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Product Market Combination for small farmers in Indonesia: Javanese premium shallots for modern retail markets

Marijn van der Laan, Marcel Stallen, Novianto

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.

Wageningen University and Research centre (Wageningen UR, The Netherlands):

Applied Plant Research (APR), AGV Research Unit Lelystad
Centre for Development Innovation (CDI), Wageningen
Plant Research International (PRI), Wageningen
Agricultural Economics Institute (LEI), Den Haag

Contact person:
Huib Hengsdijk, huib.hengsdijk@wur.nl

Indonesian Vegetable Research Institute (IVEGRI, Indonesia)

Contact person:
Witono Adigoya, balitsa@balitsa.org

Fresh Dynamics (Indonesia)

Contact person:
Marcel Stallen, info@freshdynamics.biz

www.vegIMPACT.com

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Marijn van der Laan, Marcel Stallen, Novianto (PT Fresh Dynamics Indonesia)

Contents

Abbreviations and acronyms

APR (PPO)	Applied Plant Research of Wageningen University and Research Centre
BPS	Badan Pusat Statistik, the Indonesian Central Agency on Statistics
IDR	Indonesian Rupiah (currency; 1 Euro = 15,000 IDR, July 2014)
IPM	Integrated Pest (and disease) Management
IVEGRI	Indonesian Vegetable and Research Institute
ME	Monitoring and Evaluation
MRL	Maximum Residue Level
OH	Occupational Health
PMC	Product Market Combination
WHO	World Health Organization
WP	Work Package

1 Introduction PMC Shallot

1.1 VegIMPACT Product Market Combinations

Within the vegIMPACT program, a Product Market Combination (PMC) is a pilot project implemented with partners in the supply chain, including small farmers (< 2 ha), who produce vegetables in a coordinated way and according to specific market demands. A PMC contains innovative aspects, for example the use of improved varieties, a new marketing concept, packaging materials, branding of the vegetables or the supply chain configuration itself. In a PMC supply chain partners make mutual arrangements with regard to improving existing market linkages or to create new market opportunities. PMC's are considered as a "proof of concept" to show that innovations and cooperation in market-oriented supply chains potentially can benefit all supply chain partners and in particular small farmers.

National and international vegIMPACT PMC staff facilitate this process from carrying out initial market surveys, developing business propositions in collaboration with supply chain partners, facilitating the implementation of the supply chain until the marketing of the product.

Farmers and supply chain partners in a PMC are supported by vegIMPACT project staff to improve critical issues in their supply chain such as agronomy aspects, post-harvest issues, organizational weaknesses and marketing. To this end a (training) needs assessment and supply chain analysis are conducted by vegIMPACT staff and interventions for improvement proposed.

Product Market Combinations contribute to the following vegIMPACT objectives: increased vegetable productivity; reduced pesticide use per unit product; reduced production costs per unit product; increased financial margins for farmers and reduced occupational health problems and risks. In this report the approach, facilitation process and results of the "PMC shallot" are described and the impact on the relevant vegIMPACT objectives assessed.

The remainder of Chapter 1 provides an overview of the Indonesian market segments for shallots and the main players, as well as the business opportunity that this PMC shallot wants to capture. In Chapter 2 the characteristics of the PMC shallot, the supply chain actors and other stakeholders are presented and the arrangements between partners and the market proposition (the PMC interventions) are described. Agronomical practices and the shallot cropping system are summarized as far as relevant for the performance of the supply chain. In Chapter 3, after a summary of the current agronomy and supply chain practices, the results of the PMC shallot interventions are presented and discussed. In Chapter 4 conclusions are formulated and the contribution of the PMC shallot to the vegIMPACT objectives is presented.

The development and implementation of "PMC shallot" was the first PMC conducted as part of the vegIMPACT program. Therefore, Chapter 4 also contains a number of lessons learnt that were important for implementation of other PMCs and the development of the vegIMPACT team. In 2014 and 2015, soon after the start of PMC shallot, nine other PMCs dealing with a variety of vegetables, were initiated in five Indonesian Provinces.

1.2 Shallot - the market demand

Shallots are widely used in Indonesian cuisine and therefore an important crop for farmers in Indonesia. The main production areas are located on Java which account for 75% of the national production. In Indonesia shallot is a highly seasonal product, resulting in periods of over and under supply and highly fluctuating prices.

Year	Production Area (Ha)	Total production (Ton)	Productivity (Ton/ha)
2007	93,694	802,810	8.57
2008	91,339	853,615	9.35
2009	104,009	965,164	9.28
2010	109,634	1,048,934	9.57
2011	93,667	893,124	9.54
2012	99,519	964,221	9.69
2013	98,937	1,010,773	10.22
Average	98,686	934,092	9.46

Table 1. Shallot area and production in Indonesia 2007-2013, source BPS 2014.

According to the Ministry of Agriculture the monthly national demand for shallots is 90,000 to 100,000 tons. The Indonesian Government tries to regulate and stabilize shallot market prices by stimulating export in periods with over supply and allowing limiting imports of shallots in periods of under supply. Prices (at farm gate level) for shallots were between 10,000 and 35,000 IDR/kg during the PMC pilot period in 2013.

In the shallot sector in Indonesia the following market and supply chain actors can be recognized: individual farmers and organized farmer groups, collectors / agents, traders, retailers, processors and consumers.

Downstream, shallots are sold loose at traditional markets or to processors, and in small nets of 250-500 gram in modern retail outlets in the larger cities of Indonesia.

The market for shallots in Indonesia is dominated by a few large traders, organized in an informal association that operates as a 'cartel'. They set the prices and have contracts with all major retail partners in Indonesia. Unfortunately the vegIMPACT team was not able to connect with representatives of this traders' association.

The majority of the independent and small vegetables' traders that were contacted and interviewed by the vegIMPACT PMC team, before the start of the PMC, explained that they were not interested in shallot business. Reasons are among others the volatile and fluctuating shallots prices, the high financial risks involved in shallot trading and the cartel of big traders dominating shallot trade in Indonesia.

1.3 PMC Shallot - the business proposition

During the exploratory phase of this PMC a well-known national premium fruit trading business, SSN (PT. Sewu Segar Nusantara) was identified, that was on the verge of branching out into the vegetable business. SSN was interested to participate in the PMC shallot pilot and in close cooperation with SSN the following market proposition was formulated:

"Premium quality shallots in attractive consumer packaging, produced & packed by Javanese farmers for modern retail markets in Jakarta".

For the purpose of this PMC, farmers and trader agreed on a price system that would follow weekly market prices, but would also include a premium/incentive of maximum 5% on top of the average market price for shallots that were compliant with grade A specifications (Fig. 1). Farmers would receive an additional financial remuneration for grading and packaging of grade A shallots. The remainder of the shallots (grade B) would be sold centrally at local markets. More information on the PMC price system can be found in section 2.2.2 of this report.

The target volume during the pilot was 100 kg of premium A grade packed shallots per week during a pilot period of 6 months.

Quality specifications premium grade A shallots

Size	: > 25 mm
Colour	: bright purple red without brown spots
Form	: Single bulbs only (without side bulbs)
Dryness	: *Askip* bulbs (after harvest dried for 10-14 days)
Surface	: Clean, flawless, no damage.
MRL	: Below Indonesian residue standards for shallots
Reject indicators	: Germinated, size, colour, damage, rotten

Figure 1. Contract quality specifications of shallots as set by the trader SSN.

As the participating farmers already cultivated shallots, the main benefits of the PMC would be the increased and stabilized income because of the price incentives for better quality shallots and the contract (facilitation) with SSN. Table 2 shows the expected benefits of both the participating farmers and the trader in the shallot PMC.

Participants	Expected benefits
Farmers	• Added value through on-farm grading and packing • Guaranteed stable weekly income • Introduction of improved production techniques
Trader	• Guaranteed weekly supply of premium shallot • Safe, free of pesticide residues and high quality shallots • Support in creating label and promotion material

Table 2. Expected benefits of PMC business proposition for participating farmers and trader.

The PMC pilot project preparations started May 2013 and the pilot was wrapped up 12 December 2013.

