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Assessing the Environmental Status And Proposing Measures To Improve Environmental Protection Effectiveness In Binh Thang Dried Fish Processing Craft Village, Binh Dai District, Ben Tre Province

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Abstract: *With more than 1,500 craft villages in Vietnam, the craft villages have greatly contributed to increased income and reduced poverty not only in rural areas but also in urban areas of Vietnam. However, production activities of the craft villages have also caused severe environmental pollution and degradation because they not only emit noxious gases into the air, directly discharge untreated wastewater containing large amounts of pollution substances into rivers, but also waste natural resources. And the Binh Thang dried fish processing craft village in Binh Thang commune, Binh Dai district, Ben Tre province – Vietnam also is not exceptional. In order to provide reliable and scientific data, information for policy makers and bussiness managers as well, the research related to assessing the environmental status and proposing measures to improve environmental protection effectiveness in the Binh Thang dried fish processing craft village has been implemented. The results gained from the research implementation show that: manufacturing activities in the village are hand-made, labor intensive use and long production time, so many production stages waste raw materials; waterwaste generated from production of the craft village has high level of pollution compared to current standards of Vietnam and is discharged directly into the environment; local authorities have not paid much attention or efforts to manage and disseminate legal documents regarding the environmental protection field so the effectiveness of environmental management in the studied area is not as high as expected. Based on the results of the research implementtion there are some measures regarding improvement of environmental protection effectiveness in the studied generated and implementation in combination of those measures would help the craft villages to develop economically and socially sustainable and reduce negative impacts on the environment*

Keywords: *dried fish processing, environmental status, Binh Thang, pollution, improvement*

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I. Introduction

Binh Thang Commune is one of 20 communes and townships of Binh Dai District, Ben Tre Province, with the advantages of being close to the sea and good natural conditions, so people of Binh Thang Commune live mainly on exploiting, processing and aquaculture. The economic structure of the commune is fishery-forestry-agriculture with small-scale industry and services. The annual catch is of more than 50,000 tons per year. Aquaculture is the main economic sector of the commune with two areas: exploitation and aquaculture. Therefore, the exploitation and processing of aquatic products is closely linked with industry and handicraft such as building and repairing fishing vessels; processing aquatic products. According to Ben Tre Department of Aquatic Resources Exploitation and Protection (2015), the average output of processing aquatic products in the province has reached 6,000 tons of products per year. Along with the socio-economic development of the province, many new careers in hadicrafts – fine art and craft villages have been formed and developed such as handicrafts producing fine –art products from coconut trees, weaving mats, coconut fiber production, and so on. In fact, handicraft villages in Binh Thang have contributed significantly to the economy and created traditional cultural identity for Ben Tre province, with the typical products such as coconut candy, coconut jelly, rice paper rolls, fish sun-dried, etc. Among the traditional handicraft villages of fishing and processing aquatic products, the dried fish traditional craft village of Binh Thang commune has created a considerable volume of goods meeting the diverse needs of people's lives, contributing significantly to not only local economy development, but also increase of export turnover for the country.

The Binh Thang dried fish processing craft village which has been located 50 km from Ben Tre city and about 5 km from the East Sea, has been operated for over 50 years. The craft village has about 300 households producing dried fish products and plays a very important role in the socio-economic development of the region. However, along with the strong development of seafood processing industry, environmental pollution is also increasing and the village is now confronting many environmental problems, some of which are very serious: obstruction of drainage ditches in the area; high concentration pollutants in water sources; existing waste collection and treatment systems in the area are overloaded. On average, the production of the village generates and discharges into the environment over 600m3 of wastewater without proper treatment. In addition, the quality of the air environment in the Binh Thang dried fish processing Village is also severely polluted with typical discomfort odor that affects human health and environment not only in the village but also in the neighboring areas. Therefore, it is necessary to have a systematic study that accurately reflects the current status of the environment in the village in order to support the producers and environmental managers in the region to establish policies for social – economic development in general, and environmental protection in part, and this is also the main reason for the topic "Assessing the environmental status and proposing measures to improve environmental protection effectiveness in Binh Thang dried fish processing craft village, Binh Dai district, Ben Tre province" is implemented.

