I	325	ml
alfa cypermethrin	I	216	ml
beta-cyfluthrin	I	163	ml
beta-cypermethrin	I	130	ml
cadusafos	I	43,500	ml
carbofuran	I	10	kg
Carbofuran	I	17,403	kg
carbosulfan	I	162	ml
chlorantraniliprole	I	705	ml
chlorfenapyr	I	552	ml
chlorfluazuron	I	645	ml
chlorpyrifos	I	107	ml
chlorpyrifos + cypermethrin	I	148	ml
cypermethrin	I	167	ml
cyromazine	I	2,580	gram
deltamethrin	I	420	ml
diafenthiuron	I	2,124	ml
dimehypo	I	78	ml
emamectin benzoate	I	431	ml
fenobucarb	I	107	ml
fipronil	I	178	kg
fipronil	I	18,314	kg
imidacloprid	I	482	ml
lambda cyhalothrin	I	309	ml
lufenuron	I	319	ml
methamidophos	I	210	ml
methomyl	I	207	gram
permethrin	I	201	ml

profenofos	I	214	ml
spinetoram	I	1,192	ml
spiromesifen	I	539	ml
thiamethoxam	I	1,545	gram
thiamethoxam + lambda-cyhalothrin	I	705	ml
thiodicarb	I	381	gram
triazophos	I	342	ml
Apsa	S	117	ml
Balistic	S	218	ml
Besmor	S	168	ml
Borer	S	170	ml
Dustik	S	53	ml
Indostik	S	7,345	ml
Lantis	S	37	ml
Napel	S	12	ml
Perekat	S	40	ml
Rohastik	S	35	ml
Triple-X	S	30	ml
Triton-X	S	106	ml

2.4 Labour requirements

The labour requirements of field operations in potato are shown per gender and for different years because several years of data were available. The subdivision according gender is important as wages of male and female field workers often differ, which affects the labour costs. In our data collection we observed average wages for men of IDR 8,000 per hour and for woman of IDR 4,600 per hour. The total share provides the distribution of labour carried out by male and female workers. In addition, the share per operation is given as percentage of the total labour. These shares per operations do not necessarily sum up to 100% because multiple data sources have been used.
The number of farmers used for calculating the labour requirement is the same as used for calculating the gross margins of crops (Chapter 3).

Potatoes

Labour requirement per hectare of potatoes - 2014

Gender / Operation	Hours	Share male / female	Share per operation
Male labour (total)	1763	54%	
Land preparation	*431*		*14%*
Sowing/planting	*122*		*4%*
Fertilization	*200*		*6%*
Crop protection	*602*		*19%*
Crop maintenance	*196*		*6%*
Irrigation			
Weeding	*115*		*4%*
Harvest	*279*		*9%*
Female labour (total)	1402	46%	
Land preparation	*505*		*16%*
Sowing/planting	*171*		*5%*
Fertilization	*236*		*8%*
Crop protection	*195*		*6%*
Crop maintenance	*239*		*8%*
Irrigation			
Weeding	*203*		*6%*
Harvest	*409*		*13%*
Total labour hours per hectare of potatoes	3165		

Labour requirement per hectare of potatoes - 2015

Gender / Operation	Hours	Share male / female	Share per operation
Male labour (total)	1897	59%	
Land preparation	414		13%
Sowing/planting	144		5%
Fertilization	240		8%
Crop protection	588		19%
Crop maintenance	368		12%
Irrigation	0		0%
Weeding	0		0%
Harvest	246		8%
Female labour (total)	1201	41%	
Land preparation	300		9%
Sowing/planting	167		6%
Fertilization	237		7%
Crop protection	168		5%
Crop maintenance	387		13%
Irrigation	0		0%
Weeding	0		0%
Harvest	387		13%
Total labour hours per hectare of potatoes	3098		