2 PMC Shallot: partners, approach and interventions

2.1 PMC partners

Figure 2 shows an overview of the various participants in the business propositions' supply chain of the PMC shallot.

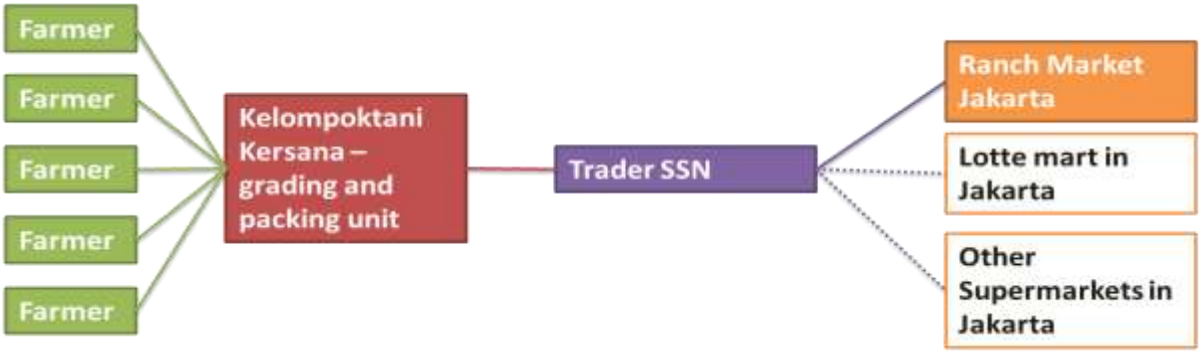

Figure 2. Supply chain and actors in the PMC shallot.

The selected farmer group consisted of 20 farmers, loosely organized in a *Kelompoktani*[1]. Farmers only met each other occasionally and there was no history of cooperation, joint activities and sharing of information. The official name of the farmer group was "*Kelompoktani* Bawang Merah Kersana" and farmers were spread over three villages. Farmers were between 20 and 62 year old and the group leader of the *Kelompoktani* was a producer as well as a trader of shallots and a seed supplier.

Participating farmers were selected on the basis of previous training activities of Wageningen UR and IVEGRI that were conducted in the Brebes region for the last couple of years. Some farmers of the selected PMC group had participated in these training activities and a follow up on those agronomy training activities was provided in the form of improved market connections.

Together the participating farmers in the PMC cultivated 3.2 ha. The majority of the farmers did not own the land, but rented land for a period of one year, which is a common practice in the Brebes area. On average each farmer cultivated about one "*bagian*", which is about 1,600 m^2, with different vegetables and rice depending on the season. Farmers participated in the PMC pilot project with only a small part of their land.

2.1.1 Trader

PT Sewu Segar Nusantara (SSN) was established in 1995 as a new company of investment group PT Gunung Sewu Kencana (GSK). GSK has extensive expertise in the fresh food and agribusiness sector, in addition to being active in the life insurance and property sector. SSN was established as a complementary business to the fruit production units of GSK, it was responsible for the sales and distribution of all GSK fresh fruit products. Since 1995, SSN has developed a trade network covering most provinces and districts of the Indonesian archipelago, and it has built strong relationships with all major retailers in Indonesia.

Currently PT SSN focuses on the sourcing, distribution and marketing of locally produced Indonesian fruits as well as imported fruits (about 30 tropical fruit types). It is one of the largest national fruit

[1] Many *Kelompoktani* were established in the 1980's, because farmers had to be organized in groups to qualify for Government support from the local *Dinas Perantanian Daerah* (public extension service). Most *Kelompoktani* only exist on paper nowadays and they are not very active.

traders in Indonesia. Working with local farmers, SSN has developed and introduced stringent quality control measures which are acknowledged by more than 1,000 retailers in Indonesia.

PT SSN operates three well-known brands for distinct Indonesian market segments: “Sunpride”, “Sunfresh” and “Sweety”. These brands are renowned for their consistent quality, taste and freshness and the brands are supported by a range of innovative marketing techniques. SSN is a pioneer in promoting fruit as part of a healthy diet.

At the start of the PMC shallots, SSN had the ambition to enter the vegetables trade. Through their extensive and operational retail network and logistical services all over Java, SSN expected to successfully enter the vegetable market and kick start the business through the PMC shallot pilot.

2.1.2 Retailer(s)

Within the Indonesian retail landscape Ranch Market is one of the leading retailers catering for high end consumers. They operate multiple shops in Indonesia. Ranch Market started its business in January 1998 with the opening of the first ‘Ranch Market USA franchise format’ supermarket in Jakarta. The Indonesian company developed and improved the Ranch Market concept by adjusting it to the Indonesian market and Javanese lifestyle. In 2010, the company decided to terminate the license agreement with Ranch Market USA. However, they were still allowed to use the Ranch Market brand in Indonesia on an exclusive basis.

Within the vegIMPACT PMC framework, Ranch Market agreed to be the launching retailer for high quality Brebes shallots supplied by SSN. It was agreed between SSN, vegIMPACT and Ranch Market that the latter party would support the introduction of Brebes premium shallots in four of their flagship stores in Jakarta.

2.2 PMC activities and interventions

2.2.1 Agronomic interventions

Cultivation training and coaching activities

In order to produce a larger share of premium grade A shallots, farmers were trained by vegIMPACT in cooperation with IVEGRI. Training modules included a modified planting distance to increase the share of harvested grade A shallots. In Table 3 an overview of the training topics is presented.

TRAINING MODULE	TRAINING TOPICS
1. **Cultivation techniques for larger share of big shallots**	• planting season, • land preparation, • seed selection, • irrigation system, • planting space, • proper fertilization, • sanitation, • harvesting.
2. **Good Agricultural Practices lowering the cost price**	• pesticide selection, • proper fertilizing.
3. **Training to improve pest & disease management, reduce pesticide use and fertilizer use**	• symptom identification, • mechanical control, • pesticide selection, • pesticide preparation, • spraying methods.

Table 3. Topics in the cultivation training provided by IVEGRI in the PMC shallot.

In addition to cultivation training, the farmers were coached by a vegIMPACT facilitator from the first shallot delivery onwards. These coaching activities were focused on monitoring the entire process from planting, to harvest, till delivery to the trader.

Continuous supply

To guarantee a continuous supply volume of 100 kg of Premium grade A shallots per week during a pilot (retail) selling period of six months, as stipulated in the contract, a process schedule was designed and agreed upon in cooperation with IVEGRI, SSN and the farmers. The first schedule covered two planting rounds. After this pilot period the activities would be jointly evaluated.

In the first planting round eighteen farmers participated and every week two farmers started planting shallots at roughly 200 m^2 each during the pilot (Table 4). This schedule would result in a total expected production of 400 kg shallots per week of which 25% was expected to be conform the premium grade A quality specifications of SSN.

Farmer 1 (name)	Farmer 2 (name)	Planting date	Harvest date	End of Drying (date)	Packing date
Farmer 1	**Farmer 2**	01/07/2013	30/08/2013	09/09/2013	11/09/2013
Farmer 3	**Farmer 4**	08/07/2013	06/09/2013	16/09/2013	18/09/2013
Farmer 5	**Farmer 6**	15/07/2013	13/09/2013	23/09/2013	25/09/2013
Farmer 7	**Farmer 8**	22/07/2013	20/09/2013	30/09/2013	02/10/2013
Farmer 9	**Farmer 10**	29/07/2013	27/09/2013	07/10/2013	09/10/2013
Farmer 11	**Farmer 12**	05/08/2013	04/10/2013	14/10/2013	16/10/2013
Farmer 13	**Farmer 14**	12/08/2013	11/10/2013	21/10/2013	23/10/2013
Farmer 15	**Farmer 16**	19/08/2013	18/10/2013	28/10/2013	30/10/2013
Farmer 17	**Farmer 18**	26/08/2013	25/10/2013	04/11/2013	06/11/2013

Table 4. First planting round in the process schedule PMC shallot pilot.

The long-term objective of the PMC shallot was to develop shallot planting schedules for a continuous and regular supply for at least 8 months per year[2]. However, participants were not ready yet to commit to this time frame. Only 18 farmers of the groups of 20 farmers were willing to join the first planting schedules.