II. Contents And Methods Of The Research

2.1. Research content

The main objective of the research is to assessing the environmental status of the Binh Thang dried fish processing craft village, Binh Dai district, Ben Tre province, and proposing measures to improve the environmental protection effectiveness towards pollution reduction and pollution prevention in processing of the craft village. In order to gain the given objective, the research focuses on the following contents:

- Studying and assessing the production in Binh Thang dried fish processing craft village;
- Assessing the current status of the environment in the village;
- Assessing activities and effectiveness of environmental management in the studied area;
- Proposing measures to improve environmental protection effectiveness in the Binh Thang craft village.

2.2. Research methods

2.2.1. Approach in the research implementation

The environment can be understood in a broad sense that all of natural and artificial/man-made materials or factors which are inter – dependent and interactive, any changes in each of the two copmartments would lead to change of quality of the environment. Human activities in socio-economic development can make the quality of the environment deteriorate, maintainable or improvable. In contrast, the nature of the natural environment system is capable to assimilate pollutants if the level of the impacts does not exceed assimilable capacity of the environment. Thus, in the development, if human-beings understand the interdependence of elements in the natural environment as well as the elements of the artificial environment, they will identify and select activities that not only bring prosperity to human but also maintain and improve the quality of the natural environment system. Based on that, the subject has used the systematic analysis of natural environmental factors, analyzing and evaluating causes affecting the environment through researching production activities: technological process; actual use of raw materials; quality of some environmental components; and effectiveness of enevironmental management in the studied area, the implementation of the research has been implemented by combination of both internal and external works.

2.2.2. Research materials and methods

The equipment and materials which have been used in the research implementation are: motorcycles used for transportation; bags, buckets and 2 liters plastic cans, rulers and balance, these are used to measure samples collected during the study; maps and GPS are used to identify routes and location of households that need to be surveyed in the studied area. Methods used in the research process include: method of collecting secondary information; collecting and analysing samples of wastewater and surface water and air samples in the studied area; participatory public assessment; Delphi method; and comparing the quality of environmental components in the studied area based on the current environmental regulations is also used. The number of households selected to conduct survey have been calculated by the the formula of Yamane (1973), as follows:

$$n = N * (1 + Ne^2)^{-1}$$

As total number of households which produce dried fish products in the studied area is 300 households, the level of error selected 10%, so the number of households selected for the survey would be 75 (n = 75). Water samples and air samples have been selected by randoon simple and random stratified sampling, with, in turn, about 20 samples and 03 samples.

III. Results And Discussion

3.1. Generalisation Of Binh Thang Dried Fish Processing Craft Village And It's Production Activities

3.1.1. Overview Of The Binh Thang Dried Fish Processing Craft Village

The dried fish processing craft village is in Binh Thang commune, Binh Dai district, Ben Tre province. The Binh Thang commune has a natural area of 13.02 km^2 in the east of Ben Tre province, about 0.5 km from Binh Dai town and 50 km away from Ben Tre city towards the west. The Binh Thang Commune is located in the Tien River and near the estuary called Cua Dai, the whole commune has 6 hamlets and dried fish producers are spread all over the village hamlets.

The Binh Thang commune - Binh Dai district is a coastal area of Ben Tre province is full of features of monsoon tropical climate with high and stable temperature, which is very convenient for dried fish processing. The climate of the region is divided into two distinct seasons: rainy season from May to November and sunny (dry) season from December to April, annual rainfall is about 1.461mm/year. However, in the dry season, the rainfall is only from 0 - 6 mm; June, July, August, and September are months which have high rainfall of from 227 to 293 mm/month; and in February and March, there is almost no rain, some time there is but the amount of the rain is very little. The average temperature is relatively high and stable with no spatial variation, the average temperatureis 27^0C. According to statistic (2015), the commune has 2,712 households and 10,569 people, an average density of 706 people/km^2, there is about 70% of the population in the commune living mainly on fishing, aquaculture and dried fish processing: in the whole commune, there are 1,899 households living by purchasing and processing seafood.

3.1.2. The current status of production in Binh Thang dried fish processing craft village

At present, there are about 300 households specializing in dried fish processing in Binh Thang village. Production activities of the households are year round, the production volume of the village is about 15 - 90 tons of raw material fish (fresh fish) per day, mainly dry stingray, dry snapper, dry mackerel and so on. There are 02 kinds of products in the Binh Thang village: salty dried fish and salty dried one day of sunlight fish.