Labour requirement per hectare of potatoes - 2016

Gender / Operation	Hours	Share male / female	Share per operation
Male labour (total)	1305	44%	
Land preparation	271		9%
Sowing/planting	119		5%
Fertilization	144		5%
Crop protection	476		17%
Crop maintenance	246		9%
Irrigation	0		0%
Weeding	17		1%
Harvest	256		10%
Female labour (total)	1347	56%	
Land preparation	302		10%
Sowing/planting	194		8%
Fertilization	217		9%
Crop protection	276		14%
Crop maintenance	471		17%
Irrigation	0		0%
Weeding	0		0%
Harvest	397		16%
Total labour hours per hectare of potatoes	2652		

Other vegetable crops

Labour requirement per hectare of shallot

Gender / Operation	Hours	Share male / female	Share per operation
Male labour (total)	2273	60%	
Land preparation	704		17%
Sowing/planting	58		1%
Fertilization	102		3%
Crop protection	473		9%
Crop maintenance	149		3%
Irrigation	701		20%
Weeding	152		3%
Harvest	249		8%
Female labour (total)	1571	40%	
Land preparation	290		7%
Sowing/planting	417		12%
Fertilization	169		6%
Crop protection	334		9%
Crop maintenance	217		9%
Irrigation	73		2%
Weeding	479		12%
Harvest	391		11%
Total Labour hours per hectare	3845		

Labour requirement per hectare of sweet corn

Gender / Operation	Hours	Share male / female	Share per operation
Male labour (total)	519	60%	
Land preparation	158		30%
Sowing/planting	45		9%
Fertilization	50		10%
Crop protection	126		24%
Crop maintenance	0		0%
Irrigation	95		18%
Weeding	37		7%
Harvest	82		16%
Female labour (total)	351	40%	
Land preparation	54		15%
Sowing/planting	83		24%
Fertilization	137		39%
Crop protection	85		24%
Crop maintenance	0		0%
Irrigation	0		0%
Weeding	150		43%
Harvest	59		17%
Total Labour hours per hectare	869		

Labour requirement per hectare of water spinach

Gender / Operation	Hours	Share male / female	Share per operation
Male labour (total)	1,850	35%	
Land preparation	400		22%
Sowing/planting	100		5%
Fertilization	350		19%
Crop protection	100		5%
Crop maintenance	0		0%
Irrigation	0		0%
Weeding	0		0%
Harvest	1,200		65%
Female labour (total)	3,500	65%	
Land preparation	400		11%
Sowing/planting	350		10%
Fertilization	350		10%
Crop protection	0		0%
Crop maintenance	0		0%
Irrigation	0		0%
Weeding	1,400		40%
Harvest	1,200		34%
Total Labour hours per hectare	5,350		

Labour requirement per hectare of rice

Gender / Operation	Hours	Share male / female	Share per operation
Male labour (total)	918	44%	
Land preparation	214		23%
Sowing/planting	107		12%
Fertilization	11		1%
Crop protection	44		5%
Crop maintenance	0		0%
Irrigation	0		0%
Weeding	800		87%
Harvest	276		30%
Female labour (total)	1,153	56%	
Land preparation	0		0%
Sowing/planting	311		27%
Fertilization	0		0%
Crop protection	0		0%
Crop maintenance	0		0%
Irrigation	0		0%
Weeding	842		73%
Harvest	0		0%
Total Labour hours per hectare	2,071		

Labour requirement per hectare of yard long bean

Gender / Operation	Hours	Share male / female	Share per operation
Male labour (total)	1,541	48%	
Land preparation	28		2%
Sowing/planting	28		2%
Fertilization	48		3%
Crop protection	263		17%
Crop maintenance	259		17%
Irrigation	643		42%
Weeding	0		0%
Harvest	618		40%
Female labour (total)	1,696	52%	
Land preparation	106		6%
Sowing/planting	106		6%
Fertilization	48		3%
Crop protection	0		0%
Crop maintenance	0		0%
Irrigation	0		0%
Weeding	0		0%
Harvest	1,459		86%
Total Labour hours per hectare	3,237		

