Economics of Production and Marketing of Safed Musli *(Chlorophytum borivilianum)* in Rural Areas of Vindhyan Plateau, Madhya Pradesh, India

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Introduction

- *Safed musli* is a herb found in tropical moist and dry deciduous forests. It is an extremely valuable gift of nature to mankind. Under the Indian system of medicine, it holds a reputed position.
- It is a medicinal plant indigenous to central India and grows naturally in M.P, Chhattisgarh, Gujarat and U.P., in tropical and sub tropical climates with altitudes up to 1500m. It is only in India that it is treated as a medicinal plant whereas in other countries it is regarded as just an ornamental plant.
- Seventeen species of *Chlorophytum* had been reported in India (P. Oudhia, 2001). All differ in medicinal properties but due to lack of correct information, all of them are called *safed musli*.
- It is used as a natural sex tonic with great potential to become an alternative to Viagra.
- Marketing channels for *safed musli* are still unorganized as it is currently sold through agents, middlemen, traders, pharmaceutical companies and retailers. There are huge margins of profit on the route from collector/producer to consumer.

Biological Features of *Safed Musli*

- In Madhya Pradesh, three main species are found and all three are under cultivation. In Sehore forest division, two species are found, *Chlorophytum borivilianum* and *Chlorophytum tuberosum*. The quality depends upon the agro climatic condition of the area, the steepness of the slope, soil, texture, shade and some anthropological factors
- Musli is a tuberous plant and propagates only through the root. Sexual vegetative reproduction is very rare and takes 18 months to mature. As it is a valuable forestry product, whoever finds it, just picks it up and sells it to a local trader. In its natural condition, production has been reduced to half in the last 3 years while in cultivated condition, its production depends upon agro-climatic conditions and management practices.
- Cultivation of this wonder crop is much more profitable than any other crop of this season and provides good returns on investment in a short gestation period of 7–8 months. The local people also cultivate it in their homes for trial purposes and have realized how rewarding it can be.

WHY THIS STUDY WAS CONDUCTED

A study of the *Safed Musli* marketing system is necessary to understand the complexities involved and identify bottlenecks with a view to providing efficient services in the transfer of farm products and inputs from producers to consumers. An efficient marketing system minimizes costs and benefits all sections of society.

The expectations from the system vary from group to group and generally, the objectives are in conflict. The efficiency and success of the system depends on how best these conflicting objectives are reconciled.

- **Producers**

Musli producers want the marketing system to purchase their produce without loss of time and provide a maximum share of the consumer's rupee. They want the maximum possible price for their surplus produce. Similarly, they want the system to supply them with inputs at the lowest possible cost.

- **Consumers**

Musli consumers are interested in a marketing system that can provide *Musli* and other items in the quantity and of the quality required at the lowest possible price. However, this objective of marketing for consumers is contrary to the objective of marketing for producers.

- **Market Middlemen**

Market middlemen are interested in a marketing system which provides them with a steady and increasing income from the purchase and sale of *Musli*. This objective of market middlemen may be achieved by purchasing *Musli* produce from

producers at low prices and selling to consumers at high prices.

- **Government**

The objectives and expectations of all three groups of society - producers, consumers and market middlemen – conflict with one another. All three groups are indispensable to society. The government has to act as watch-dog to safeguard the interests of all. It must try to provide the maximum share to the producer in the consumer's rupee; food of the required quality to consumers at the lowest possible price; and enough margin to market middlemen so that they may remain in the trade and not think of going out of trade and jeopardizing the whole marketing mechanism. Thus, the government wants the marketing system to be one that will benefit all segments of society.

Objectives

1. To analyze the farming system and landownerwise distribution of *Safed Musli*
2. To analyze production practices in physical and monetary terms
3. To analyze the marketing practices and price spread of *Safed Musli*
4. To suggest measures for the improvement and conservation of *Safed Musli*

Research Methodology

A specific sampling technique was used. This was done on the basis of a sampling design of statistical data.

Sample design

A multistage and multiphase sampling technique was used to obtain a representative sample. At a later stage, a simple stratified random sampling was used. For respondent sampling, all 60% as per forest official information were interviewed as well as cultivators who had gone for commercial cultivation.

Source & Collection of data: - Respondent Safed Musli crop growers were the source of primary data and were interviewed personally. Primary data collection was done through a pre-tested questionnaire which included open-ended and close-ended questions to get a clear view of the growers. During the selection of respondent Safed Musli crop growers, a list of growers in the respective forest divisions was prepared with the help of officials of the State Forest and Agriculture Department and then respondents were selected randomly. Only those growers were listed who had been in the business of Safed Musli crop production and marketing for the last five years.