The main materials used for processing dried fish in the village are fresh fish and different spices, the kinds of fish which are used in the production of the village include: lizard fish, mackerel, stingray fish, yellow fish, etc. Spices using in dried fish processing of the village are quite various: salt, sugar, monosodium glutamate, chilli, pepper. The amount and type of spices used depend on the type of products processed and the experience of each household, but the difference is not much. The results of survey conducting in the research implementation show that average spice volume using in processing dried one day of sunlight fish from 01 kg raw material fish is about: 10grams of salt, 5grams of sugar and 5grams of monosodium glutanate. In addition, during the processing dried fish, energy and water are also used, production activities in the village do not use fuel for drying and fish is naturally dried by the sun and thus it is also the source of bad smell characteristic of the Binh Thang dried fish processing carft village; Electric power is only used for freezers to preserve fish; In the process of producing dried fish in the village, a large amount of water is used for washing raw material fish and semi-finished fish products, with the average use of more than 9 liters/kg raw material fish. Process of processing dried fish in Binh Thang craft village is quite simple, only through some stages such as: preliminary treatment, processing and preserving products. The process of prodtion in the craft village is done by manual, not using machinery, except freezer for freezing fish and could be presented and described as follow:

Raw materials (Fresh fish) → Washing (1) → Pre-processing → Washing (2) → Spicy marinating → Drying → Packing → Preserving

Fresh fish bought from fishing boats or vessels have been first washed (Washing 1), the washed fish is then eliminated head, scales, tail etc. In the next step, the preliminary fish has been washed again (Washing 2) and then it would be marinated with salt and spiciness. The salty – spicy marinated fish is dried by sunlight, if the marinated fish is dried a day in the sun, it would be called dried one day of sunlight fish. The last step of the production process in the village is packing - Preserving.

3.2. Environmental status in Binh Thang dried fish processing craft village

3.2.1. Status of the water environment

To assess the current status of water quality, including surface water of the section of river flowing through the village and wastewater from the Binh Thang dried-fish processing households, in September 2016, the research team collected and analysed 20 samples of wastewater and 03 samples of surface water. Samples of wastewater was collected in 20 households proccessing dried fish, the selected households were representative in size as well as processing process, sampling was conducted by random simple imethod; surface water samples were taken in Binh Thang river, in the section of river flows through the village, the location of taking the 03 surface water samples: the river begins to flow through the village; the middle of the village; and at the end of river section which flows through the village, results of analysing the 20 wastewater samplesg are shown in table 3.1.

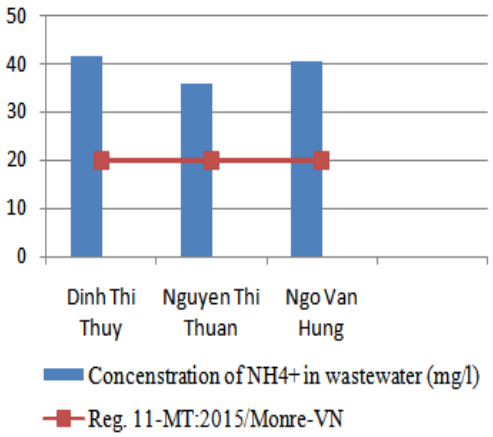
Table 3.1: Results of analysing 20 samples of wastewater of households in the craft villages

Hộ gia đình	**Thông số**							
	pH	**TSS**	**∑ N**	**Amoni**	**∑oil**	**BOD_5** mgO_2/L	**COD** mgO_2/L	**T.Coliform** (MPN/100ml)
		(mg/L)						
Vo Thi Phuong	6.50	374	57.8	37.7	68.5	740	1,070	$2.5x10^5$
Nguyen Thi No	6.81	352	52.4	26.5	63.8	420	780	$2.1x10^6$
Huynh Thi Hong	7.20	437	68.2	42.7	32.4	528	965	$2.3x10^5$
Nguyen Thi Em	6.92	372	72.2	32.2	30.4	457	857	$5.7x10^6$
Tran Van Luong	7.31	498	82.4	30.1	39.8	485	815	$4.3x10^6$
Nguyen Thi Tuoi	6.64	348	70.6	31.8	37.8	341	625	$6.4x10^6$
Dinh Thi Thuy	7.12	682	60.2	41.5	34.8	710	1,218	$2.1x10^5$
Mai Y Lan	7.53	458	58.6	36.8	32.6	653	1,041	$1.1x10^6$
Tran Thi Thuy	7.10	248	78.2	52.2	38.6	420	751	$2.1x10^5$
Nguyen Thi Thuan	6.71	376	62.5	35.6	31.6	406	988	$4.3x10^6$
Nguyen Duoc Anh	7.20	308	68.4	38.5	40.8	208	478	$1.1x10^5$
Tran Ngoc Thanh	6.52	434	52.3	29.5	35.5	476	937	$9.3x10^6$
Huynh Thi Van	6.72	336	67.8	36.5	33.2	365	602	$1.5x10^6$
Vo Thi Viet Duc	6.81	346	84.4	50.2	32.3	425	723	$4.6x10^5$
Nguyen Thi Le	7.20	428	71.8	36.4	38.5	342	670	$9.3x10^6$
Ngo Van Hung	7.30	412	75.4	40.4	38.5	820	1,182	$1.1x10^5$
Truong T. My Trang	6.70	581	82.4	48.6	35.6	538	940	$7.5x10^6$
Trương Thi Soc	7.23	425	60.2	30.5	37.2	468	657	$2.1x10^6$
Đo Thi Nhanh	6.84	408	69.8	39.7	48.7	564	940	$2.4 x10^5$
Đo Thi Tuyet Nga	6.92	522	57.8	37.5	41.3	567	858	$2.4x10^6$
Reg. 11-MT:2015/Monre - VN, (Column B)	**5,5 – 9**	**100**	**60**	**20**	**20**	**50**	**150**	**5.000**