Labour requirement per hectare of hot pepper

Gender / Operation	Hours	Share male / female	Share per operation
Male labour (total)	3,367	65%	
Land preparation	143		4%
Sowing/planting	0		0%
Fertilization	24		1%
Crop protection	162		5%
Crop maintenance	0		0%
Irrigation	2,729		81%
Weeding	0		0%
Harvest	238		7%
Female labour (total)	1,833	35%	
Land preparation	0		0%
Sowing/planting	143		8%
Fertilization	24		1%
Crop protection	0		0%
Crop maintenance	0		0%
Irrigation	0		0%
Weeding	238		13%
Harvest	1,429		78%
Total Labour hours per hectare	5,200		

Labour requirement per hectare of bittergourd

Gender / Operation	Hours	Share male / female	Share per operation
Male labour (total)	1,286	64%	
Land preparation	48		4%
Sowing/planting	24		2%
Fertilization	48		4%
Crop protection	190		15%
Crop maintenance	119		9%
Irrigation	738		57%
Weeding	0		0%
Harvest	119		9%
Female labour (total)	714	36%	
Land preperation	0		0%
Sowing/planting	24		3%
Fertilization	48		7%
Crop protection	190		27%
Crop maintenance	333		47%
Irrigation	0		0%
Weeding	0		0%
Harvest	119		17%
Total Labour hours per hectare	2,000		

2.5 Land prices

The land prices are based on vegIMPACT surveys near Brebes, Cirebon and Pekalongan in 2016 (Witono Adiyoga and Herman de Putter, 2017) and the Train the Chain project in the Brebes region in 2010. All regions are on Java.

Year: 2016	**Brebes**	**Cirebon**	**Pekalongan**
Average price	**238**	**141**	**68**
Lowest value	182	83	25
Highest value	416	225	143
Number of values	15	16	15
(2016 vegIMPACT survey data)	*IDR/m^2/month*		

Year: 2010	**Brebes**
Average	**112**
Lowest value	78
Highest Value	156
Number of values	8
(2010 Train the Chain data)	*IDR/m^2/month*

3. Gross margins

3.1 Principles of the gross margin calculations

General

The gross margins of crops in this Handbook are based registered farmers' data within the vegIMPACT program (e.g. Van den Brink et.al., 2015, Pronk et.al., 2017, De Putter et.al., 2013, De Putter et.al., 2014). The number of farmers differs per crop, which is indicated with (n) at the top of each gross margin calculation. The gross margins are expressed per hectare. The average field size is in most cases less than one hectare. The averages field size on which the gross margin is based indicated at the top of each calculation.

The gross margin is an average value, but varies considerably in practice. In order to provide an indication of this variation the median, lowest and highest values are provided.

The share of input costs in the total production costs is provided to indicate the importance of input costs in the total production costs.

In addition, the costs per kilogram product is calculated based on the yield and the total variable costs. This cost price provides an indication of the market price needed to cover all costs.

The production factors and crop income which determine the crop gross margin are described in detail in the following (all prices are in Indonesian Rupiah).

Crop income (1.)

Crop income is a combination of the physical/harvestable yield and the price of the products sold.

Specific for potatoes is that the yield is graded into different qualities/classes/grades. The most common marketable grades are A, B and C, each with a different price. Other grades include seed potatoes, damaged and rotten potatoes. The share of the total of grade A, B and C yield are expressed as a percentage of the total yield.

Specific for shallot is that the yield is based on a smaller number of farmers than the total income: Various farmers sell their 'field' and not the amount of product to a trader. Hence, these farmers have a crop income, but the actual yield is not known. This is expressed in the number of records used for yield.

Seed / rootstock (2.)

For all crops the amount of seed or rootstock used is provided, including the total costs.

Fertilization (3.)