Various official records were used to collect secondary data, including published and unpublished information/documents on various aspects of Safed Musli cultivation by different private farm corporates, the Directorate of Agriculture, the Government of Madhya Pradesh Bhopal, M.P., Commissioner, Land Record & Settlement, Government of Madhya Pradesh, Gwalior, M.P., Directorate of Horticulture, Government of Madhya Pradesh, Bhopal, M.P., Directorate of Economics & Statistics, Government of Madhya Pradesh, Bhopal, M.P. along with the Department of Forests, Government of Madhya Pradesh, Bhopal, M.P. among others.

Tools of analysis

Simple statistical tools (average, mean, median, percentage) were used to analyze the collected primary data.

Reference year

The study conducted in Sehore forest division pertains to the primary data collected for the agricultural year 2002-03.

Result and Discussion:

Status of Safed musli

The total area of Sehore forest division is 152600 hectares and the area under Musli in natural condition is 18.6% of total forest area. Production went down from 2000 to 2002. It became just half due to unsustainable harvesting practices which resulted in scrub distribution and poor regeneration.

The area under cultivation increased from 2000/02. Before this, there was no cultivation, only wild collection from the forest.

Table 1: Area wise status of Safed Musli in Sehore forest division

Sehore forest division			Total area under Musli cultivation (in Ha.)	Year	Production of Musli under Natural condition in quintals
RF (Ha.)	PF (Ha.)	Total area (in Ha.)			
112700	39900	152600	28144.997	2002	114.96
				2001	258
				2000	422.15

Table 2: Land owner wise status of Safed Musli in Sehore forest division

Land owner wise status of cultivation of Safed Musli						
Year	Fouzdar krishi farm(area in Acre)	ENBEE Agro plantation (area in Acre)	Forest department (area in Acre)	Farmer (area in Acre)	Total area in Acre	% Cultivation
2002	5 Acre	----	2.25 Acre	1.5 Acre	8.75	.002
2001	1 Acre	2 Acre	3.25 Acre	.5 acre	6.75	.0018
2000	1 Acre	2 acre	----	-----	2	.00054

Table 3 : Producer wise status of Safed Musli in Sehore Forest Division

Name of cultivators	Year	Area	Production (in quintal)	Price
Fouzdar krishi farm	2002	5 Acre	9 - 10 (fresh weight)	Sale it @ of Rs 800 / kg.
	2001	1 Acre	8 - 9 (fresh weight)	Used as planting material as increase the area of cultivation
	2000	1 Acre	5 - 6 (without bed preparation) fresh weight.	Used as planting material for next year.
Forest department through mahila sangh	2002	Not harvested.		
	2001	1 Acre	0.20 – 0.25 (fresh weight)	Not sale equally divided among the members.
	2000	Not cultivated.		
Farmer	2002	.5 Acre	0.50 – 0.55 (fresh weight)	Sale it @ of Rs 800 / kg.
	2001	.5 Acre	0.20 – 0.25 (fresh weight) because Musli cultivated with out bed preparation.	Sale it @ of Rs 500 / kg
	2000	Not cultivated at all.		
ENBEE Agro . Farm	2002	Not cultivated at all.		
	2001	2 Acre	8 - 10 (fresh weight)	Sale it @ of Rs 1200 - 1300 / kg.
	2000	2 Acre	4 - 5 (fresh weight) as cultivated with out beds preparation.	Sale it @of Rs 700 - 800 / kg.

Producer wise status of Safed Musli

The producer wise status of Safed Musli in Sehore forest division has been described in two terms - physical and monetary.

Table 3 shows the producer wise status of Safed Musli under various categories of land owner. It clearly indicates that the cultivation of Safed Musli with and without the preparation of beds makes a huge difference to the level of production. During discussion, cultivators also recognized the fact that this crop gives a better return of their investment within a short gestation period of 7 – 8 months as compared to any other crop growing in this season. This crop makes the farmer tension free as it does not suffer from any insect/pest attacks.

PRODUCER WISE PRODUCTION PRACTICES

Production practices were studied by looking at the soil, drainage systems, field preparation, bed preparation, seeds and planting material, weeding, irrigation, harvesting practices, drying and storage practices.

Table 4 shows the different cultivation practices and clearly indicates that if cultivation is done through wide and raised beds, either through the farmhouse technique or nursery technique, it hardly makes any difference to production. In the nursery technique, beds are prepared by mixing a 2:1:1 ratio of alluvial soil: sand: FYM while in the farm house technique, beds are prepared by first deep tilling, then spreading FYM and again deep tilling. It hardly affects production if all cultivation practices are followed sequentially, but if there is difference in the irrigation period or weeding, then it affects production. If a farmer doesn't irrigate the field or put all other inputs into cultivation then the result is a low yield. The farmer follows the single bed system of cultivation which covers a large space but during harvesting it is quite easy to dig out and maintain the quality of tuber as compared to the wide bed system.

GAP/ CONSTRAINT ANALYSIS OF *SAFED MUSLI*

A comparative analysis of different production practices was made. These producers were CEDMAP, Fouzdar Krishi farm, ENBEE agro farm, the forest department and farmers.