Notes:

- Reg. 11-MT: 2015/Monre – VN – National Technical Regulation on the effluent of Aquatic Products Processing Industry.

The results of analysing 20 wastewater samples taken from the households of Binh Thang craft dried fish processing village, presented in table 3.1, show that: except pH parameter, most of the parameters of the wastewater analysed exceed the current standards of Viet Nam (Reg. 11- MT: 2015/Monre - VN , column B), concentration of many parameters in the wastewater exceed many times compared with the regulation: the TSS exceeds from 2.48 to 6.82 times; Amoni exceeds the regulation, but not much with the highest number is about 1.4 times; and the BOD^5 parameters in the wastewater generated from dried fish processing in the village exceeds the regulation quite much, even there is the sample, its concentration of BOD is 16.4 times higher than standards of the regulation (in the case of Mr. Ngo Van Hung). Figures 3.2, 3.3 and 3.4 below illustrate level of BOD, TSS and Amoni in wastewater of three housholds having highest pollution level in the craft village.



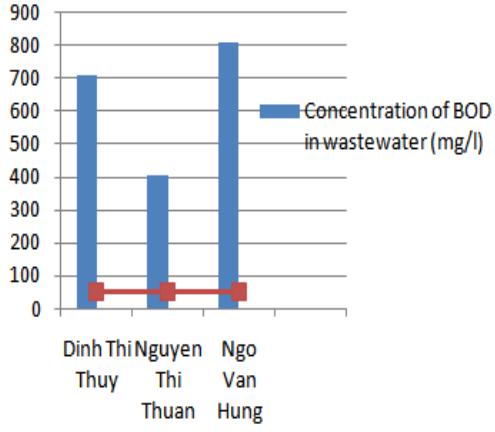


Figure 3.2: Concentration of NH_4^+ in wastewater of 03 households in the village

Figure 3.3: Concentration of TSS in wastewater of 03 households in the village

In order to assess current status of surface water quality in Binh Thang River flowing through the craft villages, in September 2016, the study carried out and analyzed 03 surface water samples that have been taken in the river location: 01 sample is at the beginning of the village, results of analysing this sample are used to assess quality of the surface water before being affected by activities of the village; 01 is at the middle of the village, analysed data of the samples are the basic for assessing impacts of the village on the water; and 01 is at the end of the village, results of analysing the sample would help assessment of impact of activities of the village on the river and quality of the water flowing out the village. The results of analyzing some characteristics of the surface water samples in the village are shown in Table 3.2.