Post-harvest activities

Normally farmers sell their shallots directly from the field to collectors (practices are described in more detail in section 3.1.1). To supply SSN during the PMC pilot period, it was agreed that farmers would harvest and dry the shallots, and deliver it to a central packing house location, managed by the farm group, for subsequent grading, packing and selling of the shallots.

To facilitate central handling of the shallots, the farmer group received support from vegIMPACT to establish a low cost, though hygienic, grading and packing place. The packing house was furnished with simple scales, fans and tables. Together the farmers decided to locate the packing- and grading facility at the premises of one of the participating farmers in Tanjung.

[2] *During the rainy season, for about 4 months, it is difficult and risky to grow shallots in Brebes and most farmers produce rice instead.*

The central handling and packing facility would be managed and operated by the farm leader and the owner of the location of the packing house. Shallot grading and packaging would be conducted by relatives of the packing house manager. Only farmers and relatives that were involved in the post-harvest activities, received a tailor-made training on post-harvest handling, grading and packaging, delivered by vegIMPACT PMC staff, based on the specifications of SSN[3].

Because all post-harvest activities would be conducted centrally, it was deemed sufficient to provide the remaining farmers that only participated in the planting schedule, with a simple harvesting and drying training.

Monitoring of agronomic practices

Pre and post agronomy practices of the PMC farmers were compared by the vegIMPACT Monitoring and Evaluation team (ME). General practices of shallot production were registered by ME before (baseline) and after interventions (evaluation) took place. The plots of the PMC planting schedule were just a small part of the overall land cultivated with shallot and farmers were not questioned about the specific practices in the plots of the PMC planting schedule, therefore results should be interpreted with caution. IVEGRI collected additional crop management information on a weekly basis during the first planting round of the PMC Shallot.

2.2.2 Marketing and sales interventions

Logistical process

Together with the trader and farmers a quality controlled logistical process was developed. After harvest, farmers would dry on farm the shallot bulbs for 10 days, after which the product (all grades included) would be delivered to the central packing house. At delivery the volume of supplied shallots would be weighed and registered on a supply card (Annex I). Packing house staff would grade the product in two quality classes: A and B. After the grading process the packing house would send the premium quality product (A) properly packed and labeled in 250 g consumer packs to SSN. It was agreed that the other grade (B) would be sold by the packing house management at the local traditional market. After completion of this entire process, the management would pay out the farmers, according to the volumes of the various grades and the prevailing price levels.

Pricing system and contract premium product

The PMC team facilitated the development of a formal contract between farmers and trader. The weekly contract price was based on an automated pricing system (Table 5). Starting point in this system was that farmers would only join the pilot, if income would be at least at the same level as when shallots would be sold ungraded at the local market. Since a part of the produced bulbs would not comply with grade A specifications, farmers would need to sell these (grade B) at the local market at prices, which were lower than the prevailing market price for ungraded shallots. Therefore, the lower crop income from grade B shallots was compensated by higher prices for grade A in the pricing system. In that way the total base income for farmers would be the same as when they would sell the bulbs at the local market. On top of that farmers received an incentive to produce a maximum amount of grade A bulbs: a 5% price incentive on top of the prevailing market price (of ungraded bulbs) for grade A shallots supplied to the packing house.

The pricing system was based on a formula that took into account:

- Volume of grade A and B

[3] *SSN owns a large professional packing house at the outskirts of Jakarta. However as labor costs in Brebes are significantly lower than in Jakarta, it was interesting for SSN to facilitate local grading and packing in Brebes.*

- Market price of ungraded dried (*askip*) shallot at local market[4]
- Market price of grade B dried (*askip*) shallot at the local market

The Pricing model in Table 5 illustrates farmers' incomes and shallot prices (for grade A and B) as well as the selling price to SSN (for grade A packed products) at various percentages of produced volumes of grade A and B shallots.

Volume of shallots in kg per week	400
Market price ungraded bulbs (IDR/kg)	20,000
Market price out-graded bulbs (Class B) in IDR/kg	16,000
Percentage incentive	5%

Crop income (IDR) ungraded shallots without PMC	% Grade A	% Grade B	Grade A (kg)	Grade B (kg)	Grade B income (IDR)	Grade A income (IDR) compensation to income level without PMC	Grade A price (IDR/kg) based on income compensation level without PMC	Incentive per kg grade A (IDR/kg)	Total incentive (IDR) for grade A	Unit price grade A for supplying farmer (IDR/kg)	Total crop income (IDR) supplying farmer with PMC	Handling fee packing house (IDR/kg)	Commission Packing house (IDR/kg)	Selling price grade A to SNN (IDR/kg)
1			2	3	4	5 (1 - 4)	6 (5 / 2)	7	8 (2 * 7)	9 (6 + 7)	10 (4 + 5 + 8)	11	12	13 (9 + 11 + 12)
8,000,000	25	75	100	300	4,800,000	3,200,000	32,000	1,000	100,000	33,000	8,100,000	2,000	1,000	36,000
8,000,000	50	50	200	200	3,200,000	4,800,000	24,000	1,000	200,000	25,000	8,200,000	2,000	1,000	28,000
8,000,000	75	25	300	100	1,600,000	6,400,000	21,333	1,000	300,000	22,333	8,300,000	2,000	1,000	25,333
8,000,000	90	10	360	40	640,000	7,360,000	20,444	1,000	360,000	21,444	8,360,000	2,000	1,000	24,444

Table 5. Price simulation model for determining shallot prices in the shallot PMC.

Hence, farm gate prices paid by SSN are always related to the prevailing market prices for out-graded bulbs (grade B) and ungraded bulbs, and the higher the percentage of grade A bulbs, the higher income farmers would receive because of the incentive scheme.

An extra, fixed handling fee of IDR 3,000 /kg was paid by SSN to the farmer group, consisting of IDR 2,000/kg for grading, packing and logistics and IDR 1,000 /kg commission for the packing house manager[5].

Marketing & promotion

The trader would be supported by the vegIMPACT PMC team with development and implementation of consumer research to investigate consumer preference regarding bulb size, price and packaging of the premium shallots. The result of this research in combination with the results of the quick market scan, performed during the preparatory phase of PMC shallot, resulted in a decision regarding packaging specifications.

The trader would also be supported in the development of a label and other promotion material (banners, poster and leaflet) for the successful introduction of premium shallots at the Jakarta retail market. Due to the extensive experience of the trader in the successful market positioning of fruits, no other additional marketing training was deemed necessary.

[4] *Local market prices of ungraded dried askip shallots were collected at the Tanjung wholesale market. It was expected grade B askip shallots would fetch a much lower price than ungraded askip shallots. Normally shallots are only sold ungraded.*

[5] *1 EUR = IDR 15,000.= (November 2013)*

3 PMC results and evaluation

3.1 Agronomy

3.1.1 Pre-PMC situation, production location and practices

In the District of Brebes (Central Java) shallot production is an important economic activity for the farmers and Brebes is the largest shallot-producing area on the island Java (Fig. 3).

Figure 3. Location of Kabupaten Brebes where the PMC shallot was piloted.

Brebes is a typical lowland area with a tropical climate and it has a distinct wet and dry season as shown in Figure 4.