Table 4 : Production practices of Safed Musli in Sehore forest division

Activities	Fouzdar Krishi Farm	ENBEE Agro. Plantation (nursery technique)	Forest department	Farmer (single bed system)
Soil	Sehara soil	Alluvial soil + sand	Sandy loam	Sandy loam
Drainage system	Well	Well	Well	Well
Field preparation Deep tilling Gobar khad Tilling	By tractor 3.75 - 4 trolley by tractor	By tractor 2 - 2.25 trolley no tilling	By gathi 2 trolley no tilling	By gathi ~ 1 trolley no tilling
Bed preparation	Up to May end	Up to June 1 – 2 weak it is prepared by mixing 2:1:1ratio of alluvial soil:sand: fym	June - July	July end- Aug.
Bed size	3.5 ft wide, 1 –1.5 ft raised	3.5 ft wide , 10mlong , 1 ft raised.	3.5 ft wide , 10m long , 1 ft raised	Single bed system, 1 ft raised
Weights of tuber used for planting material	< 5 gm	< 5 gm	< 5 gm	< 5 gm
Planting material	3.5 – 4 quintal	2.5 – 3 quintal	3 - 3.5 quintal	~ 4 quintal
Pre-treatment	Planting material placed in ash and treatedith trichoderma.	No treatment	No treatment	Planting material placed in gobar khad and sprit water for 3-4 days.
Spacing	6 * 6 inches	6 * 6inches	9 * 9 inches	9 * 9 inches
Plantation	By wooden stick	By hand	By hand	By hand
Depth of finger inside the soil	1 inches	1 inches	1 inches	1 inches
Weeding	3 times	3 times	3 times	3 times
Irrigation	Every 15 - 20 days	Once in a month	Once in a month	No irrigation
Harvesting period	March – April	Oct. - Nov.	Nov. – Dec.	Oct. – Nov.
Harvesting practices	Iron stick called Aakri (Mittal Musli farm)	By gathi and kurphi	By gathi	By gathi
No. of fingers	5 – 15	5 – 12	5 - 12	3 – 10
Washing and peeling	Placed Musli in water and peeled with stainless steel knife.	Placed Musli in water and peeled with stainless steel knife.	Leave Musli along with soil for 3 - 4days and pluck 1 tuber pushed it tail by thumb with finger on tuber skin if it leave skin than placed in water and rub with hand or against stone.	

Activities	Fouzdar Krishi Farm	ENBEE Agro. Plantation (nursery technique)	Forest department	Farmer (single bed system)
Drying	3 - 4 days in bright sunlight on white cloth to maintain quality.			
Storage practices	In a big hall first spread sand and than placed Musli over it no maintenance of temperature and moisture.	No storage practices	No storage practices	Dig a pit in shady place in home and dried it for 5 - 6 days and than put dried soil than Musli in this way 3 - 4 layer and than cover it with soil.
Production	9 –10 quintal (fresh weight)	8 - 10 quintal (fresh weight)	25 - 30 kg (fresh weight) because only big finger is harvested and huge amount of planting material is left for next year.	1 - 1.10 quintal (fresh weight)

Table 5 :Comparison of production practices of Safed Musli in Physical terms in Sehore forest division