Figure 3.4: Concentration of BOD in wastewater of 03 households in the village

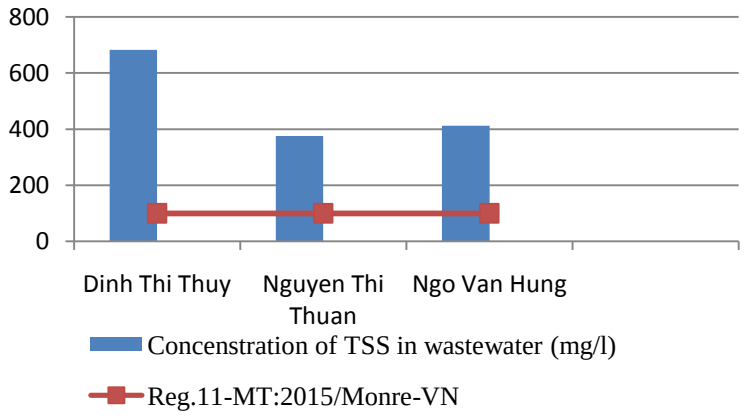


Table 3.2: Results of analysing 03 surface water samples in Binh Thang river

N_0	Parameters	Units	Results			Reg. 08-MT:2015/Monre-VN, Column B
			SWS-b	SWS-m	SWS-e	
1	pH(*)	-	7,24	7,19	7,18	5,5-9
2	TSS	mg/l	108	109	239	50
3	BOD_5	mg/l	10	9,01	6,04	15
4	COD	mg/l	9,15	6,01	5,02	30
5	$N\text{-}NH_4^{+)}$	mg/l	0,56	0,097	0,46	0,9
6	Coliform	MPN/100ml	$9,5x10^3$	$9,3x10^3$	$9,0x10^4$	7.500
7	∑ Oil	mg/l	0,12	0,201	0,030	1

Notes: - SWS-b, SWS-m, and SWS-e: Samples of surface water taken at beging, midle and end (in turn) of the river section flowing through the village.

- Reg. 08-MT:2015/Monre-VN, Column B: National technical regulation on surface water, Column B – Suface water could be used for irrigation or transportation

The results of analysis of surface water characteristics of Binh Thang River, the section flowing through the craft village, shown in Table 3.2 shows that: except TSS and coliforms, concentration and characteristic of other parameters in the samples are within the limit allowed by Regulation 08-MT:2015/Monre-VN, Column B, however, some parameters such as BOD, COD, total oil and N-NH4 + showed signs of decrease at the source end of the studied area; and the content of some pollutants in surface water in the studied area is increased gradually in the section of the river flowing through the village, especially TSS and total coliform levels. The level of TSS in the surface water at the beging, the midle and the end of the river section flowing through the Binh Thang craft village is illustrated in Figure 3.5 below.

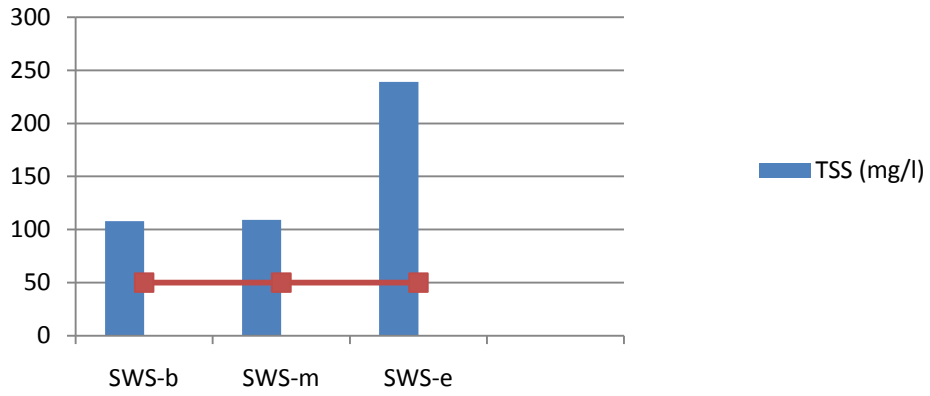


Figure 3.5: Concentration of TSS in samples of surface river water flowing through the village

From the figure 3.5, it can be seen that the concentration of TSS in the surface water in the beginng and midle of the river section flowing through the Binh Thang dried fish processing craft village is twice as high as the current standard, this value almost does not change in the midle compared with the beginning. However, at the end of the river, the concentration of TSS is very large, more than 2 times higher than existing standards of Vietnam for surface water, the high concentration of TSS at the river end of the village may be due to the discharge of waste water of the village into the river.

3.2.2. Air environment

Regarding the air environment in the studied area, results of field survey conducted during the study shows that the air environment in Binh Thang craft dried fish processing village has a very characteristic odor, discomfort and dispersion in a large space, the odors have arisen mainly from areas such as pre-processing, drying and from drainage ditches. To assess the level of air pollution in the Binh Thang craft dried fish processing village, the study had conducted a survey and selected three air samples to analyze specific parameters such as dust total, SO2, CO, NO_2, H_2S parameters; the smell alone is determined by the sense of members of the research team. The location of the air sampling sites is determined on the basis of the representativeness of the production areas and not affected by factors which are not related to fish processing activities of the craft village; Sampling time in the morning and sampling was done at the time of high intensity production of the village. Results of analysis of air quality 03 samples in the village, signed as: AS - 1, AS - 2, and AS - 3, are shown in table 3.3.