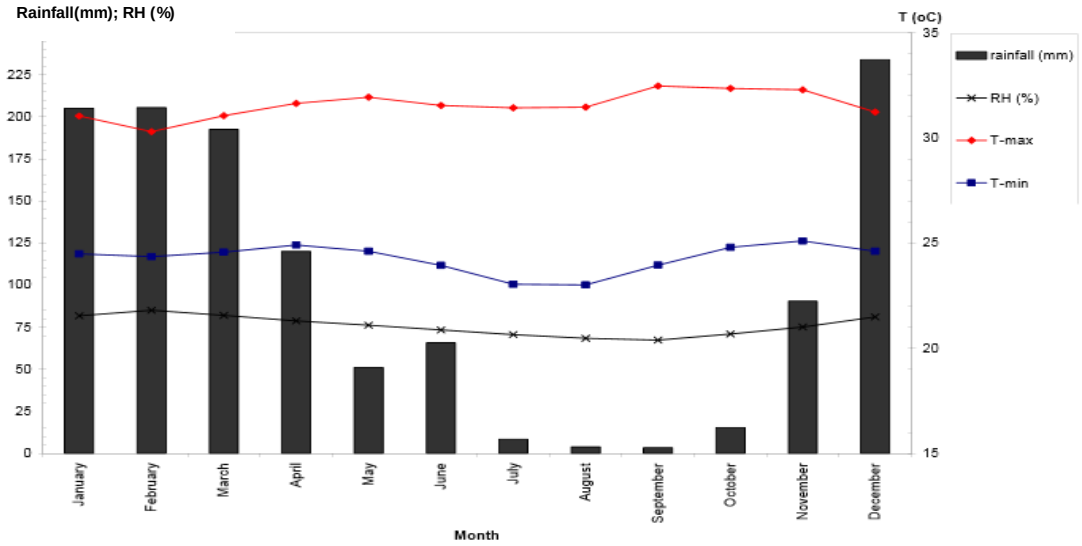

Figure 4. Average rainfall distribution and minimum-maximum temperature in Tegal[6] (period 2003 - 2009).

[6] Tegal is located 25 km East of Brebes

The pilot location was near the village of Kersana, centrally located in the district of Brebes, it consisted of a predominant soil type of very heavy clay (fluviol soil with about 70% clay) with a low organic matter content.

In Kersana (and Brebes) the dominant production system consists of vegetables grown on beds of approximately 15 m (length) x 1.5 m (width), surrounded by 0.8 m wide ditches, filled with water, of 0.6 m depth. The net area that can actually be used for shallot production is therefore about 70 - 75% of the total area and 25 – 30% is ditches filled with water.

The traditional cropping pattern in this area is shallots during the dry season alternated with hot pepper and rice in the wet season. Because of the short growing period of shallot (approximately 60-70 days) most farmers are able to produce more than one shallot crop during the dry season.

Farmers in Brebes do not use fixed shallot planting schedules and most of them tend to plant their entire land with shallot at once. The majority of the farmers in Brebes produces and keeps their own planting material by selection and drying part of their harvest, and uses this for the next planting cycle. Specialized seed suppliers are becoming more important, but most of the farmers cannot afford to buy 'new' seed for each production cycle.

Most of the farmers in Brebes hire external, casual labor for cultivating their land. Women are hired for regular weeding and crop maintenance. Men are mostly responsible for land preparation, planting and spraying.

Farmers sell their shallots to collectors who buy the shallots "off the field", at a fixed price per kg, before the actual harvest. Farmer often receive 50% of the agreed sales price 40-50 days after planting and the remainder is paid out by the collector to the farmer after harvest (about 60-70 days after planting).

Collectors arrange the harvest including the necessary labor, at their convenience. Collectors either sell the freshly harvested product directly to other collectors at the local Tanjung market, or they dry the shallot first (in the open, at the road side, covered by plastic to protect the shallots from rain, or at their premises), before selling the product to traders or commissioners at local wholesale markets per kilogram or per *quintal* (= 100 kg). The Tanjung wholesale market is one of the major markets for onions and hot pepper and prices paid at the Tanjung market are a benchmark for most of the traders and farmers in the region.

3.1.2 Agronomic training and results

Most farmers who participated in the PMC shallot planting schedule attended the three module cultivation training, conducted by IVEGRI. This training (summarized in Table 3) covered all agronomy aspects of growing better quality shallots in a responsible way.

Specifically for this PMC and in order to produce a higher share of larger grade A bulbs, planting distance in the field was increased as compared to the standard practices in the Brebes region. A complete overview of the agronomic practices during the PMC pilot period as recorded and analyzed by IVEGRI can be found in Annex II.

. The PMC pilot was conducted in the dry season only and according to the ME data, average input costs for shallot production in the dry season went down with 43%. The cost for fertilizer did not change, but cost for pesticides used during the pilot period (conducted in the dry season) went up with 23%. The cost of plant material was considerably lower (40%) as compared with the baseline data (Fig. 5). According to the ME data, the average shallot productivity of the PMC farmers was lower than farmer yields in the previous season, which may be related to the wider planting distance of bulbs used in the PMC. In addition, experience gained in vegIMPACT shows that the productivity of shallot greatly varies among seasons and years. The reasons for this variation are yet unclear but may be related to variation in weather conditions, which also can have affected yields negatively during the PMC pilot.

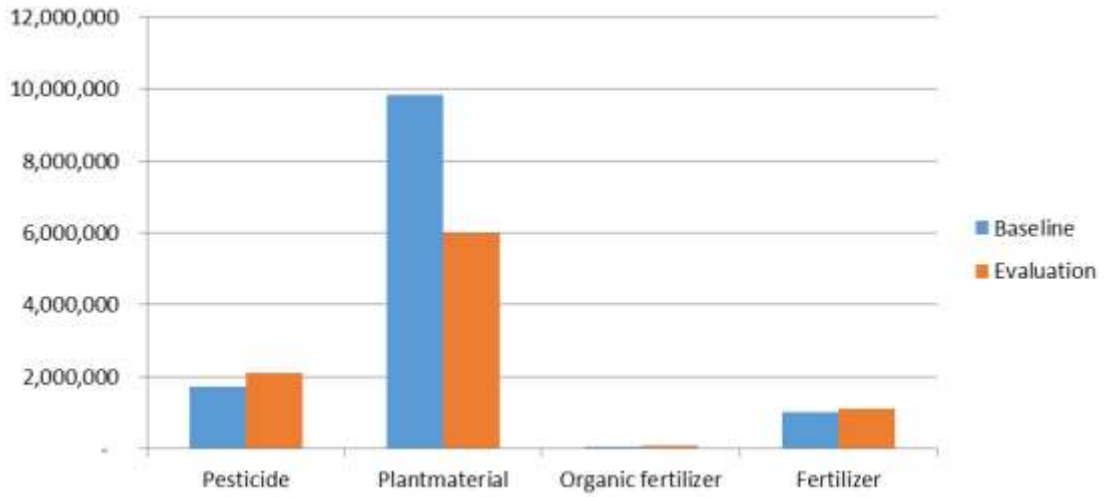

Figure 5. Average input costs (IDR/ha) of shallot production before and after interventions in the PMC shallot for dry season shallot cultivation.

The input data of ME differ from the farm records collected on weekly bases by IVEGRI staff (Annex II) because of different data collection methods. In order to assess the impact as a result of the vegIMPACT agronomy training, we used the only source (vegIMPACT ME) that recorded data by using a uniform method before and after conducting the PMC interventions.

3.1.3 Implementation of planting schedules

Two planting rounds of 9 planting cycles (Table 4) each were planned. In each planting cycle two farmers would participate with about 200 m^2 per farmer[7]. The first planting round was completed and the results, as registered by the packing house management, are presented in Table 6. The contract with SSN consisted of an order of 100 kg per week, however during time the actual SSN orders started to deviate from the contract volume.

Delivery week	Volume supplied to pack house (kg)	Volume grade B (kg)	Volume grade A (kg)	% grade B	% grade A	Order from SSN (kg)	Volume supply to SSN (kg)
1	143	29	114	20%	80%	100	103
2	116	16	100	14%	86%	100	103
3	123	24	99	20%	80%	99	102
4	228	123	105	54%	46%	99	102
5	184	39	145	21%	79%	99	102
6	200	50	150	25%	75%	150	155
7	110	25	85	23%	77%	70	155
8	200	150	50	75%	25%	50	155
Total	**1304**	**456**	**848**	**35%**	**65%**	**767**	**975**

Table 6. Volume of shallot supply to packing house and SSN as recorded by packing house management.

It can be concluded from Table 6 that on average the target of 100 kg of grade A shallot per week was achieved. However, the average total yield per week was only 163 kg, according to the packing house records, instead of the expected 400 kg per week. The percentage of grade A product was therefore much higher (65%) than the expected 25%.