The recorded data on fertilization showed a wide variety of fertilizer products with different prices used by farmers. Therefore, the fertilization costs are calculated as an average input cost. To provide agronomic insight in the fertilization per crop, the total amount of N (nitrogen), P_2O_5 (phosphate) and K_2O (potassium) has been calculated based on the nutrient content of the used fertilizers and the amount applied per crop.

Crop protection (4.)

Similar to fertilization, the number of crop protection products used is large and diverse. For crop protection a similar approach is used as for fertilizers. The costs of fungicides, herbicides, insecticides and other crop protection agents are provided. Because crop protection agents can have different forms (solid and liquid forms) the amount of crop agents can vary depending on the formulation of the product. The other group crop protection includes, for example, adjuvants to improve operation and

effect of the applied crop protection agent.

Energy (5.)

The energy costs include the costs for gasoline for motorised knapsack sprayers and vehicles to transport produce, fertilizer, manure, etc.

Other materials and substances (6.)

All other production materials and substances used are included. The main materials are bamboo sticks, rope and mulch.

Labour requirements (7.)

The labour requirements and costs are based on all field operations in a given crop. The labour requirements include the labour provided by the farmer and him/her family and hired labour. The amount of hired labour differs per crop area and is primarily dependent on farm size. Bigger farms have more hired labour. Therefore, the amount of labour and the labour costs are not comparable. Labour requirements for post-harvest operations are not included.
Contracted labour is not taken into account. This applies for example for ridging, which is done for multiple successive crops.

Total variable costs (8.)

The total variable costs are the sum of the costs for the production factors 2 to 8.

Gross margin (9.)

The gross margin is calculated based on the average total income minus the total variable costs.

3.2 Potatoes

Ware potatoes, Atlantic, wet season, per hectare

n= 28

Average field size: 0.37 ha

	Amount	Unit	Budget in ha (in IDR)	Median	Lowest	Highest
Yield	18,523	kg/ha		16,910	2,870	36,783
Grade ABC	78%					
Other	22%					
1. Total income			**109,624,537**	114,342,031	13,260,620	271,072,319
2. Seed material		**28%**				
Amount seed potatoes	1,777	kg		1,771	540	2,894
Costs seed potatoes			20,027,335	18,929,825	4,316,877	43,386,039
3. Fertilization		**21%**				
N-fertilizer	385	kg N		364	82	715
P2O5-fertilizer	609	kg P2O5		622	622	102
K2O-fertilizer	364	kg K2O		353	353	82
Fertilization costs			15,257,930	14,561,726	14,561,726	2,037,887
4. Crop protection		**15%**				
Fungicide	64,394	gr./ml.	7,588,066	5,488,759	1,375,947	22,605,611
Herbicide	2,986	gr./ml.	278,801	211,214	0	748,130
Insecticide	5,875	gr./ml.	2,432,763	1,639,454	0	5,812,968
Other	7,911	gr./ml.	471,544	336,273	0	2,387,781
5. Energy		**1%**				
Amount (gasoline)	89	ltr.		86	0	185
Energy costs			669,505	602,949	0	1,478,743
6. Other materials and substances		**11%**				
Costs other materials and substances			7,900,087	9,790,104	154,860	9,790,104
7. Labour costs		**25%**				
Hours			2,920	2,785	545	5,312
Labour costs			18,045,686	18,049,109	4,328,358	36,150,647
8. Total variable costs			**72,674,636**			
9. Gross margin			**36,949,901**			
Total variable costs per kg/ha			*3,923*			