Table 3.3. Results of air environment in the Binh Thang craft dried fish processing village

N_0	**Parameters**	**Units**	**Results**			Reg. 05:2013/Monre - VN & Reg. 06:2009/Monre-VN
			AS - 1	**AS - 2**	**AS - 3**	
1	∑ Dust	mg/m^3	0,130	0,270	0,097	0,3
2	SO_2	mg/m^3	0,078	0,089	0,086	0,35
3	NO_2	mg/m^3	0,054	0,072	0,063	0,2
4	CO	mg/m^3	2,04	3,12	2,26	30
5	H_2S	mg/m^3	**0,072**	0,022	**0,043**	0,042

Notes: - AS – 1: Location at beginning of the village, closed to Ba Khoai creek and Binh Dai market
- AS – 2: Loaction at midle of the village and closed to hamlet's wharft.
- AS - 3: Location at the end of the village, closed to the commune's fish port

The results of air quality analyis of the craft villages shown in table 3.3 show that the quality of air environment in the craft villages is currently polluted by H_2S, especially in the areas where are dried fish production households and interchanges, pollution level of the air environment is quite high and exceeds the existing standards of Viet nam.

3.2.3. Solid waste

The production and daily life of the villagers creates a large amount of waste with different components: broken packages, domestic waste, solid waste (shredded meat, fish scales, bones, intestines, etc.). To determine the amount of solid waste generated in the village, the topic was measured and recorded data on daily production of 20 households representing the dried fish processing in the village: raw materials used daily; the quantity of fish used for each production day in each household. Due to the amount of fresh fish used for one day of production of and in each household varies, so to determine the level of solid waste discharge for one day of production per dried fish processing household, the subject has selected 5 days having similar amount of fresh fish putting into production for each household, coded L1, L2, L3, L4, and L5. Data of solid wastes generated in 20 dried fish processing households in the craft villages are shown in the following table 3.4.

Table 3.4. Solid waste generated in the households of the craft village

N_0	Households	Solid waste (kg/day)					Average (kg/day)
		L_1	L_2	L_3	L_4	L_5	
1	Vo Thi Phuong	120	128	125	122	126	124
2	Nguyen Thi No	70	62	67	63	68	66
3	Huynh Thi Hong	105	105	100	109	106	105
4	Nguyen Thi Em	70	66	74	64	66	68
5	Tran Van Luong	60	70	66	62	67	65
6	Nguyen Thi Tuoi	90	90	92	89	89	90
7	Dinh Thi Thuy	210	300	285	235	245	255
8	Mai Y Lan	60	70	68	62	65	65
9	Tran Thi Thuy	120	132	125	126	127	126
10	Nguyen Thi Thuan	54	63	61	54	60	58,3
11	Nguyen Duoc Anh	54	57.6	55	56.4	55.2	55.1
12	Tran Ngoc Thanh	60	70	59	65	71	65
13	Huynh Thi Van	48	57.6	54.9	51	51.5	52.8
14	Vo Thi Viet Duc	100	89.9	92.1	99	94	95
15	Nguyen Thi Le	70	70	69	70	71	70
16	Ngo Van Hung	70	76	73	74	72	73
17	Truong Thi My Trang	35	30.6	35	32	30.8	32.8
18	Trương Thi Soc	54	54	56	53	53	54
19	Do Thi Nhanh	54	64.8	60.1	60	58.7	59.4
20	Do Thi Tuyet Nga	48	59.4	49.2	55.0	54.1	53.6
Sum.		**1,552.0**	**1,715.9**	**1,666.3**	**1,601.4**	**1,630.3**	**1,633.8**

The results presented in table 3.4 show that the total volume of solid waste in 20 household surveyed was about 1,633.8 kg/day, with on average 81.7 kg/day for a household. With the number of dried fish producers in the village about 300 households, there is about 24.51 tons of solid waste daily generated in the village. At present, the garbage generated such as scraps, fish scales, heads, fins, bones, intestines, etc. are being collected and sold to the local factory in order to process seafood and food for cattle and poultry in Binh Dai district.