Scientific method of cultivation (according to CEDMAP)	Fouzdar krishi farm	ENBEE Agro. Plantation	Forest department.	Farmer
Sandy loam, well drained , high organic content .	Sandy loam and well drained soil	Sandy loam and well drained soil	Sandy loam and well drained soil	Sandy loam and well drained soil
Land preparation Deep tilling Green manure Decomposed khad(5-10 trolly) Tilling Other khad like Hadi khad , soil conditioners	 By tractor No 3.75 - 4 trolley tilling ------	 By tractor No 2 – 2.35 trolley ---------- --------	 By gathi No 2 trolley (soil +khad) -------- ----------	 By gathi No ~ 1 trolley ---------- ----------
Bed preparation (up to 15th June)	Up to May end	Up to 1 – 2 weak of June	June end - July	July – Aug.
Bed size	3.5 ft wide, 1 – 1.5 ft raised	3.5 ft wide,10m long, 1 ft raised	3.5 ft wide, 10m long, 1 ft raised.	Single bed system 1 ft raised
Weight of tuber used for planting material (5 – 10 gms)	< 5gm	<,5gm	< 5 gm	< 5gm
Planting material (3 – 6 quintal)	3.5 – 4 quintal	2.5 – 3 quintal	3 - 3.5 quintal	~4 quintal
Pretreatment of planting material (2 min bovestien solu + 1 hr in cow urine)	Planting material placed in ash and treat with Trichoderma.	No treatment	No treatment	Planting material placed in a gobar khad for 3 – 4 days and sprit water over it.
Spacing (6*6 inches)	6*6 inches	6*6inches	9*9inches	9*9inches
Plantation(With the help of wooden stick or kurphi)	With the help of wooden stick	By hand	By hand	By hand
Fingers placed not more than 1 inch inside the soil	1 inches	1 Inches	1 inches	1 inches
Weeding (3 times)	3 times	3 times	3times	3 times
Irrigation (every 15 – 20 days till digging)	15 – 20 days	Once in a month	Once in a month	No irrigation at all
Harvesting period	After Feb. in March and April up to 15th.	Oct. - Nov.	Nov. – Dec.	Oct. - Nov.
Harvesting practices (by kudhali)	Iron stick called Aakri by Mittal Musli farm	Gathi and kurphi	Gathi	Gathi
No .of fingers (10- 12 is consider as good)	Mini : 5 – 8 Maxi : 10 – 15	Mini : 5 - 8 Maxi : 10 - 12	Mini : 5 - 8 Maxi : 10 -12	Mini : 3 – 4 Maxi : 8 – 10
Washing and peeling(put Musli in basket and placed in flowing water and washed and peeled with stainless steel knife)	Put Musli in water and peeled with stain less steel knife.	Put Musli in water and peeled with stainless steel knife.	Leave the Musli along with soil for 3 -4 days and take one finger press the Musli finger with thumb and finger on tuber if it leave skin than placed in water and rub with hand or against the stone.	
Drying: 3 - 5 days in sunlight on white cloth for quality maintain.	Fallow the practices.			
Storage practices By maintaining moisture at 70 – 80 % and temperature at 28 – 31 ^{0}C. Dig a pit in shady place and dried it and put Musli and cover it with soil.	In a big hall first spread sand and than placed Musli over it nothing else no need to maintain temperature and moisture.	No storage practices	No storage practices	Dig a pit in a room and dried for 5-6 days and put dried soil over it and than put Musli than soil in such a way 3 – 4 layer and at last

Scientific method of cultivation (according to CEDMAP)	Fouzdar krishi farm	ENBEE Agro. Plantation	Forest department.	Farmer
				cover with soil. No washing leave Musli along with soil and stored it .
Production: According to CEDMAP if planting material from reputed farm house than production will be 17 quintal fresh weight + planting material for next year and if planting material is taken from forest than production is 2 quintal fresh weight + planting material for next year.	9 – 10 quintal (fresh weight) and no planting material is left.	8 – 10 quintal and no planting material is left.	25 - 30 kg (fresh weight) and good amount of planting material is left for next year because only big finger is harvested and other huge number of finger is remaining in the field.	1 - 1.10 quintal (fresh weight) no planting material is left for next year.

Table 5 shows that none of the cultivators follow standard production/cultivation practices. They do not use green manure or bone meal, there is a difference in the timing of bed preparation, the quantity of planting material, pretreatment of planting material and a difference in the irrigation period. Harvesting practices also differ but production was similar to that in standard cultivation practices, if all the management practices are followed in a timely way, as in case of the ENBEE agro plantation and Fouzdar Krishi farm. However, with farmers who did not follow timely management practices, the ultimate result was low production. The forest department production was also low but they get a better quantity of planting material for the next year and save money in that way.

Table 6: Comparison of production practices of *Safed Musli* in monetary terms

Activities	**CEDMAP**	**Fouzdar Krishi Farm**	**ENBEE Agro Plantation**	**Forest Dept.**	**Farmer**
Cost of planting material	30,000	14,000	6,000	7,000	6,000
Decomposed Khad	2500	1200	600	600	400
Expenditure on land preparation (tilling twice)	1000	1000	1200	3000	500
Bed preparation	2000	1000	2700	500	500
Expenditure on green manure/ mulching	2000	--------	--------	-------	-------
Weeding twice	1500	1500	1500	500	300
Plantation cost	2000	500	600	500	300
Harvesting and washing	2500	1000	1000	2000	300
Expenditure on drying and peeling	20,000	10,000	10,000	250	500
Others	2000	--------	---------	-------	--------
Total Expenditure	**65,500**	**30,200**	**23,600**	**14,350**	**8800**
Income from					