[7] *The actual implemented planting schedule (m^2 and growing days) can be found in Annex III*

During the evaluation of the PMC it became clear that different than agreed upon in the original plan farmers had pre-graded their harvest before actually supplying the product to the packing house. In addition, the IVEGRI farm recording showed only 28% of actual total shallot yield of the farmers was supplied to the packing house. Therefore, the actual yield per week during the first planting round was higher than the target yield of 400 kg per week, i.e. 582 kg[8] of ungraded bulbs. This also implies that the actual percentage of grade A shallots was on average only 18% and not 65% as registered by the packing house (Table 6).

During the second planting round multiple problems occurred at farm side such as shortage of water, pest infestations and resignation of farmers from the group (and thus from participation in the planting schedule). The latter was due to the growing disagreement on the (financial) arrangements between farmers and the packing house (section 3.2.3).

At the same time the trader was not satisfied with the result of the PMC pilot during the first planting round, in particular because of lower than agreed quality of the grade A shallot delivered (section 3.2.3), which resulted in disappointing sales figures downstream.

In the third week of the second planting round it became obvious that the problems at farm side would lead to many gaps in the continuous supply calendar and a sub-optimum grade A product. This, in combination with the disappointing sales figures, led to the joint SSN /vegIMPACT decision to terminate the 2nd shallot planting schedule prematurely.

3.1.4 Post-harvest actvities and proces

Together with the farmer group a central drying, grading and packing facility was established in Kersana (Fig. 6). Based on the required process flow, the selected premises was renovated and equipped for grading and packing activities. Staff was trained and posters on quality classes of shallots, grading and best handling practices were provided to continuously remind packing house staff on the required shallot specification.

Figure 6. Illustrations of packing house.

A supply card system was designed to record the delivery volume of each individual farmer and the volumes per grade after grading. Also the price per grade could be noted down on the card (Annex I). As volumes at the various stages would determine the final income for farmers, this record system

[8] *Average weekly supply of shallots to packing house was 163 kg, so the average yield per week was 582 kg/400 m² (≈ 14.5 t/ha) resulting in a yield above the national average registered by the Indonesian ministry of 9.8 ton/ha.*

would allow for transparency of the process. It was agreed the farm leader would coordinate the post-harvest activities conform the mutually agreed arrangements.

However as explained in sub-section 3.1.3 and despite the instructions provided before the start of the PMC, shallots supplied by farmers to the central packing house in Kersana had already been pre-graded by farmers themselves at their own premises. Hence, farmers claimed that all shallots supplied to the packing house were of grade A quality, but after inspection in the packing house it appeared that not all products met the agreed grade A specifications of SSN.

As a result, the Kersana packing house graded the shallot once more in Grade A, Grade B and "reject". Of the already pre-graded shallots (by farmers themselves) on average only 65% was accepted by the packing house as Grade A (depending on delivery date the percentage of grade A volume varied between 80% and 25%, see Table 6).

It appeared that the farmers had a different quality perception of grade A as compared to the SSN market quality requirements. Obviously, degrading of the shallots resulted in growing disputes between farmers and packing house staff and disappointment with the farmers throughout the first planting round. Moreover by pre-grading the shallots, farmers distorted the price system (section 3.2.2).

3.2 Marketing and sales

3.2.1 Logistical process from farm to retail

Evaluation of the PMC revealed that the packing house management never implemented the supply card system and farmers were therefore uncertain about volumes registered, and prices and payments they would receive. The process of drying (10 days) and grading of shallots by individual farmers also took a lot more time as compared to the normal shallot harvest and sales process. In the end farmers expected an unrealistic high PMC premium price for their shallots.

Another deviation from the original planning was that the product graded as grade B by the packing house, was never sold centrally. Instead, the supplying farmers recollecting these grade B shallots and sold them on the traditional market themselves.

The grade A shallots were packed in plastic trays, labeled and transported in carton boxes to a delivery point nearby, where SSN trucks, on their way from Surabaya to Jakarta, would pick up the product. From the central distribution center of SSN the packed shallots were sold and distributed to various supermarkets in Jakarta.

3.2.2 Market introduction and retail process

The initial launching of the premium shallots from Brebes at Ranch Market was a success. But during an evaluation in the second half of the first planting round, it became clear that SSN quality control staff were increasingly unhappy with the quality and specifications of the shallots. Bulbs were very uneven in size, smaller than expected and the weight of the consumer packs was always just a bit under the agreed weight of 250 g. As a result the orders from high-end supermarket Ranch Market stopped, as the shallots were not considered as a premium product suitable for their flagship stores in Jakarta.

The SSN PMC coordinator had communicated frequently with the farmers' packing house and shared the concerns of SSN and Ranch Market, but SSN was under the impression that because of the agreement with vegIMPACT, they were obliged to accept all supplied and packed shallots, regardless the quality.

At that point PMC staff stressed that SSN should treat the products from the pilot farmers in the same way they would treat any product from any other supplier they worked with. Shallots that did not meet the specifications set in the contract, should therefore be rejected. However in the

meantime shallot stock at the SSN distribution center had increased considerably and in response the SSN sales department tried to sell the product wherever they could, premium or not premium.

3.2.3 Contract, pricing system and financial results

The contract between SSN and the farmer group was signed by the farmer group leader and as the group did not have a joint bank account all financial arrangements had to be channeled through the personal account of the farmer group leader.

This resulted into problems, as the handling fee (IDR 3,000 /kg) was not completely reimbursed by the farm leader to the packing house manager who actually did all the work. During the PMC shallot wrap up meeting it also became clear that the participating farmers never really understood the mechanism and functioning of the PMC pricing and payment system. Shortly after the start of the PMC pilot there was already a growing distrust towards the leader of the farmer group[9], who did not seem very committed. For example, the farmer group leader did not join most of the meetings with the PMC facilitator; neither did he attend the trainings. Also the transfer of money from farm leader to supplying farmers was very sketchy and irregular and farmers were kept in the dark about the contract arrangements with SSN.

Communication amongst the farmers was not very transparent and there was a lot of informal communication between various farmer sub groups during the PMC pilot, and issues were not centrally addressed and solved. During the wrap-up meeting with farmers more issues emerged. For example, even though the pricing system was discussed with all farmers at various occasions, they felt it was unfair to pay packing house staff for grading which was already conducted - in their opinion - by the farmers themselves.

Farmers were of the opinion that they had made extra costs for the following activities for which they also expected compensation:

- Drying at the own farm
- Labour cost for pre-grading at the farmers' premises (not accounted for as in the original plan packing house staff was supposed to do all grading)
- Logistical cost for selling grade B on local market (not accounted for as in the original plan packing house staff was supposed to sell grade B)

Financial result business proposition for farmers

As the pilot PMC diverted from the original planning, and not all financial transactions were handled through the central grading and packing house, the financial benefits of participation in this PMC shallot, for each of the farmers cannot be determined.

As described in section 3.1.3 the pricing system was distorted as the 5% price incentive for grade A was not calculated based on the true percentage A grade bulbs. As a result SSN paid a much higher financial incentive to the farmers than was planned and expected. In the evaluation it also became clear that the original pricing model (Table 5) was not always (correctly) used by SSN. As the farmers did not only receive an incentive for grade A shallots, but were also compensated for the lower grade B shallot prices, the average price SSN paid for premium grade A shallots to the farmer group was on average 27% above the average market price for ungraded shallots at the traditional market during the pilot period. The final price for the packed shallot was much higher than SSN expected to pay at the start of the PMC and was from a SSN perspective unsustainable in the long term.

In case farmers sell their shallots directly to collectors they normally get 50% of the payment 40-50 days after planting and the remaining 50% of the payment would be made within 5-10 days after harvest (Section 3.1.1.). SSN on the other hand arranged payment, only after arrival of the product at

[9] *The PMC team tried to facilitate a switch in management of the farmer group, but as the farm leader was the most senior farmer in the group, the others found it very difficult to be upfront with him.*

their distribution center in Jakarta, about 80 days after planting, which is inconvenient for small and cash constrained Brebes farmers.

When taking into account the extra labor input of farmers for drying and grading and the unfavorable payment terms of modern markets, the selling of shallots to SSN was less attractive for the individual supplying farmers than expected. Only the farmers of the farmer group that managed the central packing house benefitted considerably.