3.3. Actuality and effectiveness of environmental protection in the Binh Thang craft dried fish processing village

3.3.1. Organizational structure of environmental protection system in the craft villages.

The results of the survey conducting during the research implementation show that the organizational structure of the environmental protection system in Binh Dai district is currently composed of: the Division of Natural Resources and Environment, it is the specialized agency operating under the People's Committee of Binh Dai district and has responsibility for managing, guiding, inspecting ... communes and towns in the district on environment and natural resources within their area; the People's Committee of the commune does not have a dedicated environmental unit, but there is one environmental officer helping people's committee of the commune on environmental protection; and the craft village management board having the function in conjunction with the commune environmental officers to inspect the production acitvities as well as environmental protection in the craft village. The organizational structure of environmental management system in Binh Dai district is shown in figure 3.6 below.

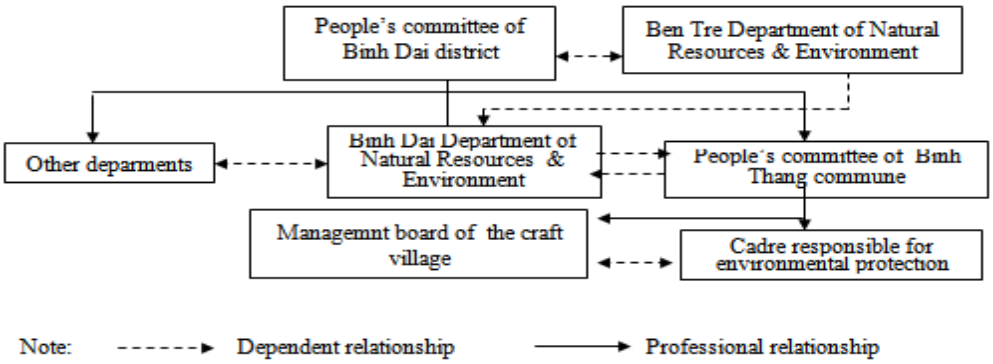


Figure 3.6: Scheme of administration of environmental management system

3.3.2. The status of environmental protection activities in the craft village

Results of implementation of the research on the status of environmental protection activities in Binh Thang commune show that there are still many limitations in environmental management in the studied area sush as: environmental management in the production households; activities of communication and dissemination of information related to the environment, including the environment, in general and the environment in the craft village, in particular, and fish processing field; inspecting, examining and sanctioning violations on environmental protection; and investment funds for environmental protection activities. Details of the limitations are, as follow:

a) Environmental management in production households in the craft village

In the Binh Thang dried fish processing craft village, up to now there is only one household which has registered their business, so this is only the household which has been granted confirmation of environmental protection commitment as stipulation in VietNam environmental proptection law. The rest of the households in the craft village do not have both business registration and confirmation of environmental protection commitment. The environmental monitoring as well as the inspection of environmental protection activities are not carried out regularly.

b) Communication and dissemination of legal documents on environmental protection and organization of environmental management system of the craft village The production of the households in the craft village is small in size and the perception of local people on environment is very limited, most of the producers in the craft village insist that their activities do not affect the environment. In addition, the People's Committee of Binh Thang commune has not paid much attention to this and there is no effort to raise awareness and disseminate legal documents on environmental protection to the producers. Some legal documents regarding environmental protection in craft villages have contradictory contents and overlapping. Stipulations in many documents are not close to reality of localities and localities do not have timely feedback on the difficulties to accordingly modify. There is a lot of shrortcomings in assigning responsibilities for environmental management among different parts of the organizational structure of the environmental management system, especially environmental protection responsibility in craft villages.ficiency of the system of environmental protection in the research area has not been as expected. All of that lead to ineffectiveness of environmental protection in the studied region

c) The investment budgets for developing craft villages The central and local budgets investing for environmental protection are very limited, the investment and use of the funds for waste treatment and environmental protection in the craft village is spread out, lack of uniform. So, using budgets for environmental protection is ineffective.

d)The inspection, examination and handling of law violations in the studied area. Among the causes leading to reduction of environmental quality in the Binh Thang dried fish processing craft village there are such causes as: the inspection work regarding environmental protection in the village has not been carried out; the dried fish processing households in the craft villages do not comply with the regulations on environmental dossiers; and the application of current environmental regulations on dealing with administrative violations of the households in the craft villages is difficult due to many unclear and inadequate provisions in the existing legal documents on the environmental field.