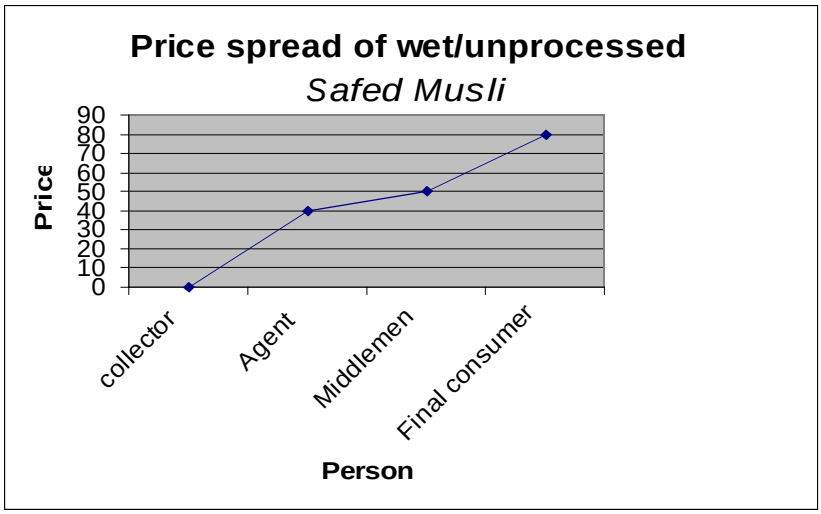
crop					
By selling dry *Musli*	100,000	180,000	240,000	6000	20,000
Earn as planting material	75,000	No planting material	No planting material	8000	No planting material
Total Earnings	17,500	180,000	240,000	6000	20,000
Total Expenditure	65,000	30,200	23,600	14,350	8800
Net Profit	**90,000**	**149,800**	**216,400**	**No profit**	**11,200**

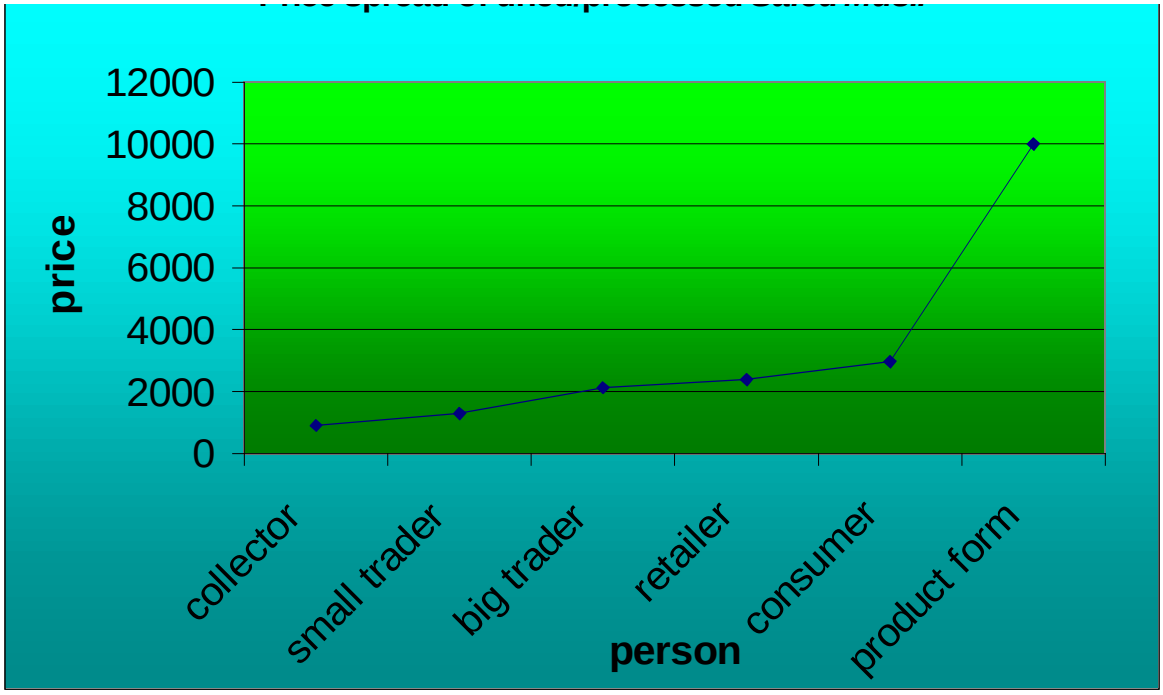
Table 6 shows that the total expenditure in cultivation of this wonder crop is quite small in comparison to net earnings and there is a huge difference in the economy of *Safed Musli* published by CEDMAP and that actually in the field. The Fouzdar Krishi Farm invested Rs 30,200 per acre and earned Rs149,800 while ENBEE Agro plantation invested Rs 23,600 per acre and earned Rs 21,600 from this crop. Farmers earned the least profits but even so, more than they did for any other crop growing in this season.