Ware potatoes, Atlantic, dry season, per hectare

n= 9

Average field size: 0.39 ha

	Amount	Unit		Budget in ha (in IDR)	Median	Lowest	Highest
Yield	20,197	kg/ha			18,042	12,879	34,251
Grade ABC	86%						
Other	14%						
1. Total income				**113,193,631**	**104,301,075**	**71,250,000**	**179,210,918**
2. Seed material			**30%**				
Amount seed potatoes	1,867	kg			1,735	909	3,102
Costs seed potatoes				23,343,706	21,691,347	11,363,636	38,771,712
3. Fertilization			**20%**				
N-fertilizer	442	kg N			378	203	914
P2O5-fertilizer	601	kg P2O5			520	236	924
K2O-fertilizer	389	kg K2O			378	203	567
Fertilization costs				16,146,188	14,328,949	9,230,769	23,490,488
4. Crop protection			**13%**				
Fungicide	63,313	gr./ml.		7,315,723	9,182,051	2,137,960	11,792,804
Herbicide	7,634	gr./ml.		470,862	470,862	0	487,179
Insecticide	4,261	gr./ml.		2,058,451	1,868,234	613,421	4,164,599
Other	3,968	gr./ml.		368,519	286,592	0	830,769
5. Energy			**1%**				
Amount (gasoline)	97	ltr			92	0	170
Energy costs				688,452	668,947	0	1,186,931
6. Other materials and substances			**11%**				
Costs other materials and substances				8,390,993	8,844,139	3,136,364	8,844,139
7. Labour costs			**26%**				
Labour requirement	2,880	hours			3,045	1,179	5,125
Labour costs				20,182,818	19,933,651	13,635,241	27,150,538
8. Total variable costs				**78,965,714**			
9. Gross margin				**34,227,917**			
Total variable costs per kg/ha				3,910			

Ware potatoes, Granola, wet season, per hectare

n= 47

Average field size: 0.22 ha

	Amount	Unit		Budget in ha (in IDR)	Median	Lowest	Highest
Yield	20,713	kg/ha			20,281	6,739	42,022
Grade ABC	62%						
Other	38%						
1. Total income				**116,844,700**	99,257,687	**30,932,103**	**319,676,065**
2. Seed material			**27%**				
Amount seed potatoes	1,644	kg			1,592	812	3,824
Costs seed potatoes				22,241,029	19,536,020	7,359,706	87,954,111
3. Fertilization			**31%**				
N-fertilizer	385	kg N			362	77	678
P2O5-fertilizer	551	kg P2O5			512	113	1,049
K2O-fertilizer	362	kg K2O			361	62	718
Fertilization costs				24,931,165	12,718,944	2,955,811	565,307,339
4. Crop protection			**14%**				
Fungicide	51,269	gr./ml.		6,977,620	6,144,165	0	16,361,465
Herbicide	4,702	gr./ml.		330,792	231,788	0	955,414
Insecticide	5,611	gr./ml.		4,109,421	1,389,624	0	5,752,318
Other	4,878	gr./ml.		317,348	252,294	0	849,927
5. Energy			**1%**				
Amount (gasoline)	222	ltr			106	0	2,851
Energy costs				934,388	831,986	0	2,912,429
6. Other materials and substances			**5%**				
Costs other materials and substances				4,321,588	2,010,317	257,660	2,010,317
7. Labour costs			**21%**				
Labour requirement	3,304				3,241	1,047	7,744
Labour costs				16,897,961	15,103,009	0	44,541,109
8. Total variable costs				**78,953,434**			
9. Gross margin				**37,891,266**			
Total variable costs per kg/ha				3,913			