3.4. Analysng and evaluating the causes of pollution and proposing measures to improve environemntal protection effectiveness in the Binh Thang craft village

3.4.1. General assessment of causes of environmental pollution in the craft villages

From the information obtained during the study, combined with the results of the analysis and evaluation in the research implementation, it is possible to deduce some main causes leading to the reduction of environmental quality of the Binh Thang dried fish processing craft village and the efficiency of environmental protection in the region is not as high as expected. The causes are as follows: Production scale in the craft villages is small, mostly it is household scale; Most production technology and equipment are backward; Production relations in the village are just family and clan, so there is no oppurtunity to exchange and learn each other in reducing costs, increasing production efficiency as well as reducing the amount of pollutants; The technical infrastructure for environmental protection has not been paid proper attention both the producers and the state management agencies in terms of environment; Organizing the implementation of environmental protection legislation is still weak and not effective; The production custom in the village is spontaneous, small scale and so on leading to difficult planning for environmental protection; The dried fish processing activities of the village is mainly done at home and not be separated from the other activities of the family as well as residential areas, and the households in the craft village are only interested in profit, not environmental awareness, all of this would lead to reduction of environmental quality and environmental management effectiveness as well.

3.4.2. Proposing measures to improve environmental protection in the Binh Thang craft village

Based on the results of analysing and assessing the causes of environmental pollution and the current situation of environmental management in the craft village, there are suggested such solutions to improve environmental protection in the studied area, as follows:

a) Application of technical measures: Replication of cleaner production models for dried fish processing households in the whole village; Implementing guidance on production techniques to dried fish processing as well as methods of environmental protection and wastetreatment; Construction of rain water drainage and dredging drainage canals; and Building a concentrated wastewater treatment system for the craft village.

b) Planning: Adjusting the plan of the Binh Thang dried fish production craft village so that it suits the planning of the craft villages and handicraft villages and link them with the master plan for socio-economic development and environmental planning of the region.

c) Measures for propaganda and education: Organizing propaganda in the form of intensive training, direct meetings with producers and representatives of mass organizations; Implemention of a model of 03 typical households in the village and then propagating it to the whole village; Maximizing effectiveness of the mass media in raising awareness about environmental protection; Establishing environmental educational program that could fully be conveyed on radio and television; Integrating propaganda on environmental protection and hygiene into the meeting of: Youth Union, Women's Union, Veteran's Association, Farmers' Association; and mass organizations.

d) Measures to strengthen the capacity of environmental protection of the craft villages: It is needed to add professional environmental staff to relevant organizations and units at the commune and hamlet levels; In the immediate future, there need to have at least 01 officer responsible for environmental sanitation management in the hamlet 1, 3, and 4 of the craft village since these hamlets have dried fish processing households concentrated in; and it should be established an environmental self-management group, in which there is at least one solid waste collector

e) Socialization of environmental management: Implementing the policy of vigorous implementation of social protection of environmental protection activities, including environmental protection of craft villages, in order to mobilize the active participation of the people themselves, production households as well as social sectors with preferential mechanisms and policies adequately.

IV. Conclusion

From the results obtained during the implementation of the project entitled "Assessing the environmental status and proposing measures to improve the effectiveness of environmental protection in Binh Thang small fish processing village, Binh Dai district, Ben Tre province", there are some conclusions drawn as follows:

* Most of the stages of manufacturing activities in the Binh Thang dried fish processing craft villages are hand-made, labor intensive use and long production time; Equipment and tools used in the production are rudimentary, poorly preserved, so the quality of dried fish products does not meet hygiene and food safety requirements; Production of households are small scale, scattered; The production process in the research area has not been optimized, many stages of wastage of raw materials.

* The waterwaste of the craft vilage has high level of pollution compared to current standards; Wastewater generated from craft villages are discharged directly into the environment causing environmental pollution, especially canals, drainage ditches in the concentrated residential areas of the village; Canal network in the village is polluted and is no longer capable of undertaking drainage functions; Amount of solid waste from the craft villages is quite high although most solid wastes from fish processing has been collected and reused.

* Local authorities have not paid much attention or efforts to manage and disseminate legal documents regarding the environmental protection field so the effectiveness of environmental management in the studied area is not as high as expected; The inspection and examination works have not yet been carried out in the craft village; and Investment budgets for developing the craft villages in general and for environmental protection in particular have not met the demand.

* Research results also showed that combination of the such measures as: management; economic – technical; and propaganda to raise awareness of the people in the Binh Thang dried fish processing craft village would help the craft villages to develop economically and socially sustainable and reduce negative impacts on the environment

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