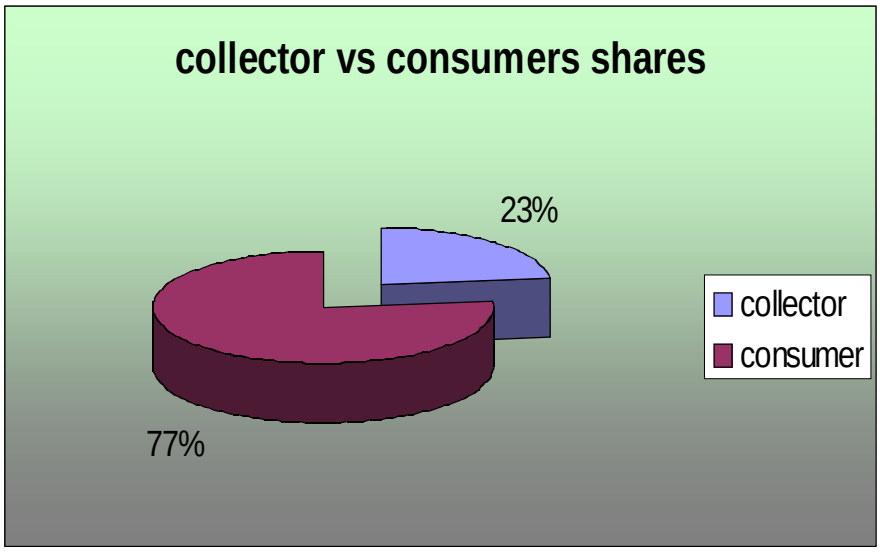
Price Spread and Associated Issues

The first graph shows the price spread/ marketing channel of wet *Musli* where no value was added at all, from collector level to consumer level. At collector level, the price was Rs 35/40 per kg in the beginning, increasing to a final price of Rs 60 -80 per kg. At agent level, the price increases by Rs 5 –10 per kg, middlemen made a margin of Rs 10 - 20 per kg and the consumer paid Rs 80 – 100 per kg for the same quantity of product.

The second graph shows the price spread of processed *Musli* where the collector got only Rs 800-900 per kg while for the same quantity, the final consumer paid Rs 3000 per kg although no value addition took place except grading and 1 – 2 days drying.







The third graph shows the gatherer's contribution to the final consumer share as the gatherer got only 23% of the total money that the consumer actually paid and the consumer paid 77% more than the actual cost. All this is due to the unorganized market.

Price spread and value addition of *Safed Musli*

Table 7 clearly shows the price spread at various levels from agent to big trader and pharmaceutical company with value added at each level. In the marketing of *Safed Musli*, village level traders who collect wet *Musli* @ Rs 30 – 80 per kg, dry it in bright sunlight for 1 –2 weeks and store it for 2- 3 months, make a margin of Rs 200- 400 per kg. The agent collects the *Musli* unprocessed from the collector and sells it to the next level in the same form without processing. For this, they make a margin of Rs 5–10 per kg. Their job is simply to transport the *Musli* up the road. The next person in this series is the village level middleman who collects the *Musli* from the agent and sells it to a big plantation company. No other value addition is done at this level yet they make a margin of Rs 15 – 20 per kg.

Small traders take only processed *Musli*, dry it for 1-3 days and grade it, for which they make the margin of at least Rs150 – 300 per kg the big

traders just contac small traders, purchase their material and sell it to other parties, making a margin of at least Rs 500 per kg. For this work they have agents whose margin money is 1-2 %. If they purchase 1 kg of *Musli* @ of Rs 1400 per kg and sell it @ Rs 2200 per kg they get at least Rs70 – 80 per kg.

Table 7: Price spread and value addition to *Safed Musli* at agent and trader levels