Financial results trader

The trading company, SSN, normally uses a so-called 'price ladder' (Fig. 7) to calculate farm gate prices for fresh products. Starting point of such a ladder is the average expected retail market prices downstream, from which they deduct a handling fee (including margin). As a result, due to fluctuating (retail) market prices, farm gate prices also vary through time.

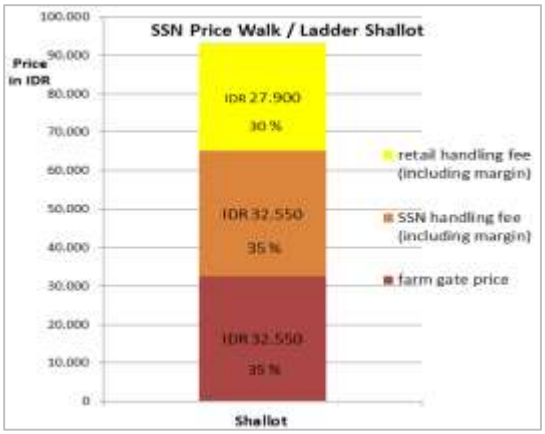

Figure 7. Example of price ladder used by SSN to determine shallot prices and margins.

The agreed pricing system in this PMC pilot was designed by the PMC team and new to SSN. During the PMC evaluation it appeared that the pricing system was considered too complicated by the trader. Based on its experience with fruit farmers SSN was of the opinion that a good relation with small farmers would already be established, by adhering to agreements, offering reasonable prices and paying on time. Extra financial incentives on top of already weekly changing prices, through a complicated pricing system as introduced and tested by vegIMPACT would not work with small farmers in Indonesia according to SSN. A transparent and simple price setting system would be much easier to understand and handle by all partners and would not be prone to misunderstanding.

In the case of PMC shallot SSN would have rather preferred a price per box (of 20 consumer packs premium shallots), instead of a per kg price. SSN did not disclose the financial result of this project, but they did share that regardless of the price, the pilot volume as well as the consumer demand was too small to turn the PMC shallot into an attractive proposition for SSN.

3.2.4 Marketing & promotion

After a market quick scan and consumer research in supermarkets in Jakarta, SSN decided on using black plastic trays with a transparent hard plastic cover. Each tray contained 250 gram of grade A shallots and was labeled with an informative label with product information and a recipe.

Over time it became obvious that the packaging was not entirely suitable for the shallot product, even though the packs contained small holes for aeration, the product started to mold quickly and/or produced green shoots. After these symptoms emerged SSN asked the farmers to dry the shallots some days longer, as they assumed drier bulbs would solve the problems. SSN was not able and willing to order and start using other packaging materials, as recommended by the PMC team, because SSN had already ordered a stock of packaging material for weeks ahead.

The launching of the Brebes shallots in two Ranch Market stores in Jakarta was supported with in store promotional activities in the form of banners, colourful displays, leaflets and SSN promotion ladies (Fig. 8).

Figure 8. Impression of shallot introduction and promotional activities at retail level.

Within six weeks after introduction, the Ranch Market management decided to stop selling the shallots. Reasons were among others that consumer demand turned out to be low and with the small supply volumes that were agreed upon, Ranch Market found it difficult to make a firm statement in their shops during the introduction period[10]. It appeared to be difficult to have impact on consumers with a small display of shallots and buyers demand was less than expected maybe enhanced by the poor quality/price ratio.

SSN reacted adequately on this situation and started to identify other retailers who would be interested to include the "premium" shallots in their product portfolio. However, many retailers preferred to source onion, shallot and garlic from one and the same trader, which could not be provided by SSN. Still SSN managed to get the product on the shelves of Carrefour and Lotte supermarkets, sometimes at discount prices in order to get rid of the shallot backlog (Fig. 9). But also consumers in these retail stores only showed a lukewarm reaction to the shallots, which could possibly be attributed to the sub optimum quality of the shallots after prolonged storage with SSN.

A vegIMPACT survey in the supermarkets learnt that the quality of packed PMC shallots was indeed below contract specification and because of that hardly different from ordinary medium seized shallots available. Only the upgrading of shallot packaging and the adding of an informative label was not sufficient to induce more sales compared to the sales of ordinary netted product, available in the supermarkets.

Figure 9. Lotte promotion PMC shallots.

[10] It is common practice for supermarkets to introduce new products by creating large displays of the product in order to attract the visual interest of consumers and entice them to do a trial buy. Once consumers accept the product, they will look for it at the normal shelves. Often traders are asked to invest in this initial 'oversupply' on consignment bases (they have to take back the products that are not sold, at their own cost).

4 Conclusions

4.1 Business proposition PMC shallot

The PMC "Javanese premium shallots for modern retail markets" was successful in achieving a continuous supply of an agreed volume of shallots. However, the quality of the shallots was unstable due to poor quality management at the packing house. In addition, on average only 18 % of the total volume of shallots was classified as grade A (> 25 mm diameter), which was lower than expected.

Added value for drying, grading and packing of shallots was established; however it did not benefit the supplying farmers, but only the farmers that were involved in the management of the packing house.

The business proposition did not develop as expected for different reasons. During the wrap up with PMC partners it became clear that the originally proposed business proposition has never been properly tested in the pilot, as there were too many deviations from the original plan like:

- on farm grading of bulbs by farmers
- selling of grade B by individual farmers
- incorrect and limited use of agreed pricing module
- irregular money transfer from farm leader to farmers
- relaxed quality control by SSN in first weeks, allowing sub quality shallots to enter the market
- premature departure of farmers from the group and thus from planting schedule

These diversions resulted in an array of cascading problems at the farm till downstream at modern retail markets in Jakarta. The outcome of the PMC might have been different if farmers would have worked together harmoniously, bulb quality would have been at par right from the start, packaging would have been more conducive for extended shelf life and volume would have been larger.

At the end of the PMC pilot the SSN sourcing manager expressed that he still believed in the market proposition "premium shallot for high end modern retail markets". But for a sustainable success, volumes would need to be larger and shallot quality higher and more constant. Shortly after termination of the shallot planting schedule, SSN management decided to abandon the idea to move into premium vegetable trade all together and to focus on their core business (fruits) again.

During this first PMC pilot, some lessons were learnt by the PMC team, that were implemented in consecutive PMC pilots within the vegIMPACT program:

a. A well organized and coherent farmer group is of crucial importance to manage a business proposition such as PMC shallot. Therefore, it was decided by vegIMPACT PMC management that farmer groups participating in future PMC pilots should receive training on organizational aspects
b. The importance of more intensive coaching of farmers. Small farmers will not automatically implement and abide by agreements and advices provided during training sessions. During future PMC projects more intense coaching by PMC facilitators is foreseen, especially during the first months (2-3 days per week)
c. The need for transparency regarding contract arrangements for all participating partners (including all farmers).
d. Farm recording to monitor events and impact, needs to be strengthened in order to be able to draw conclusions on the contribution of the PMC business proposition to vegIMPACT objectives.

4.2 PMC contribution to vegIMPACT objectives

The contribution of PMC shallot to the vegIMPACT objectives is shown in Table 7.

vegIMPACT objective	PMC contribution	Remarks
increased vegetable productivity	**-**	According to ME records shallot productivity of the PMC farmers was lower than previous seasons, this was possibly related to other planting densities in the PMC plot and weather conditions.
reduced pesticide use per unit product	**?**	Records did show an increase in pesticide cost of 23% for shallot cultivation during dry season. But as the ME records measured overall practices of farmers (with regard to the entire cultivated land including the PMC plots), it is unclear if the cost for pesticide used specifically in the PMC plots also increased.
reduced production costs per unit product	**+**	Average input cost for shallot cultivation in dry season was lower as compared with the ME base line survey data. This was mainly due to the lower cost for plant material.
increased financial margins for farmers	**?**	Due to the incomplete recording in the PMC no conclusion can be drawn about the financial margins for farmers.
reduced occupational health risks	**?**	Occupational health training was not delivered within this PMC as the OH material was not yet ready. At a later date some of the farmers did participate in training that was provided by WP OH in the region.
Explanation:	*+ = PMC positively contributed to specific objective* *- = PMC had negative effect on specific objective* *? = Uncertain effect of PMC on specific objective*	

Table 7. Summary of contribution PMC shallot to vegIMPACT objectives.