Ware potatoes, Granola, dry season, per hectare

n= 28

Average field size: 0.23 ha

	Amount	Unit	Budget in ha (in IDR)	Median	Lowest	Highest
Yield	15,877	kg/ha		14,262	7,200	32,354
Grade ABC	63%					
Other	37%					
1. Total income			**102,613,332**	**89,998,386**	**38,120,567**	**236,118,986**
2. Seed material		**27%**				
Amount seed potatoes	53,581	kg		2,144	773	664,452
Costs seed potatoes			14,984,081	18,605,593	429	33,573,141
3. Fertilization		**21%**				
N-fertilizer	376	kg N		364	140	749
P2O5-fertilizer	488	kg P2O5		484	201	756
K2O-fertilizer	376	kg K2O		384	92	698
Fertilization costs			11,446,179	10,806,714	4,392,923	23,263,609
4. Crop protection		**14%**				
Fungicide	41,327	gr./ml.	5,377,540	4,518,521	141,789	13,586,428
Herbicide	3,573	gr./ml.	297,329	225,747	0	676,721
Insecticide	5,698	gr./ml.	1,738,573	1,256,676	0	6,363,636
Other	4,245	gr./ml.	254,905	221,631	0	467,825
5. Energy		**2%**				
Amount (gasoline)	165	ltr		106	0	797
Energy costs			1,169,579	741,525	0	5,178,479
6. Other materials and substances		**6%**				
Costs other materials and substances			3,010,035	733,563	0	755,603
7. Labour costs		**30%**				
Labour requirement	3,301	hours		3,140	870	9,333
Labour costs			16,221,604	14,751,244	0	57,811,692
8. Total variable costs			**54,499,823**			
9. Gross margin			**48,113,509**			
	Total variable costs per kg/ha		3,433			

3.3 Vegetable crops

Shallot, wet and dry season, per hectare

n= 66 * n for yield = 43

Average field size: 0.39 ha

	Amount	Unit		Budget in ha (in IDR)	Median	Lowest	Highest
Yield	11,966	kg/ha			11,556	4,600	27,089
1. Total income				**122,338,842**	**102,541,905**	**14,285,714**	**352,777,778**
2. Seed material			**59%**				
Amount of seed	2,167	kg			2,113	1,250	3,889
Costs of seed				60,891,865	58,928,571	16,250,000	145,000,000
3. Fertilization			**9%**				
N-fertilizer	245	kg N			221	43	708
P2O5-fertilizer	196	kg P2O5			187	19	736
K2O-fertilizer	217	kg K2O			183	43	633
Costs of fertilizer				9,798,333	8,499,571	2,996,154	37,361,111
4. Crop protection			**10%**				
Fungicide	20,731	gr./ml.		3,092,421	2,275,000	0	19,569,493
Herbicide	17,339	gr./ml.		505,641	262,857	0	3,203,017
Insecticide	22,141	gr./ml.		5,987,450	4,495,829	0	22,838,889
Other	9,485	gr./ml.		735,094	574,278	0	2,254,200
5. Energy			**0%**				
Amount (gasoline)		ltr					
Costs of energy							
6. Other materials and substances			**2%**				
Costs other materials and substances				2,222,089	166,667	0	35,819,067
7. Labour costs			**20%**				
Hours				3,898	3,093	1,260	13,833
Costs of labour				20,231,294	17,059,982	0	58,853,333
8. Total variable costs				**103,468,085**			
9. Gross margin				**18,870,757**			
	Total variable costs per kg/ha			8,647			

* 23 growers did not harvest the product themselves. They sold the entire field including harvest work. Their yield is 1 field.

Sweet corn, wet and dry season, average per hectare

n= 13

Average field size: 0.53 ha

	Amount	Unit		Budget in ha (in IDR)	Median	Lowest	Highest
Yield	26,300	kg/ha			19,643	8,304	64,286
1. Total income				**47,413,379**	**27,500,000**	**15,446,429**	**128,571,429**
2. Seed material			**13%**				
Amount of seed	19,126	kg			13,839	0	48,214
Costs of seed				3,579,762	3,435,714	0	7,142,857
3. Fertilization			**25%**				
N-fertilizer	424	kg N			386	139	777
P2O5-fertilizer	103	kg P2O5			74	11	321
K2O-fertilizer	139	kg K2O			129	13	441
Costs of fertilizer				7,096,772	3,665,625	1,846,429	35,098,214
4. Crop protection			**24%**				
Fungicide	5,466	gr./ml.		2,908,029	1,010,714	296,400	21,116,071
Herbicide	11,860	gr./ml.		541,214	461,929	0	1,269,286
Insecticide	5,128	gr./ml.		3,124,960	1,962,857	222,857	12,376,429
Other	3,123	gr./ml.		170,100	163,314	0	341,518
5. Energy			**4%**				
Amount (gasoline)	165	ltr			179	0	286
Costs of energy				1,142,857	1,225,000	0	2,000,000
6. Other materials and substances			**1%**				
Costs other materials and substances				158,571	128,571	0	321,429
7. Labour costs			**34%**				
Hours				1,349	1,163	0	2,893
Costs of labour				9,664,890	7,767,857	4,660,714	22,285,714
8. Total variable costs				**28,388,505**			
9. Gross margin				**19,024,874**			
	Total variable costs per kg/ha			1,079			