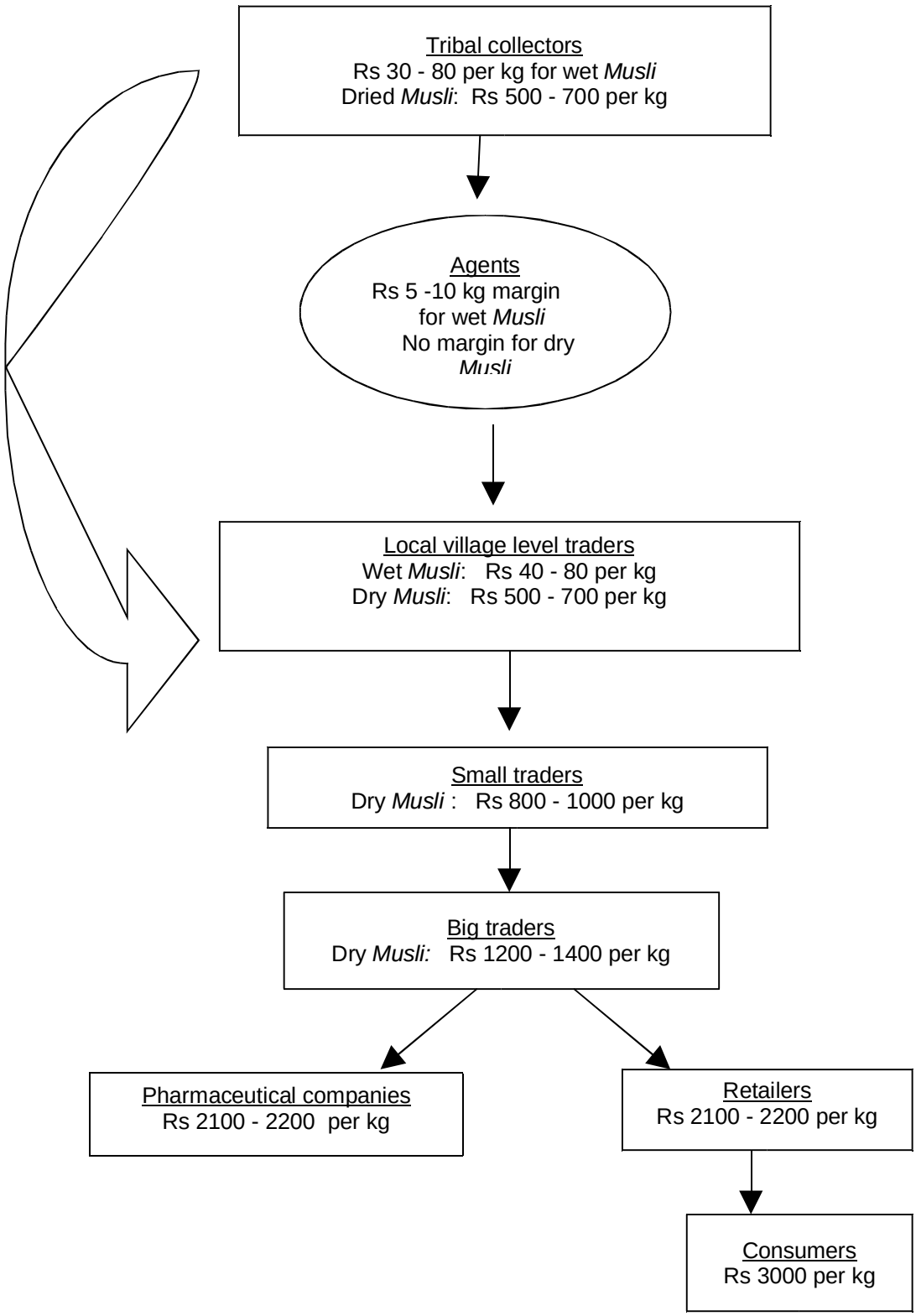
Agent / traders	Species	Year	Purchasing price (in Rs/ kg)		Selling price (in Rs / kg)		Turn over (in quintal)	Value addition
			Wet Musli	Dry Musli	Wet Musli	Dry Musli		
Village level trader	Chlorophytum borivilianum	2002	30 – 80	------		800 - 1000	1 - 1.5	Dried and stored it.
Agent	Chlorophytum borivilianum	2002	30 – 50	-------	40- 60	------	~ 50	No value addition except transport to road.
		2001	25 – 35	--------	30 -40	------	~60	No value addition
		2000	15 – 25	-------	20 30	-------	80 - 90	No value addition.
Middle-men	Chlorophytum borivilianum	2002	40 – 60	-------	80	-------	40 - 50	No value addition
		2001	40 -45	--------	60- 65	-------	50 - 60	No value addition
City level traders	Chlorophytum borivilianum	2002	-----	Grade1 : 350 – 400 Grade 2 : 800 – 950	-----	1100 – 1300	1 – 1.25	Graded and dried it.
		2001	------	500- 600	------	700 – 800	4 – 5	Graded and dried it.
		2000	-------	200 – 250	-------	400 – 500	7 – 8	Graded and dried it.
Big traders	Chlorophytum borivilianum	2002	-------	1300 – 1400	------	2100 – 2200	30 – 35	No value addition.
		2001	--------	1200 – 1300	-------	2000 – 2100	40 – 45	No value addition.
Pharma ceutical firm	Chlorophytum borivilianum	2002	--------	2100 – 2200	--------	2400 – 10000	~5	Powdered and capsule form.

Table 8 : Mode of Advance Payment for *Safed Musli*

Sub division	Range	Beat	Time of advance payment	Type of advance payment	
				Cash	Kind
Budhni	Budhni	Khatpura	--------	----------	--------
		Bhimkothi	June-July	Rs 100-200	
		Samnapur	May- July		Wheat, rice and other household grocery
		Hoda	May – July		Wheat, rice and other household grocery.
		Dungariya	--------	--------	-------
	Raeti	Salkanpur	--------	---------	---------
		Khanpura	June - July	Rs 100-300	
		Semri	------	------	-------
		Ratanpur	------	-----	-------
		Khajuri	-------	------	-------
		Dhaba	-------	------	-------
	Larkui	Sewaniya	--------	--------	-------
		Bilakhara	June-July	Rs 100-200	
		Mograkhara	--------	-------	--------
		Bhoorakhara	June-July	Rs 100-200	
		Piplani	--------	--------	---------
		Donglapani	--------	--------	----------
Sehore	Birpura	Lohapahar	--------	--------	---------
		Saras	--------	--------	---------
		Kathotia	--------	--------	---------
		Baweriyakha	--------	--------	---------

Table 8 shows the time and mode of advances which are given in both cash and kind in the summer before *Musli* collection. The collector only receives Rs 100-300 in cash, depending on the quantity. The trader gives cash to the head/chief of the area who distributes it to the collector and collects the *Musli*. At the time of extending advances, a certain quantity and price is prefixed but when the supply of the quantity at a prefixed price is in excess, then it becomes a free market price. The advances given in kind are generally cereals/grains and other items of consumption valued at minimum existing market prices.