Annex I Farmer supply registration card (PMC shallot)

Supply card Shallot

Name farmer

			AFTER GRADING			PRICE		PAYMENT	
Delivery date	**Weight (kg) with green**	**Weight (kg) without green**	**Kg Grade A**	**Kg Grade B**	**Kg reject**	**Price per Kg A**	**Price per Kg B**	**Total paid out**	**Date payment**

Annex II. Summary of agronomic practices of shallot farming

Herman de Putter (Wageningen UR) and Witono (IVEGRI), 2013

Planting

Except for one farmer all farmers' planted the local cultivar Bima Curut. One farmer planted the cultivar Tuk Tuk but this crop didn't return a yield and was considered as a loss. Two to five days before planting the bulbs were bought and cleaned (Rogol), which resulted in an average loss of 14% . Per hectare on average 2321 kg planting bulbs were purchased of which about 2000 kg was planted. A poor correlation between the quantity of planted bulbs and yield existed (R^2 = 0.22).

Bulbs were mostly planted at a distance of 18 x 20 cm resulting in 27.8 plants per m^2. Only one farmer had a denser plant arrangement with 15 x 18 cm resulting in 51.3 plants per m^2.

Crop protection

Pesticides were applied by all farmers, with the first application14 days after planting (Table II). Until harvest a total of 12 applications with insecticides and 11 with fungicides were carried out, on average every 3.3 days during the growing season. About eight days before harvest most farmers stopped spraying, but one farmer continued until three days before harvesting, while another farmer applied 21 days before harvest the last pesticide application.

Pesticides were applied using a knapsack sprayer and used water volumes ranged between 390 and 1060 liter per hectare. Often, more than one pesticide is applied per spray operation. On average the shallots were sprayed with 2.2 different insecticides and 1.1 fungicides per application.

Farmers applied standard a contact fungicide to control fungal diseases and added a curative fungicide when disease risks were high or disease symptoms observed.

To control insects in shallots carbamates (Mode of Action group 1A), organophosphates (Mode of Action group 1B) or pyrethroids (Mode of Action group 3A) were applied.

Table II.1. Crop protection characteristics in the PMC shallot, Kersana, 2013.

	Average	Minimum	Maximum
First application (Days after planting)	14	7	33
Interval between applications (days)	3.3	2.4	4.6
Total number of applications with insecticides	12	8	14
Total number of applications with fungicides	11	7	14
Post-harvest interval (days)	8	3	21
Number of insecticides per application	2.2	1.1	4.0
Number of fungicides per application	1.1	1.0	1.5
Water use per spray (l/ha)	737	389	1063

Besides pesticide applications of the crop three out of the 17 farmers also treated the bulbs before planting with fungicides and insecticides. Two other farmers treated their bulbs with only fungicides. On average, these farmers applied 7.6 kg active ingredient per hectare for this purpose (Table II.2). For insecticide bulb treatment on average 0.2 kg/ha was used.

Before planting and during the growing season two farmers also applied a granular soil insecticide, e.g. carbofuran or carbosulfan, to prevent soil borne pests such as cut worm and gryllotalpa.

Overall farmers used 22% WHO class Ib and II pesticides with spray applications. Not included are the seed and soil treatments since these applications pose less risks for human health.

Table II.2. Use of insecticides and fungicide (Active ingredient kg/ha) in the PMC shallot, Kersana, 2013.

	Average	Minimum	Maximum
Total Active Ingredient (kg/ha)	25.8	11.5	49.1
Active Ingredient of fungicide spray application (kg/ha)	13.4	5.3	18.7
Active Ingredient of fungicide seed application (kg/ha)	7.6	0	15.6
Active Ingredient of insecticide spray application (kg/ha)	4.5	0.4	16.5
Active Ingredient of insecticide soil application (kg/ha)	0.1	0	1.2
Active Ingredient of insecticide seed application (kg/ha)	0.2	0	2.8
Active ingredient of WHO class Ib+II with spray applications of fungicide and insecticides (kg/ha)	4.3	0.4	16.3
Percentage applied WHO class Ib+II of total applied active ingredient with spray application (%).	22	4	46

For controlling diseases most farmers rely on spraying the contact fungicides propineb and mancozeb only (Table II.3). In most cases the first sprays were carried out with a propineb-based fungicide followed by the more effective mancozeb, or with mancozeb only for the whole period. A total of four farmers applied three to six times per season a curative fungicide, i.e. pyraclostrobin, azoxystrobin and difeconazole.

Table II.3. Number of farmers in the PMC shallot using fungicides, average number of applications when used and classification per mode of action group (MoA) and world health organisation (WHO class), Kersana, 2013.

Active ingredient	Number of farmers using	Average number of applications per season	MoA	WHO class
propineb	8	5.4	M3	U
mancozeb	17	8.4	M3	U
iprodion	1	6.0	2	III
metiram + pyraclostrobin	2	3.0	M3+11	U
pyraclostrobin	1	1.0	11	U
azoxystrobin + difeconazole	2	1.0	11+3	II

Almost all farmers used pyrethroid, organophosphate or carbamate broad spectrum insecticides (Table II.4). When these insecticides are continuously used without alternating them with insecticides belonging to different MoA groups risks of pest resistance are high. As a result of increased pest resistance the efficacy of these insecticides decreases and farmers tend to apply higher rates or apply them more frequent. The pyrethroids insecticide with the active ingredient beta-cyfluthrin is most frequently used. This active ingredient has a high toxicity WHO classification and is more toxic than the other pyrethroids.
About half of the farmers use methomyl, which also is classified as high toxicity pesticide by the WHO.

Table II.4. Number of farmers in the PMC shallot using broad spectrum insecticides (pyrethroids, organophosphates (OP) or carbamates), average number of applications when used and classification per mode of action group (MoA) and world health organisation (WHO class), Kersana, 2013.

Active ingredient	Number of farmers using	Average number of applications per season	MoA	WHO class
Pyrethroids + OP + Carbamates	16	12.6	1A/1A/3A	Ib-II
Pyrethroids	12	6.8	3A	Ib-II
alfa cypermethrin	1	4.0	3A	II
beta cyfluthrin	7	7.4	3A	Ib
cypermethrin	1	2.0	3A	II
chlorpenapyr + beta cyfluthrin	1	11.0	3A + 13	II
fenpropathrin	1	1.0	3A	II
lambda-cyhalothrin	1	1.0	3A	II
permethrin	1	11.0	3A	II
OP + Carbamates	14	8.6	1A+1B	Ib-II
carbosulfan	3	7.7	1A	II
chlorpyrifos	8	5.3	1B	II
methomyl	7	5.0	1A	Ib
thiodicarb	3	5.7	1A	II
triazophos	1	3.0	1B	Ib

Besides the broad spectrum insecticides farmers also apply more selective insecticides (Table II.5). Most farmers spray chlorfenapyr, an insecticide that can control mites and spodoptora and abamectine which is able to control leafminer, thrips and mites. Other insecticides used by a high number of farmers are fipronil and emamectin benzoate which are used to control spodoptera.

Table II.5. Number of farmers in the PMC shallot using other insecticides than broad spectrum insecticides (pyrethroids, organophosphates (OP) or carbamates), average number of applications when used and classification per mode of action group (MoA) and world health organisation (WHO class), Kersana, 2013.

Active ingredient	Number of farmers using	Average number of applications per season	MoA	WHO class
abamectin	10	4.8	6	NL
chlorantraniliprole	1	3.0	28	U
chlorfenapyr	15	8.5	13	II
chlorfenapyr + abamectin	1	2.0	13+6	II
chlorpenapyr + beta cyfluthrin	1	11.0	13+3A	Ib
diafenthiuron	1	2.0	12A	III
emamectin benzoate	6	6.0	6	NL
fipronil	7	4.3	2B	II
spinetoram	2	8.0	5	U

Besides field applications with knap sack sprayers also other application methods were used (Table II.6). All farmers treat the plant bulbs before planting with mancozeb or a combination of mancozeb and carbendazim to protect the bulbs against soil borne diseases. Three farmers also treat the bulbs with an insecticide. Only one farmer applied Furadan (active ingredient carbofuran) together with the fertilizer to the field. For this purpose the chemical is pre mixed with the fertilizers and consequently a manual broad cast application with bare hands is carried out. To control cut worm

and gryllotalpa one farmer used a bait technique where rice or another bait attractive to the pest treated with chlorpyrifos is distributed spot-wise on the field.