Water spinach, dry season, average per hectare

n= 2

Average field size: 0.05 ha

	Amount	Unit		Budget in ha (in IDR)	Median	Lowest	Highest
Yield	72,000	kg/ha			72,000	72,000	72,000
1. Total income				**58,500,000**	**58,500,000**	**45,000,000**	**72,000,000**
2. Seed material			**6%**				
Amount of seed	70	kg			70	60	80
Costs of seed				2,300,000	2,300,000	1,600,000	3,000,000
3. Fertilization			**8%**				
N-fertilizer	644	kg N			644	552	736
P2O5-fertilizer	0	kg P2O5			0	0	0
K2O-fertilizer	0	kg K2O			0	0	0
Costs of fertilizer				2,800,000	2,800,000	2,400,000	3,200,000
4. Crop protection			**1%**				
Fungicide	0	gr./ml.		0	0	0	0
Herbicide	5,000	gr./ml.		325,000	650,000	0	650,000
Insecticide	0	gr./ml.		0	0	0	0
Other	0	gr./ml.		0	0	0	0
5. Energy			**0%**				
Amount (gasoline)	0	ltr			0	0	0
Costs of energy				0	0	0	0
6. Other materials and substances			**0%**				
Costs other materials and substances				0	0	0	0
7. Labour costs			**85%**				
Hours				5,350	5,350	5,200	5,500
Costs of labour				31,300,000	31,300,000	29,300,000	33,300,000
8. Total variable costs				**36,730,350**			
9. Gross margin				**21,769,650**			
Total variable costs per kg/ha				510			

Yard Long Bean, wet and dry season, average per hectare

n= 2

Average field size: 0.19 ha

	Amount	Unit		Budget in ha (in IDR)	Median	Lowest	Highest
Yield	15,594	kg/ha			15,594	14,176	17,013
1. Total income				**33,082,247**	**33,082,247**	**19,757,619**	**46,406,875**
2. Seed material			**2%**				
Amount of seed	6	kg			6	5	6
Costs of seed				550,595	550,595	476,190	625,000
3. Fertilization			**4%**				
N-fertilizer	63	kg N			63	0	125
P2O5-fertilizer	15	kg P2O5			15	0	29
K2O-fertilizer	6	kg K2O			6	0	12
Costs of fertilizer				861,905	861,905	0	1,723,810
4. Crop protection			**50%**				
Fungicide	5,536	gr./ml.		5,847,143	5,847,143	4,754,286	6,940,000
Herbicide	0	gr./ml.		0	0	0	0
Insecticide	5,143	gr./ml.		6,235,179	6,235,179	5,262,857	7,207,500
Other	2,202	gr./ml.		55,060	55,060	47,619	62,500
5. Energy			**0%**				
Amount (gasoline)	0	ltr			0	0	0
Costs of energy				0	0	0	0
6. Other materials and substances			**0%**				
Costs other materials and substances				55,060	55,060	47,619	62,500
7. Labour costs			**44%**				
Hours				3,237	3,237	3,188	3,286
Costs of labour				10,821,429	10,821,429	0	21,642,857
8. Total variable costs				**24,429,606**			
9. Gross margin				**8,652,641**			
	Total variable costs per kg/ha			1,567			