Flow Chart 1: Marketing Channels and Margin in the trade of *Safed Musli*



The above figure shows the marketing channel of *Safed Musli* from collector to consumer level. The collector invests 10 – 12 hr/day to collect *Safed Musli* and gets Rs 30 – 80 per kg for unprocessed *Musli* if they sell it directly to the trader but if they sell it through an agent, then it makes a difference of Rs 5–10 per kg from the market price and Rs 500 – 700 per kg for processed *Musli* which is sold directly to traders; agents do not purchase it. The local village level trader collects both processed and unprocessed *Musli* and sells only processed *Musli* to small traders @ Rs 800 – 1000 per kg. These traders dry and grade it and sell it to big traders @ of Rs 1200 – 1400 per kg. They sell it to pharmaceutical companies and retailers @ Rs 2100 – 2200 per kg. Finally, the consumer pays Rs 3000 for the same quantity of *Musli* although the price varies widely depending upon the quality.

CONCLUSION

Sehore forest division is most suited for both the cultivation and natural growth of *Safed Musli* due to its agro-climatic conditions. Under natural conditions, it is found in both steep and less steep areas, and on sandy loam and *mooram* soil. It is rarely found in the plains. This study concludes that there is a huge difference in quality and production of *Safed Musli* between two subdivisions as well as in the different ranges of the same subdivision. A better quality of *musli* is available in Budhni subdivision and within the subdivision, in Budhni range in comparison to Raethi and Larkui Forest Range.

Cultivation practices show that people are keenly interested in the cultivation of *Musli*. Where it grows naturally in the forest, it is spread over 18.6% of the total forest land area in Sehore forest division and this has been the case for many years. However, production under natural conditions is continuously decreasing due to complete uprooting of the plant. Under cultivated condition, its area is continuously increasing.

Regarding different cultivation practices (i.e. farmhouse technique, nursery technique, single bed technique), it hardly makes any difference in yield level if all cultivation practices are followed in time. Weeding has an adverse effect on production as compared to irrigation. If weeding is not done at all, then the *Musli* dies under the soil but if irrigation is not done, the same amount of *Musli* is still produced.

Cultivators did not follow all stages of standard cultivation practices as they did not grow green manure nor apply bone meal nor make any time difference in planting or quantity of planting material, pretreatment of planting material, irrigation period, harvesting time or harvesting period. Despite this, their production was still similar to the standard one. A detailed economic study on resource use efficiency would be useful.

Regarding distribution and marketing practices, there is a huge difference in the price of *Safed Musli* among ranges of the same subdivision. In Budhni, range collectors get only Rs 30–40 per kg while in Larkui collectors get Rs 60-80 per kg.

Marketing channels for *Safed Musli* are informal and unorganized. Intermediaries and traders have a strong grip over the market and take advantage of this situation. There is no parameter for pricing in the study area. As produce moves from collector to big trader, the value addition portion goes down and marketing margins per kg increase. The agent gets Rs 5–10 per kg and the big trader Rs 500–700 per kg, a surprising and unbalanced situation but due to the increase in the number of intermediaries from collector to consumer. The collector who works 10–12 hours per day gets at most a 23% share of the price actually paid by the consumer. The remaining 77% goes to intermediaries, agents and traders. This situation should be rectified by providing training to various intermediaries and agents in processing, grading, packaging etc. At the same time, these intermediaries should be minimized to a justifiable limit of their existence in the business system.

This crop can probably only be harvested for the next two years as the species is disappearing. It is threatened locally because of the huge amount of wild, unsustainable and premature harvesting from the forest. An equal quantity of re-planting does not take place to compensate for that loss. Once the plant is harvested, reseeding never

occurs because *Musli* is a tuberous plant which germinates by tuber only; sexual reproduction through seed is very rare in this plant.

Various observations were made about unsustainable and unscientific harvesting practices in all four ranges. The most prominent reasons were: an increase in competition among collectors to collect more and more as this plant is a cash crop; informal and unorganized market channels where traders have a strong grip over the market because they provide quick credit for the collector's product and demand for the next; they also give advances before the season starts; collectors have a readymade market for the trader comes to him to purchase the product.

To maintain future availability of *Safed Musli,* the plant must be nurtured and protected. There must be immediate checks on present harvesting practices; the plant should only be collected when it is mature; the entire plant should not be pulled out; only big *Musli* should be harvested; cultivators should be encouraged to cultivate it at home in their kitchen gardens; training on scientific production should be given so that they are processing-oriented rather then harvesting-oriented.

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