Table II.6. Number of farmers in the PMC shallot using pesticides for other purposes than crop sprays, average number of applications when used and classification per mode of action group (MoA) and world health organisation (WHO class), Kersana, 2013.

Active ingredient	Application method	Number of farmers using	Average number of applications per season	MoA	WHO class
mancozeb	seed treatment	10	1	M3	U
mancozeb + carbendazim	seed treatment	7	1	M3	U
carbofuran	soil treatment	1	1	1A	Ib
chlorpyrifos	bait	1	1	1B	II
abamectin	seed treatment	2	1	6	NL
beta cyfluthrin	seed treatment	1	1	3A	Ib

Fertilization

In shallot, farmers applied on average 339 kg/ha nitrogen, 179 kg/ha phosphate and 254 kg/ha potash (Table II.7). However, variation in fertilizer application among fields is large.
Farmers apply 2.9 split N applications, with the first application 5.2 days after planting. About 30 days after planting the last N application is given.

Table II.7. Fertilizer quantities and number and timing of applications in the PMC shallot, Kersana, 2013.

	average	minimum	maximum
Average of N (kg/ha)	339	120	604
Average of P_2O_5 (kg/ha)	179	80	410
Average of K_2O (kg/ha)	254	120	579
Nitrogen applications (number per season)	2.9	2.0	4.0
Period between planting and first nitrogen application (days)	5.2	-3.0	10.0
Period between last nitrogen application and harvest (days)	29.7	19.0	48.0

Most farmers used single nitrogen fertilizer, compound NPK fertilizers and single potash fertilizer to the shallot crop (Table II.8). Most used fertilizers are urea, NPK 15-15-15 and Kamas 0-0-30.

Table II.8. Used fertilizers in the PMC shallot, Kersana, 2013.

Fertilizer type	Used by farmers (%)	Most used	2nd used	3rd used
N-P_2O_5-K_2O	77	NPK 15-15-15	Grower 1.5-9-2	NPK 16-16-16
N-K_2O	18	Grand K 3-0-46	Potasiumnitrate 13-0-46	
N-P_2O_5	24	DAP 18-46-0	Saprodap 16-20-0	
N	88	Urea 46-0-0	Ammonium sulfate 21-0-0	
P_2O_5	53	SP 0-36-0		
K_2O	77	Kamas 0-0-30	KCL 0-060	

There tend to be a weak relationship between the amount of N fertilization and final yield (Fig. II.1), but overall variation in yields is large, ranging from 10 to 20 t/ha.

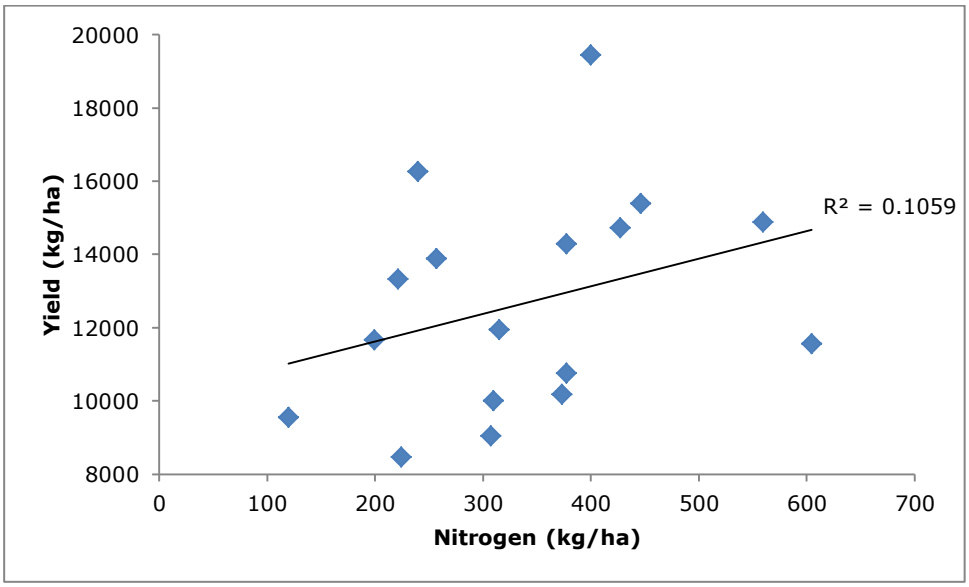

Figure II.2. *Relationship between nitrogen fertilization and shallot yield in the PMC shallot, Kersana, 2013.*

Labour

Shallot is a high labour demanding crop. The recorded labor input of the PMC shallot farmers is based on small plots, which is scaled up to labour requirements per ha. Land preparation demands most labour, which is mainly done by male labour (Table II.9), based on piece wage contract (*borongan*). Planting and weeding activities were mainly carried out by female workers, although male workers take care of the seedling transport. Also during harvest female workers do the actually harvesting while male workers transport the harvested product to the road side to be picked up by middlemen. Crop protection and irrigation is in most cases done by the farmer himself. Next to using pesticides to control pests and diseases labour was also spend on non-chemical control methods, for example,manual removal of infected leaves or *spodoptora* caterpillars is quite common.

Table II.9. *Labour hours (hr/ha) and share (% of total labour hours) per activity and gender in the PMC shallot, Kersana, 2013.*

	Male	Female	Both
Total hours	5309	2216	7525
Total hours %	71	29	100
land preparation %	22	1	24
bed maintenance %	4	0	4
planting %	2	6	8
crop protection %	12	0	12
non chemical crop protection %	7	5	13
fertilization %	4	0	4
irrigation %	12	0	13
weeding %	5	10	15
harvest %	3	5	9

Conclusions

Due to several factors, e.g. climate, farmers' practices and seed bulb quality, the shallot supply was unevenly distributed. No proper analyses could be done to investigate which factor contributed the most this phenomenon. However, it seems that climate has a big influence on growing days.

Nitrogen use differs a lot among farmers, the farmers with the lowest N input used less than the local advice of 250 kg/ha, while the farmer with highest input used more than twice as much as the recommendation.

Farmers rely on the indiscriminate use of cheap broad spectrum insecticides to protect their crops. Every 3.3 days the crop is sprayed with a cocktail of pesticides. Farmers apply many contact fungicides and only a few farmers applied a curative fungicide. The control of diseases can be improved by selecting contact or curative fungicides, and by changing spray intervals based on infection risks.

Annex III. Actual shallot planting schedule realized

Farmer [11]	Nett surface (m^2)	Planting date (and week)		harvest date (and week)		growing period (# days)
1	186	1-7-2013	(27)	28-8-2013	(35)	58
2	160	1-7-2013	(27)	11-9-2013	(37)	72
3	126	8-7-2013	(28)	3-9-2013	(36)	57
4	156	8-7-2013	(28)	5-9-2013	(36)	59
5	225	15-7-2013	(29)	15-9-2013	(37)	62
6	168	15-7-2013	(29)	9-9-2013	(37)	56
7	180	22-7-2013	(30)	19-9-2013	(38)	59
8	225	29-7-2013	(31)	23-9-2013	(39)	56
9	210	29-7-2013	(31)	16-9-2013	(38)	49
10	180	5-8-2013	(32)	22-9-2013	(38)	48
11	180	5-8-2013	(32)	28-9-2013	(39)	54
12	180	12-8-2013	(33)	7-10-2013	(41)	56
13	150	12-8-2013	(33)	2-10-2013	(40)	51
14	180	19-8-2013	(34)	8-10-2013	(41)	50
15	216	19-8-2013	(34)	15-10-2013	(42)	57
16	195	26-8-2013	(35)	21-10-2013	(43)	56
17	210	26-8-2013	(35)	23-10-2013	(43)	58
Average	**184 m^2**					**56 days**

Source: IVEGRI

[11] *Names of individual farmers are with vegIMPACT PMC secretariat*