Hot pepper, wet season, average per hectare

n= 1

Average field size: 0.21 ha

	Amount	Unit		Budget in ha (in IDR)
Yield	7,090	kg/ha		
1. Total income				**35,004,762**
2. Seed material			**1%**	
Amount of seed	1,429	kg		
Costs of seed				428,571
3. Fertilization			**5%**	
N-fertilizer	238	kg N		
P2O5-fertilizer	41	kg P2O5		
K2O-fertilizer	11	kg K2O		
Costs of fertilizer				2,602,381
4. Crop protection			**16%**	
Fungicide	8,000	gr./ml.		832,000
Herbicide	4,785	gr./ml.		118,362
Insecticide	9,143	gr./ml.		6,646,857
Other	5,333	gr./ml.		533,333
5. Energy			**6%**	
Amount (gasoline)	448	ltr		
Costs of energy				3,133,333
6. Other materials and substances			**0%**	
Costs other materials and substances				0
7. Labour costs			**72%**	
Hours				5,200
Costs of labour				36,100,000
8. Total variable costs				**50,400,038**
9. Gross margin				**-15,395,276**
	Total variable costs per kg/ha			7,108

Bitter-gourd, wet season, average per hectare

n= 1

Average field size: 0.21 ha

	Amount	Unit		Budget in ha (in IDR)
Yield	3,805	kg/ha		
1. Total income				**15,814,286**
2. Seed material			**1%**	
Amount of seed	1,905	kg		
Costs of seed				266,667
3. Fertilization			**7%**	
N-fertilizer	125	kg N		
P2O5-fertilizer	29	kg P2O5		
K2O-fertilizer	12	kg K2O		
Costs of fertilizer				1,723,810
4. Crop protection			**13%**	
Fungicide	1,905	gr./ml.		176,762
Herbicide	2,860	gr./ml.		230,000
Insecticide	3,643	gr./ml.		2,892,857
Other	976	gr./ml.		24,405
5. Energy			**0%**	
Amount (gasoline)	0	ltr		
Costs of energy				0
6. Other materials and substances			**22%**	
Costs other materials and substances				5,471,429
7. Labour costs			**56%**	
Hours				2,000
Costs of labour				13,857,143
8. Total variable costs				**24,645,071**
9. Gross margin				**-8,830,786**
	Total variable costs per kg/ha			6,477

3.4 Cereals

Rice, wet season, average per hectare

n= 2

Average field size: 0.19 ha

	Amount	Unit		Budget in ha (in IDR)	Median	Lowest	Highest
Yield	5,292	kg/ha			5,292	4,583	6,000
1. Total income				**21,483,333**	**21,483,333**	**20,166,667**	**22,800,000**
2. Seed material			**2%**				
Amount of seed	51	kg			51	42	60
Costs of seed				589,167	589,167	458,333	720,000
3. Fertilization			**43%**				
N-fertilizer	60	kg N			60	52	67
P2O5-fertilizer	11	kg P2O5			11	0	23
K2O-fertilizer	11	kg K2O			11	0	23
Costs of fertilizer				13,674,028	13,674,028	230,000	27,118,056
4. Crop protection			**3%**				
Fungicide	379	gr./ml.		358,575	358,575	0	717,150
Herbicide	0	gr./ml.		0	0	0	0
Insecticide	6,426	gr./ml.		515,711	515,711	52,222	979,200
Other	306	gr./ml.		38,611	38,611	0	77,222
5. Energy			**0%**				
Amount (gasoline)	0	ltr			0	0	0
Costs of energy				0	0	0	0
6. Other materials and substances			**0%**				
Costs other materials and substances				0	0	0	0
7. Labour costs			**52%**				
Hours				1,700	1,700	0	3,400
Costs of labour				16,369,444	16,369,444	6,738,889	26,000,000
8. Total variable costs				**31,547,236**			
9. Gross margin				**-10,063,903**			
	Total variable costs per kg/ha			5,962			

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